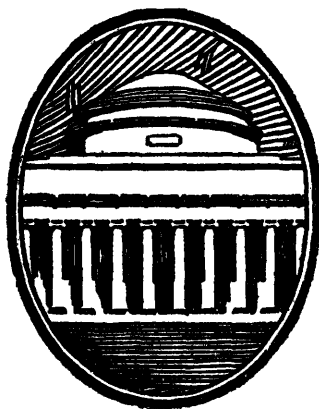


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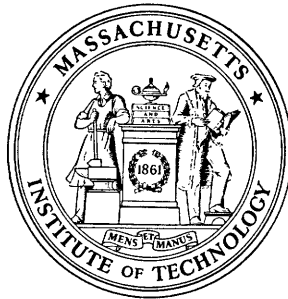
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OF TECHNOLOGY  
BULLETIN

# President's Report Issue

1949-1950

VOLUME 86



NUMBER I

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## TABLE OF CONTENTS

REPORT OF THE PRESIDENT	PAGE
Meeting the Nation's Defense Needs . . . . .	7
Research Policy . . . . .	7
Educational Policies . . . . .	10
The Year in Review . . . . .	11
Educational Survey . . . . .	11
Research Program . . . . .	14
Summer School Program . . . . .	18
Towards a Residential College . . . . .	19
New Facilities . . . . .	20
The Development Program . . . . .	21
Special Needs and Opportunities . . . . .	23
Scholarships . . . . .	23
Round Hill . . . . .	24
Humanities and Social Sciences . . . . .	24
Statistics of the Year . . . . .	25
Finances . . . . .	25
Enrollment . . . . .	27
Student Aid . . . . .	27
Personnel . . . . .	28
Corporation . . . . .	28
Faculty . . . . .	29
Administration . . . . .	33
Conclusion . . . . .	34
<b>REPORTS OF ADMINISTRATIVE OFFICERS</b>	
Dean of Students . . . . .	35
Dean of the Graduate School . . . . .	43
Registrar . . . . .	46
Director of Admissions . . . . .	69
Director of Libraries . . . . .	72
Director of the Division of Industrial Cooperation . . . . .	82
Adviser to Foreign Students . . . . .	83
Placement Officer . . . . .	86
Industrial Liaison Officer . . . . .	89
Personnel Officer . . . . .	91
Medical Director . . . . .	93
Executive Vice President of the Alumni Association . . . . .	97

SCHOOL OF ENGINEERING	PAGE
Aeronautical Engineering . . . . .	99
Building Engineering and Construction . . . . .	108
Business and Engineering Administration . . . . .	112
Chemical Engineering . . . . .	121
Civil and Sanitary Engineering . . . . .	126
Electrical Engineering . . . . .	131
Graphics . . . . .	141
Mechanical Engineering . . . . .	141
Metallurgy . . . . .	162
Meteorology . . . . .	170
Round Hill Field Station . . . . .	174
Military Science and Tactics . . . . .	175
Naval Architecture and Marine Engineering . . . . .	177
SCHOOL OF SCIENCE	
Biology . . . . .	179
Chemistry . . . . .	182
Food Technology . . . . .	183
Geology . . . . .	184
Mathematics . . . . .	187
Physics . . . . .	189
SCHOOL OF ARCHITECTURE AND PLANNING	
Architecture . . . . .	192
Bemis Foundation . . . . .	193
City and Regional Planning . . . . .	195
DIVISION OF HUMANITIES	
Economics and Social Science . . . . .	197
English and History . . . . .	198
Modern Languages . . . . .	201
Museums and Exhibitions . . . . .	203
INTERDEPARTMENTAL LABORATORIES	
Acoustics . . . . .	204
Electronics . . . . .	208
Nuclear Science and Engineering . . . . .	212
Spectroscopy Laboratory . . . . .	214

TABLE OF CONTENTS

5

REPORT OF THE TREASURER	PAGE
AUDITOR'S CERTIFICATE AND REPORT OF AUDITING COMMITTEE	218

I

FINANCIAL REVIEW . . . . .	219
Gifts, Grants and Bequests Received During Year . . . . .	227
Report of the Technology Loan Fund Committee . . . . .	233
Report of the Trustees of the M. I. T. Pension Association . . . . .	234
M. I. T. Pension Association Investments . . . . .	235
BALANCE SHEET . . . . .	Schedule A 236
INCOME AND EXPENSE STATEMENT . . . . .	Schedule B 238
DEFICIT FROM OPERATIONS . . . . .	Schedule C 239

II

STATEMENT ON ACCOUNTS . . . . .	240
---------------------------------	-----

BALANCE SHEET — SUPPORTING SCHEDULES:

General Investments . . . . .	A-1	241
Investments of Funds Separately Invested . . . . .	A-2	248
Endowment Funds, Income for General Purposes . . . . .	A-3	252
Endowment Funds, Income for Designated Purposes and Unexpended Income Thereof . . . . .	A-4	254
Student Loan Funds . . . . .	A-5	264
Building Funds . . . . .	A-6	264
Other Invested Funds:		
General Purposes . . . . .	A-7	264
Designated Purposes . . . . .	A-8	266
Deposits and Advances, Held for Investment . . . . .	A-9	270
Conditional Gifts . . . . .	A-10	272
Accumulated Net Gain on General Investments . . . . .	A-11	272
Students' Notes Receivable . . . . .	A-12	274
Accounts Receivable . . . . .	A-13	274
Contracts in Progress . . . . .	A-14	275
Inventories, Prepaid Expenses and Deferred Charges . . . . .	A-15	276
Students' Advance Fees and Deposits . . . . .	A-16	277
Withholdings, Deposits, and Other Credits . . . . .	A-17	277
Unexpended Balances of Gifts and Other Receipts for Current Purposes — Uninvested . . . . .	A-18	278

	PAGE
Educational Plant Assets . . . . .	A-19 289
Principal Gifts and Appropriations for Educational Plant . . . . .	A-20 290
<b>INCOME AND EXPENSE STATEMENT — SUPPORTING SCHEDULES:</b>	
Students' Fees . . . . .	B-1 292
Allocation of the use of Investment Income and Gifts and Other Receipts to Current Expenses . . . . .	B-2 293
Use of Income from Investments . . . . .	B-2a 294
Expendable Gifts and Other Receipts used for Current Expenses . . . . .	B-2b 294
Research Contracts . . . . .	B-3 295
Other Income . . . . .	B-4 296
Salaries and Wages of Staff, Accessory to Teaching and Laboratory Service . . . . .	B-5 297
Departmental Expenses . . . . .	B-6 298
Library and Museum Expenses . . . . .	B-7 299
Clerical Salaries and Administrative Office Expenses . . . . .	B-8 299
General and Administrative Expenses . . . . .	B-9 300
Plant Operation . . . . .	B-10 301
Medical Department . . . . .	B-11 302
Undergraduate Budget Board . . . . .	B-12 302
Auxiliary Activities . . . . .	B-13 303
<b>III</b>	
<b>A BRIEF DESCRIPTION OF THE ENDOWMENT AND OTHER FUNDS . . . . .</b>	<b>304</b>
<b>LIST OF PERIODICAL PUBLICATIONS, BOOKS AND REVIEWS BY MEMBERS OF THE STAFF . . . . .</b>	<b>331</b>
Index of Authors . . . . .	377
<b>THESES PRESENTED FOR DOCTORS' DEGREES . . . . .</b>	<b>368</b>
Index of Authors . . . . .	383

## REPORT OF THE PRESIDENT

TO THE MEMBERS OF THE CORPORATION:

**N**O EDUCATOR contemplating the present world scene and its inherent hazard of another catastrophic war can fail to be deeply disturbed and perplexed by the difficulties of setting any true course. The half-light in which we live obscures the road ahead and dims the clarity of any policy or long-range plan. It is like driving in the twilight; the dim light makes it hard to see and the headlights are much less effective than they are in total darkness.

In presenting my annual report at this time, I do so with the awareness that our programs and our planning at the Institute are subject to change without notice, and that the only policy that we can be certain is sound is to keep ourselves in a state of readiness to serve our nation, which must now mobilize its might as the surest way to prevent a war as well as to maintain the essential condition for our defense. I can report to you with confidence that all groups at the Institute share in this feeling of responsibility. Underlying all of our policies and planning is a clear commitment to be guided by the national interests and not by self-interest.

Keeping ourselves in a state of readiness means that we should keep our program as flexible as possible. We should try to avoid commitments that might later prove to have low priority. We are trying to hold our staff as nearly intact as possible so that they may be effective as a team in carrying on our present program and in attacking any emergency programs that we may later be asked to undertake when the need might be much greater.

*Research Policy.* The scientific situation today is quite unlike the period prior to World War II. At that time there was no appreciable mobilization of scientific resources and the civilian scientists and engineers had scant familiarity with

military problems or planning. In contrast, we now have extensive scientific mobilization already as a result of the development of large government laboratories and the sponsored research programs of the Armed Services. Moreover, large numbers of our scientists and engineers are well informed about military problems, and hundreds of them are actively participating in military planning, as, for example, through the organization of the Research and Development Board.

With these considerations in mind, I suggest that M. I. T. should continue its basic educational and research activities as uninterruptedly as possible, especially since they bear directly on national defense. We can make our maximum contribution to national security by doing thoroughly what we already have undertaken. As you know, we are already carrying a heavy load of research and advisory activity in connection with national defense. We are prepared to continue this with vigor, or, as the need may dictate, to expedite and to expand it.

In addition to research they conduct on campus for the Government, members of our staff have been serving as consultants to Government on a wide variety of problems. The magnitude of this service is quite beyond anything that took place prior to World War II, and provides another illustration of the resources of manpower and ideas which are present in this institution.

During the past several years an interesting new consultative technique has been developed and employed here and elsewhere to help the Government solve complex problems. Let me cite a specific example. Two summers ago the Atomic Energy Commission needed expert counsel and imaginative consideration of a highly technical and strategically important problem. Instead of setting up a research laboratory or a new research group to deal with it, A. E. C. representatives came to M. I. T. and asked if we would assemble a representative group of first-rate scientists and engineers to spend three or



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new accommodations for students."*



*"... a room of modern design,  
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*“The interest which has been shown  
in the Summer School program  
gives a measure of its success.”*



four months intensively studying this problem for the purpose of appraising present ideas and charting a future course of action. The group was to undertake no laboratory research. It was to serve rather as a panel of experts and was to be so briefed and organized that they could be uninhibited in their thinking about the problem. This group, which came to be known as the Lexington Project, was organized under these conditions. A group of first-rate men from both industry and a wide variety of educational institutions was brought together, and spent the summer living with this problem and thinking about it in a free-wheeling manner. The results were good, and the A. E. C. had in its hands an evaluation and a program which it hardly could have obtained in any other manner.

So successful was Project Lexington that its formula has now been duplicated several times with new groups assembled to study problems of other government departments. In each instance the results have been highly valuable. A new order of civilian ingenuity and imagination has been brought to bear upon military problems, and the Government has had the benefit of some of the best minds in the nation. It has had the benefit of these minds, and this is important, without unduly disturbing their normal educational or industrial activities. The groups have all been assembled for relatively short periods of time, and a deadline set beyond which they would not go. The men in the groups then dispersed and went back to their normal activities.

I cite this type of assistance to our Government to illustrate two advantages of the plan. In the first place, it provides a technique whereby our Government can have access to the best thinking of our professional people without uprooting them for long periods of time. By bringing them together in these ad hoc study groups, the Government is able to get sound counsel on complex technical questions. Furthermore, it can get broad thinking about systems, instead of limited thinking

about components. Because M. I. T. has a versatile and integrated team, it has unusual competence to do comprehensive "systems" research, and many of our staff feel that this is one of the most important contributions that we can make to defense.

The second advantage of this type of project is that the men who are participating in them can lend their services to the Government without upsetting unduly the programs of the institutions to which they are permanently attached, or for that matter without unduly disrupting the professional activities of the men themselves. Still another advantage of this kind of arrangement is that it builds a cadre of informed professional people in this country who know what the Government's technical problems are in certain areas that otherwise would be kept from them and therefore who are more readily available further to assist the Government if an emergency makes it necessary.

Government and industry-sponsored research projects, together with projects such as the one I have just described, are means by which we can make a direct contribution to the national security and at the same time continue to perform our basic and fundamental jobs of educating a steady stream of young people and of advancing the boundaries of knowledge.

*Educational Policies.* At this stage I believe that we can and should maintain our educational and fundamental research programs in as vigorous a condition as possible. We should try to maintain at full momentum our current postwar program, as outlined in later pages of this report, with all of our plans for improving and strengthening our educational program and our financial position going ahead without letup. At the same time we should be prepared to drop them all and mobilize completely if called by national policy to do so.

I am hopeful that the present studies of the National Security Resources Board will result in a courageous man-

power policy that will provide adequately for the large military needs of the nation and that at the same time will avoid the complex and frequently invidious procedures inherent in our present selective service. I hope, too, that this policy will chart a clear emergency course for our universities and their students to follow. Whatever this policy may be, the universities can and will adjust to it, even though it forces changes in the pattern of higher education. Meanwhile schools training men for such essential professions as science, engineering, and medicine have a responsibility to maintain a high degree of educational effectiveness.

The future of our country also depends upon our holding fast as long as possible to those aspects of education which inculcate a sense of the first-rate as expressed in such imponderables as good taste, high standards, and high ideals. It is all too easy to think of these as non-essential.

#### THE YEAR IN REVIEW

*Educational Survey.* The most important academic event of the year was the report to the faculty of its Committee on Educational Survey.\* Copies of this report were distributed to the Corporation last spring, and copies have now been made available by the Technology Press for public distribution.

Winston Churchill once said that every nation needed from time to time to call upon leading citizens to come together to do what he called "exalted brooding" about the problems and the future of the nation. The Survey Committee performed this function with great distinction and success; it also fortunately did the grubby work of preparing a detailed blueprint of what it thought our faculty should do to maintain M. I. T.'s educational pioneering and leadership.

Most notably the report drives home the opportunity which M. I. T. has still further to strengthen its undergraduate

\*Membership of the committee included Professors Ronald H. Robnett, C. Richard Soderberg, Julius A. Stratton, John R. Loofbourow (secretary), and Warren K. Lewis (chairman).

education in order that the Institute may turn out men better qualified to deal with the current problems of society. The committee recommended ways, now adopted by the faculty, in which the organization of our faculty could be strengthened for the purpose of achieving better educational supervision and integration of our undergraduate curriculum.

The committee considered and rejected proposals that M. I. T. change its present policy of offering a professional education at both the undergraduate and the graduate level and concentrate on postgraduate education, thus separating general and professional education much as the schools of medicine and law have done. Also rejected was the necessity for lengthening the undergraduate program to five or six years if a broader educational program were to be adopted.

Instead the committee has emphasized the challenging opportunity which M. I. T. now has of pioneering in finding ways of achieving the desired synthesis of general and professional education in a four-year undergraduate program, while continuing as it now does to offer courses of various lengths to meet special professional requirements. It is believed that in the four-year program the general rather than the professional aims must be dominant. But it is recognized that if during these years the student acquires a broad understanding of scientific and technological fundamentals, he will find that professional opportunities will be open to him, and that he will be able to learn practical applications and routines through experience in industry.

The committee urged that we move in the direction of more flexibility, that we improve our subjects of instruction by reduction of detailed content and by increased emphasis upon fundamental principles, and upon the development of powers of judgment and discrimination by the students in the formulation and application of these principles. It suggested a variety of ways in which we can further improve our teaching techniques, and it outlined many ways in which we can provide an

environment contributing to the intellectual unity and the morale of our faculty.

And finally, the report recommended that we give increasing importance to the humanities and the social sciences in our program. "It is M. I. T.'s duty," says the report, "to prepare its students for social responsibility and for a rich and complete life. But, important though these objectives may be, technological and social problems are now so inextricably interwoven that the humanities and social sciences are also essential components of a man's professional education. Without an adequate cultural background, a technical specialist is no longer qualified for leadership in his own field."

The report proposes that the present Division of Humanities be raised to equal status with the professional schools; that the new school "assume the responsibility for planning and administering the program of general education as a part of the common curriculum, and that it offer professional courses leading to graduate as well as undergraduate degrees."

Establishment of this school, which the faculty has also recommended, does not mean that M. I. T. plans now or in the future to take on the character of a college of liberal arts. We shall remain an institution of limited objectives, offering as we have in the past a program centered around science, engineering, architecture, and management. However, a great institute of technology must recognize that these professions encompass a wide range of responsibilities for the public welfare. We believe that those aspects of social relations which bear a relationship to engineering and science, and which we might define as social technology, can thrive in our environment. By giving them support and recognition we can make basically important contributions to management, economics, and other social sciences that might not be made so effectively in other academic environments. The insights and techniques of science also have an important contribution to make to the solution of human and social problems, which such a school

can help us to explore. At the same time the professional schools will gain from the broader humanities program which the new school will make possible.

I am particularly happy about the emphasis which the committee placed upon a strong and advancing undergraduate program. We have not made as much progress in recent years in this country in undergraduate teaching as we have in graduate teaching, and the time has come to give special attention again to this part of our program. At M. I. T., where pioneering contributions have been made to undergraduate education, we have a tradition and a responsibility to live up to. The faculty and administration are in accord that we must have superlatively good undergraduate teaching, the best that can be found.

In accordance with the recommendations of the survey, the faculty has appointed a Committee on Undergraduate Policy, with Professor Walter G. Whitman as chairman. This important new committee has started its work by a restudy of the first-year curriculum and the integration of those faculty groups responsible for undergraduate instruction.

*Research Program.* A wide-ranging program of fundamental research has continued to provide the steady progress and creative scholarship which vitalizes both graduate and undergraduate education. The objectives of advancing knowledge and enriching education are inseparable goals in our scheme of education.

I mention here only a fraction of the important research results achieved by students and staff, but at the risk of invidious selection let me list the following, drawn from the individual reports of department heads, as typical of the character and diversity of our research activities:

¶ A tangible result of the program of research in communications is an electronic correlator capable of detecting signals masked by noise. In a related effort, promising results have been obtained in the development of electrical devices

to replace human sensory responses as an aid for handicapped persons.

¶ The aeronautical engineering department's broad program of research in aero-elasticity has expanded steadily with emphasis on problems dealing with shock and impact on structures, including the effect of blast forces, static loads on swept wings and very thin wings, and the effect of flutter on dynamic control and stability.

¶ An interesting example of cooperative engineering research on an international scale is the International Project on Flame Radiation, supported by British, French, and Dutch government and industrial interests. The M. I. T. Fuels Research Laboratory staff are participating in the planning and direction of the work being done in Holland.

¶ In metallurgy, a group has obtained a solution to the age-old problem of the mechanism of the hardening of steel. Although the hardening of steel is an ancient art, the mechanism had not previously been thoroughly understood, and the solution of this classical problem is a major contribution in the field of metallurgy.

¶ The first accurate measurements of the surface tension of a solid metal have recently been made at the Institute.

¶ Extensive experimental studies of the hydraulic analogy to supersonic flow have shown that it is possible to simulate supersonic flow in gases at Mach numbers from 1 to 7 by tests with water in a large shallow channel. An extension of the mathematical analogy for an idealized gas has made it possible to obtain a good agreement between supersonic flow of air and the results with water.

¶ A bold attack on the problem of solidifying soils by the use of chemicals has shown promising and probably practical results. By the use of calcium acrylate, a soupy mud can be converted to an elastic mass of appreciable tensile strength, as shown by field tests.

¶ Research in the department of geology made it possible

to photograph the geometrical position of atoms in crystal structures for which the required phase shifts were known. The crystal structures of marcasite, pyrite, and potassium dihydrogen phosphate have been photographed to date.

¶ Research in the department of chemistry on methods for preparation of the fused thiazolidine-8-lactam ring system of penicillin has resulted in the synthesis of a 5-phenyl penicillin, which has the complete structure of the natural penicillins, plus a phenyl substituent. This preparation is the closest approach yet made to an unambiguous synthesis of a natural penicillin.

¶ Mesons have been produced with the newly constructed synchrotron, and measurements of the lifetime of the  $\pi^+$  meson have been made by members of the staff in the laboratory for nuclear science and engineering by adapting the sort of techniques used for cosmic rays to the particles produced by the synchrotron.

¶ The development of the echelle, a spectroscopic device having properties intermediate between a diffraction grating and an interferometer, has proceeded far enough so that it promises to bring about new possibilities of very accurate and large-scale measurement of spectral lines.

¶ Studies of nuclear energy levels have revealed previously unsuspected complexity in the energy level schemes of both light and heavy nuclei. Work on the light nuclei is being done with the Van de Graaff generators, and on the heavy nuclei by the emergent beam from the cyclotron. It is such experimental information on nuclear energy levels which is needed to make possible further advance in nuclear theory.

¶ The low temperature laboratory has advanced far enough so that undergraduate as well as graduate students have been making contributions to the knowledge of the effect of pressure on the velocity of second sound in liquid helium, and the effect of low temperature on the resistance of metals. Never before has an institution had sufficient liquid helium available to make it available to undergraduates for research.



¶ As a result of research in the department of biology, the powerful antibiotic agent, aureomycin, has been shown to interfere with the oxidative reactions which furnish the energy of the cell. This provides an important clue for further research in the control of infectious disease.

¶ Certain proteins of great importance in the body including a hormone (insulin), digestive enzymes (pepsin, trypsin, chymotrypsin, and invertase), antibodies (the Rh blood factor), and protein components of the blood-clotting system were shown to be rendered biologically inert in the test tube by the action of the oxidative metal-containing enzymes, tyrosinase and peroxidase.

¶ In the food technology department, sufficient work has been done to indicate that by using cathode rays from the Van de Graaff generator, complete sterilization can be obtained, without heat, from any bacteria, whether spore formers or non-spore formers, yeasts, molds, or even insect infestation on any products so far tested, and now studies are in progress on the side reactions affecting color, taste, and nutritional value.

¶ This year the Roosevelt project continued its work of selecting and preparing for publication with explanatory annotation the letters of Theodore Roosevelt. These letters deal not only with the development of the public policies for which Roosevelt was in large part responsible, but also with the multifarious aspects of American life in which he was interested.

¶ During the year major advances were made in a different area of research — that of the housing industry. The contributions which technology can make to this second largest industry have long been limited by the character of the industry itself. Starting from the background of the general studies of the Bemis Foundation, which is soon to bring out its survey of the prefabrication industry, the department of economics staffed and put into operation an investigation of the economics

of innovation in the housing industry. This represents an application to this industry of the process of analysis developed in previous studies of other industries.

*Summer School Program.* Continuing our policy of using the summer months to make M. I. T. facilities available to those who would not otherwise be able to participate in the work at the Institute, as well as to students who desire to augment their studies, we have further expanded and strengthened our summer program under the able direction of Professor Walter H. Gale.

Conferences of short duration brought together groups of specialists for a current survey and exchange of ideas in fields of importance to science and industry. Courses designed especially for professional and technical people from industry, offered instruction and laboratory work in other special subjects. There were sixteen of these conferences and special courses, in addition to the regular summer program of courses and projects for undergraduate and graduate students.

The interest which has been shown in the summer program gives a measure of its success. In certain of the special courses we had to turn down more applications than we accepted. While the registration of regular students was approximately the same as last year, the total registration in the summer courses was ten per cent greater than in 1949. This increase was due to the special course registration and does not include the large number attending conferences and symposia.

In order that the burden of an expanded summer program will not rest too heavily on the Institute staff, as well as for the contribution which it makes to the variety of summer offerings, the practice has been continued of inviting distinguished visiting lecturers from this country and abroad to participate in the program. This has had the additional advantage of providing members of the M. I. T. community a working association with these men from other campuses, from industry and government.

The Summer Session Office devoted a great deal of time and attention this year to helping the Institute's guests enjoy the recreational opportunities of the campus and the community. A bulletin issued by the office furnished a directory of sports and cultural events, as well as a guide to interesting places in and around Boston. Tours were arranged and tickets procured for those who wanted them. An outstanding feature of the summer was the Popular Lecture Series arranged by Mr. Michael Kesler of the student lecture series committee. These lectures and forums covered a wide range of subjects and were well attended.

One of the pleasantest features of the summer was the availability of the new dormitory for housing. This permitted the groups to live together and develop their common interests. Thus in informal as well as formal ways the participants in the summer session came to know M. I. T. very well.

*Towards a Residential College.* One of the most important additions to our facilities during the year was made through purchase of the Riverside Apartment Hotel on Memorial Drive. This past summer we started converting this building to a dormitory that will ultimately house some five hundred students. This, together with the new dormitory which was finished last year, gives us within a year nearly a thousand new accommodations for students, more than doubling our permanent dormitory facilities. This brings us closer to our objective of having dormitories adequate to house those students who wish to live in them.

When the Riverside Apartments are in full use as a dormitory, we will be able to provide housing for approximately two-thirds of our student body, if we include the temporary barracks, Westgate and Westgate West, and the fraternity houses. This additional housing means a notable improvement in our environment and in our opportunity to provide a more rounded educational program and community life for our student body.

With this additional housing available we were able this fall to take care of all freshmen who wished to live in dormitories. By gathering a large proportion of our freshman class together on the campus, we can better promote adjustment and morale and strengthen the educational influence of our community life.

*New Facilities.* Blueprint preparation, ground breaking, and dedication ceremonies have continued to mark the progress of our development program. The hydrodynamics laboratory and towing tank, begun last year, are now in use. The twelve million electron volt electrostatic generator has been substantially completed. Dedication of the Charles Hayden Memorial Library took place in May, attended by stimulating and gracious visitors in appropriate compliment to the beauty and usefulness of this great new library.

Construction was started this summer on the Alfred P. Sloan Metal Processing Laboratory. This will provide much needed new facilities for education and research in metallurgical science as applied to basic manufacturing processes. Named in honor of Alfred P. Sloan, Jr., whose generosity has made it possible, this new building will enable the interdepartmental metal processing laboratory to enjoy superb working facilities.

A new biology and food technology laboratory, to be called the John Thompson Dorrance Laboratory, in honor of the late John Thompson Dorrance '95, has been made possible by a grant from the Campbell Soup Company, and the design of this structure is nearing completion. It is our hope that we will be able to start construction on this important addition to our science facilities this year, thus adding another excellent modern building with top-notch equipment to our East campus.

Of major importance to the development of our college community and our broader educational program will be the auditorium and chapel for which funds have now been received from The Kresge Foundation. The addition of an auditorium and chapel to our campus will carry M. I. T. another long step

forward in its program of increasing the emphasis on its community, cultural, and spiritual activities.

The community life of the campus has also been aided by the addition this past year of a new student-faculty room, where students and faculty can meet under informal conditions. This room was made possible by the Development Program, and designed by one of the student members of the Student-Faculty Committee, so that its purpose of stimulating a community spirit has been served from the very start.

The student-faculty room is for general use. In addition, we are slowly providing much-needed new rooms for seminars and extra-curricular meetings where students and faculty can get together in attractive surroundings. This June a dedication tea marked the opening of the Dugald Caleb Jackson Room, a room of modern design, beautifully equipped to serve for seminars, conferences, and special meetings of the Department of Electrical Engineering. I might mention here that the new Metal Processing Laboratory is to have a penthouse "common room" above the fourth floor, for the use of all students and faculty members. Equipped with a complete kitchen and dining facilities, the room will make possible social occasions which will supplement and enrich the formal contacts of the laboratory and classroom.

The progress we have made this last year in adding to our facilities brings us to within sight of reaching our goal of replacing inadequate facilities with modern ones, and of exploiting new scientific and technological opportunities. An outstanding need yet to be filled is for a new building to bring together our scattered and inadequately housed groups in Electronics and Nuclear Science. We confidently hope that the remaining months of the Development Program will make this possible, along with a much needed Faculty Club.

*The Development Program.* The \$20,000,000 Development Fund drive was carried beyond the \$15,500,000 mark with the receipt of the grant of \$1,500,000 from The Kresge Foundation

late in June. This grant brings to around \$10,000,000 the additions to the Development Fund since June of last year. Of the total amount of the fund to the present date, somewhat over one-third has come from corporations, another one-third from individuals, and the rest from foundations, estates, trusts, and other sources.

Three gifts of one million dollars or more highlighted this year's effort. The Campbell Soup Company grant of one million dollars for the biology and food technology laboratory and the million and one half dollars from The Kresge Foundation for an auditorium and chapel, made major contribution to our building program. An unrestricted gift of one million dollars was given to the Institute by John D. Rockefeller, Jr. This gift will be used for continuing operating needs, in accordance with the preference expressed by Mr. Rockefeller and our own objective of bolstering the Institute's unrestricted funds. In making this gift, Mr. Rockefeller stated that he did so in the hope and the belief "that the Institute may continue to expand its strategic service to all interested in the advancement of science for the betterment of mankind, irrespective of national boundaries."

Some two hundred corporations have contributed to the Development Program to date, and the number is steadily increasing. Almost one-fourth of these companies are making grants spread over a period of years under the Industrial Liaison Program through which the Institute renders the companies a variety of special services. The growth in number of these cooperative arrangements with larger companies is heartening endorsement by industry of the pattern of cooperation which M. I. T. is developing.

Impressive and promising is the fact that forty per cent of all the cash gifts received by the Institute during the past year came from corporations.

Marshall B. Dalton's untiring efforts as Chairman of the M. I. T. Development Fund have contributed mightily to its

successful year, as has the interest and support of the Honorary Chairman, Alfred P. Sloan, Jr. I find it difficult to pay adequate tribute to the M. I. T. alumni throughout the country who have given unsparingly of their time, their ability, and their effort. This spring more than two hundred members of the Committee on Financing Development attended a meeting at the Institute, the third national meeting since the drive began. The interest of the M. I. T. alumni in the Development Program, as indicated in extraordinary measure by this group, gives us reason to expect that the current year will bring the \$20,000,000 drive to a successful conclusion.

Completion of the \$20,000,000 program is but the first and intensive phase of a sustained and systematic search for new resources. Plans are now being formulated for a permanent development office which can insure this long-term effort. I believe that the Institute should plan on obtaining at the minimum another ten million dollars of capital funds within the next five years, and that it is not unrealistic for us to strive to double this amount, in addition to the current development goal.

#### SPECIAL NEEDS AND OPPORTUNITIES

*Scholarships.* The objectives of the Development Program include many of the current major needs of the Institute, but not all. One serious omission is adequate scholarship funds. Last year our undergraduate scholarship awards totaled only \$188,096, or \$53 per undergraduate. Of the total undergraduates enrolled, 602 received scholarship assistance, and the average award was \$312.

At another institution which draws a student body with a national spread comparable to ours, but which has a lower tuition, the undergraduate scholarship awards averaged \$100 per student enrolled. Many other institutions are similarly higher in their awards than our own.

The evidence is clear that many applicants of outstanding

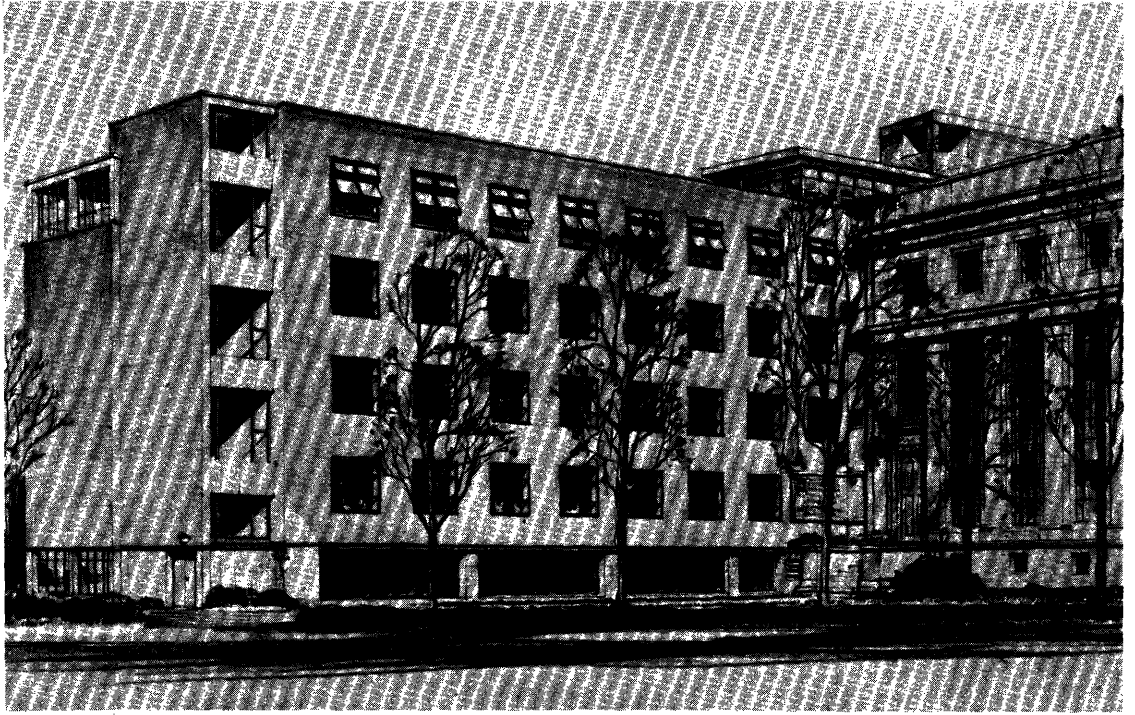
merit but of inadequate financial means turn away from the Institute, their first choice, to other colleges where more adequate scholarship aid is available to them. The Institute is fortunate in having the large resources of the Technology Loan Fund, but loans alone will not suffice if we are to draw our share of the ablest youth of the nation.

The Executive Committee has earmarked for scholarships the income on \$500,000 received for the Development Program as a first step in building up our funds. A major objective in the months and years ahead must be the further increase of our undergraduate scholarship funds; we need at least to double our present endowment of \$3,400,000 for this purpose. In stressing the need for undergraduate scholarship funds, I do not infer that we do not at the same time need additional graduate scholarship funds. We do, but our graduate scholarships are more nearly ample than our undergraduate, primarily as a result of the many industrial fellowships now available.

*Round Hill.* Last year I spoke of our opportunity to make effective use of Round Hill, the estate near New Bedford given the Institute by Mrs. Matthew Astor Wilks, provided we could obtain funds to recondition the large stone mansion on the property and to endow its operation. We are still seeking funds for this purpose, since we envisage many important uses for the estate, including making it an off-campus center for scientific meetings and for a variety of educational and student activities. Our Lexington Field Station has already proved its usefulness and Round Hill can become even more important.

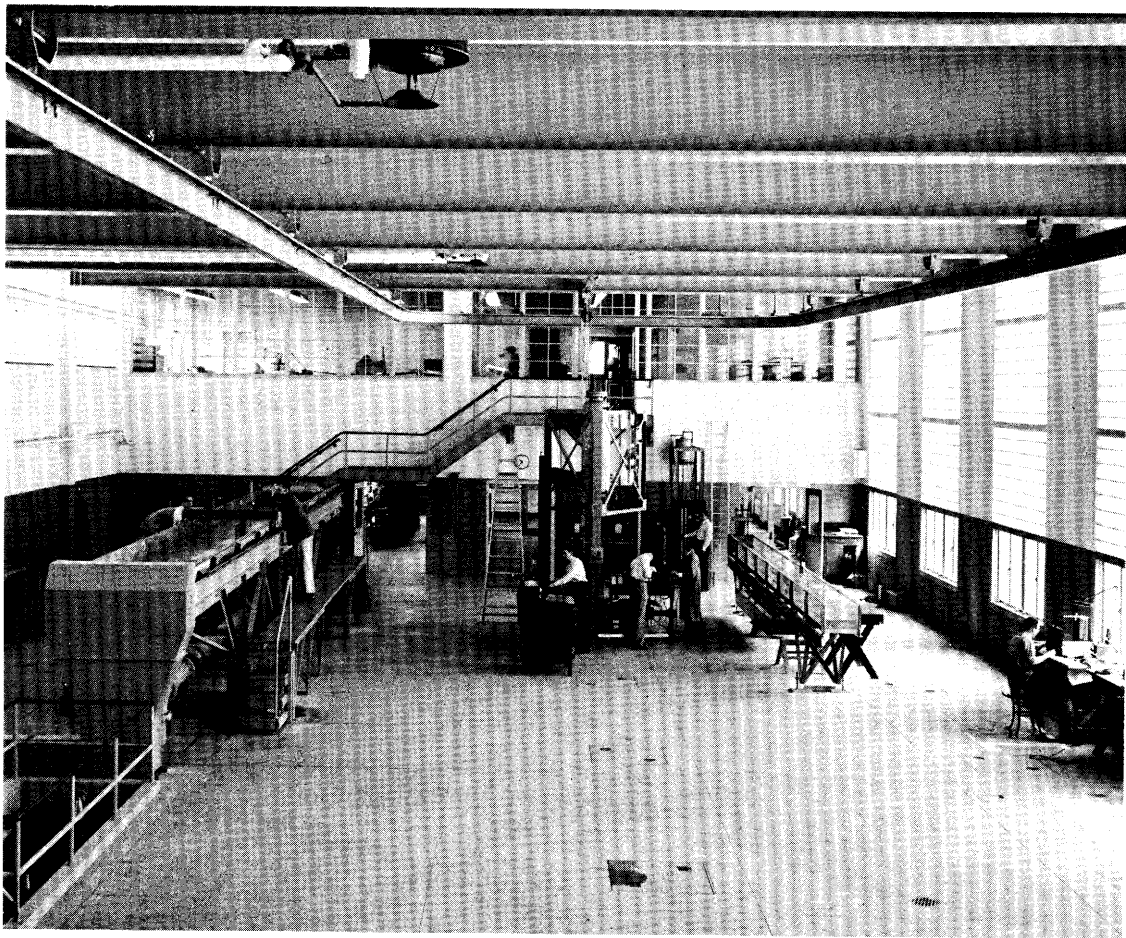
*Humanities and Social Sciences.* I have mentioned plans to strengthen our educational work in these fields. Again an important step ahead depends upon obtaining the necessary funds, and support is not so readily obtainable for the humanities as it is for technology and science. Corporations, for example, do not feel that they can properly contribute to the humanities. I hope that the concept of the "Fourth School" as adopted by our Faculty and the important fields embracing





ALFRED P. SLOAN METAL PROCESSING LABORATORY

*“ . . . much needed new facilities for education  
and research in metallurgical science.”*



HYDRODYNAMICS LABORATORY

*“The hydrodynamics laboratory  
and towing tank are now in use.”*

the social sciences can attract the support which will enable us to exploit this part of our program. We need an endowment, including endowed professorships, of at least \$2,000,000 to fund essential activities in these fields.

I cite these special needs, not included in our Development Program, because they are not so obvious and not because they necessarily have top priority. The department heads of the Schools of Science and Engineering have well demonstrated needs for new equipment, space and programs running into many hundreds of thousands of dollars and which we must and will provide. Our new program in geology is an example. We believe we have an exceptional opportunity to develop geophysics, not in its narrow sense but in the broadest sense of wedding to geology more and more of the techniques and methods of physics and chemistry.

#### STATISTICS OF THE YEAR

*Finances.* The year 1949-50 ended with an excess of expense of \$65,667 on operations totaling \$21,536,000. The increase in tuition (from \$700 to \$800 per academic year) which took place at the beginning of this past academic year kept the Institute from incurring a much larger operating deficit.

The Institute's endowment and other funds now have a total book value of \$50,994,000 invested in securities and other assets with a market value of \$57,532,000. Plant assets stand at \$24,214,000, about \$2,000,000 above last year. For the third successive year the income allocation to funds sharing the general investments was at 4.0 per cent of book value. Unallocated investment income in the amount of \$175,000 was added to the balance of undistributed investment income bringing the total to \$243,000.

The volume of sponsored research totaled \$12,858,000, compared to \$15,473,000 in the previous year and \$13,300,000 in 1947-48. The following comparative percentage distribu-

tion of the major elements of income and expense shows the marked effects of sponsored research on the Institute's fiscal operations.

### DISTRIBUTION OF MAJOR ELEMENTS OF INCOME AND EXPENSE

INCOME			
	<i>Per cent</i>		
	1939-1940	1948-1949	1949-1950
Tuition . . . . .	48	16	20
Investments . . . . .	32	6	6
Gifts and Other Funds . . . . .	7	9	9
Research Contracts: For Direct Expense . . .	3	58	50
For Indirect Expense . .	0	6	8
Dormitories, Dining Services . . . . .	10	5	7
	<u>100</u>	<u>100</u>	<u>100</u>
EXPENSE			
	<i>Per cent</i>		
	1939-1940	1948-1949	1949-1950
Academic . . . . .	61	21	23
General Administrative . . . . .	13	8	10*
Plant Operation . . . . .	10	6	8†
Research Contracts: Direct . . . . .	3	58	50
Medical and Other . . . . .	4	2	2
Dormitories, Dining Services . . . . .	9	5	7
	<u>100</u>	<u>100</u>	<u>100</u>

\* Increase of two per cent over 1948-1949 is due to expense of Development Program.

† Increase of two per cent over 1948-1949 is due to items of deferred maintenance held over from the war period and completed during 1949-1950 and also due to space-change expenses incidental to the moving of the library and humanities departments into the new Charles Hayden Memorial Library.

The total gifts received each year since 1940 are shown in the following table:

	<i>Capital Additions</i>	<i>Total Gifts</i>
1940-1941 . . . . .	\$ 511,949	\$ 888,180
1941-1942 . . . . .	534,316	926,897
1942-1943 . . . . .	616,702	884,268
1943-1944 . . . . .	1,132,835	1,367,507
1944-1945 . . . . .	1,245,911	1,736,892
1945-1946 . . . . .	2,042,533	2,549,969
1946-1947 . . . . .	1,945,297	2,382,681
1947-1948 . . . . .	1,381,329	2,191,822
1948-1949 . . . . .	1,900,737	2,536,802
1949-1950 . . . . .	5,064,326	6,528,089

The total of gifts shown above for 1949-1950 does not include the pledges to the Development Program received during the year.

Contributions to the Alumni Fund, which marked its tenth anniversary, totaled \$166,280 from 10,631 alumni. This makes the total giving to M. I. T. through the Alumni Fund during its ten-year life \$1,387,237.

*Enrollment.* The student body numbered 5,458 in 1949-1950, compared with 5,433 in 1948-1949. The estimated enrollment for 1950-1951 is 5,175. Thirty-seven per cent of last year's total were veterans, as compared to forty-eight per cent the previous year. Twenty-two per cent were married, the same ratio as in 1948-1949. Seventy-one women were enrolled. A total of 243 American colleges and universities and 102 foreign institutions were represented. Foreign students numbered 445 and these students represented 69 foreign countries. The Institute continues to enroll the highest percentage of foreign students of any college in the country.

The number of applications for the Graduate School was larger in the past year than at any time in the history of the Institute.

ENROLLMENT AT M. I. T.

	<i>Freshman</i>	<i>Total Undergraduate</i>	<i>Total Graduate*</i>	<i>Total</i>
1940-1941.....	605	2,379	759	3,138
1945-1946.....	703	1,160	378	1,538
1946-1947.....	907	3,811	1,361	5,172
1947-1948.....	884	4,138	1,524	5,662
1948-1949.....	819	3,831	1,602	5,433
1949-1950.....	744	3,856	1,602	5,458
1950-1951 (est.) .....	775	3,500	1,675	5,175

\* A large part of the enrollment in the Graduate School is on a part-time basis. For example, of the 1,602 graduate students in 1949-1950, 39 per cent were enrolled on a part-time student basis and were members of the academic staff.

*Student Aid.* The demands on the undergraduate scholarship funds and the Technology Loan Fund continued to increase this past year because of general financial conditions and the fact that fewer students were studying under the G.I. bill.

There were 602 undergraduate scholarships granted, totaling \$188,096. Some undergraduates held both scholarships and loans. One hundred ninety-three men received loans as of June, 1950, bringing the cumulative total from 2,816 (June, 1949) to 3,009 men. This group of 193 men were loaned \$137,851, bringing the cumulative total loaned from \$2,041,660 (June, 1949) to \$2,179,511 (June, 1950).

Total graduate scholarships and fellowships for 1949-1950 amounted to \$227,228, and these scholarships and fellowships were granted to 267 recipients. This compares with a total of \$176,880 distributed to 233 recipients in 1948-1949. The number of fellowships sponsored by industrial companies totaled 68, with an aggregate stipend of \$161,300.

The Student Employment Bureau placed 508 students in part-time jobs in 1949-1950, as compared with 458 in 1948-1949. The 1949-1950 group earned \$124,934 as compared with \$98,657 earned by the 1948-1949 group.

#### PERSONNEL

*Corporation.* The Corporation suffered severe losses through the deaths of two Life Members, Frank Baldwin Jewett and Edwin Sibley Webster. Dr. Jewett, who died on November 18, 1949, became a Term Member of the Corporation in 1928 and a Life Member in 1934. Mr. Webster, who died on May 10, 1950, became a Term Member in 1910 and a Life Member in 1915. At the time of his death Mr. Webster was a member of the Executive Committee, which he had served for nearly thirty years.

Both Dr. Jewett and Mr. Webster were towering figures in the history of the Institute, active and influential as alumni, devoted and decisively effective as Corporation members, pioneers and outstandingly successful leaders in their professional and business careers.

In June Horace S. Ford retired as Treasurer, and was immediately elected a Life Member of the Corporation. Mr. Ford

first came to the Institute as Bursar in 1914, and was appointed Treasurer in 1934. In addition to his sagacious management of the Institute's finances, he has become and continues to be a beloved member of the Institute family and a wise counsellor to all of us. Although retired as Treasurer, he continues to serve the Institute as consultant to the President, in addition to being a Life Member of the Corporation.

The Institute's new Treasurer, Joseph J. Snyder, came to the Institute in World War II as a member of the staff of the Radiation Laboratory, and became associate head of the Office of Business Administration of that project. In 1945 he was appointed Assistant Treasurer of the Institute, and during the five-year period in this post worked closely with Mr. Ford in the financial management of the Institute and made a major contribution to the initiation and conduct of the M. I. T. Development Program. He comes to his new post with the confidence and affection of the Institute community.

Corporation ranks have been changed by reason of term expirations of Alumni Members Raymond Stevens, Edward S. Farrow and Horace W. McCurdy. John M. Hancock's term as Special Term Member was extended for five years and Ralph Lowell was elected a Special Term Member. C. Adrian Sawyer, Jr., Pierre F. Lavedan and Charles A. Thomas have been elected new Alumni Term Members, and John A. Lunn also joins the Corporation as the new President of the Alumni Association.

*Faculty.* We have been saddened this year by the deaths of W. Felton Brown, Emeritus Professor in Architecture, and William Hovgaard, Emeritus Professor in Naval Architecture; Addison F. Holmes, Emeritus Associate Professor in Mechanical Engineering, and Dean M. Fuller, Associate Professor in English and History.

The title of Professor Emeritus has been given to the following faculty members whose retirement due to age took place this year: Ralph G. Hudson, Professor in Electrical

Engineering and Chairman of the Course in General Science and Engineering; Frederick G. Keyes, Professor in Chemistry; Frederick K. Morris, Professor in Geology, and Donald S. Tucker, Professor in Economics and Social Science. The title of Professor Emeritus was also granted to Professor Victor O. Homerberg of the Department of Metallurgy, who retired this year. Of the above group, Professors Hudson, Keyes, and Tucker will return during the current year to serve as Lecturers. Mr. Dard Hunter was appointed Honorary Curator of the Dard Hunter Museum upon his retirement as Curator.

Vice Admiral Edward L. Cochrane, U.S.N. (ret.), Head of the Department of Naval Architecture and Marine Engineering, has been granted leave to accept a Presidential appointment as Chairman of the Federal Maritime Board and Maritime Administrator. Professor George C. Manning will serve as Acting Head of the department while Admiral Cochrane is on leave. Captain James M. Farrin, Professor in the same department, has been granted leave to serve on the staff of the Commander of Naval Forces, U. S. Seventh Fleet, in the Far East.

Professor John T. Rule has been appointed Chairman of the Course in General Science and Engineering to succeed Professor Hudson. Professor Rule will continue to administer the Section of Graphics, which he has headed since 1938.

Professor Robert R. Shrock was appointed Head of the Department of Geology, following a year of service as Acting Head of this department. Professor Shrock has been on the M. I. T. faculty since 1937, and was named Executive Officer of his department in 1946. Professor Patrick M. Hurley was appointed Executive Officer of the department this year.

Charles F. Baish, Colonel, Corps of Engineers, was appointed to succeed Colonel Harold R. Jackson as Professor and Head of the Department of Military Science and Tactics, following the resignation of Colonel Jackson.

With the establishment of a separate Department of the Air Force in the Federal Government, there was established



at the Institute this year a separate Department of Air Science. Major Thomas U. Lineham, Jr., was designated Professor of Air Science and Tactics, in charge of the Department, and Dean John E. Burchard was appointed Coordinator of R.O.T.C. Affairs.

Other faculty administrative changes include the appointment of Professor George B. Thomas, Jr. as Executive Officer of the Department of Mathematics, and Earle F. Watts as Executive Officer of the Section of Graphics. Professor George G. Harvey, Associate Professor in Physics, was appointed Assistant Director of the Research Laboratory of Electronics.

An office for the specific purpose of giving assistance and advice to members of the staff and student body in matters connected with military service was established in August, and Professor Leicester F. Hamilton was appointed Chairman of the M. I. T. Advisory Committee on Military Service. He is being assisted by Dean John W. M. Bunker, Mr. Malcolm M. Stevens and Mr. Thomas L. Hilton. Professor Hamilton will represent the Institute on all matters concerned with Selective Service and Reserve status.

*Leaves of Absence*, other than those mentioned elsewhere, have been granted to Victor F. Weisskopf, Professor in Physics, and to Assistant Professors Lyle B. Borst, Chemistry, Godfrey T. Coate, Electrical Engineering, Norman C. Dahl, Mechanical Engineering, and Amos J. Shaler, Metallurgy.

*Resignations* not elsewhere mentioned have been accepted from Professor Vernon DeMars; Associate Professors Lieutenant Colonel Herrick F. Bearce, Lieutenant Colonel Raymond S. Crossman, Albert C. Hall, F. Alexander Magoun, Manfred Rauscher, Major Jack W. Streeton, Colonel Curtis L. Varner, Henry Wallman, William R. Weems and Assistant Professors John N. Adkins, Wayland S. Bailey, Draveaux Bender, W. Farnsworth Loomis, J. Judson Mealy, Alan S. Michaels, Captain Dante Morel, Jack B. Pohlenz, Fritjof A. Raven, William A. Reed, Matthew L. Sands, Ariel A. Thomas, Warren

L. Towle, David A. Trageser, Michael Witunski and Edward Woicak. Professor Weems will continue his association with the Institute as Technical Industrial Liaison Officer.

*Promotions* to the rank of Professor were as follows: William P. Allis, Eugene W. Boehne, Albert G. H. Dietz, Carl F. Floe, Harold A. Freeman, Raphael Salem, Clair N. Sawyer, Robert R. Shrock and Jerome B. Wiesner.

The following were promoted to the rank of Associate Professor: Warren Ambrose, John E. Arnold, Duncan S. Ballantine, Alex Bavelas, Robert L. Bishop, Robert J. Hansen, Francis B. Hildebrand, Myle J. Holley, Jr., David N. Hume, Burnham Kelly, Ernest P. Neumann, John D. Roberts, and George B. Thomas, Jr.

The following were promoted to the rank of Assistant Professor: Richard B. Adler, Louis H. Ahrens, Walter A. Backofen, John L. Bastian, Warrant Officer Roy O. Enemark, Robert B. Green, Donald R. F. Harleman, E. Neal Hartley, Arthur E. Johnson, John C. Johnson, Alexander Kusko, Sidney Lees, Edward A. Mason, George L. Nelson, Demetrios A. Polychrone, James B. Reswick, William E. Ritchie, Henry Sherman, Morton S. Silberstein, David I. Sinizer, Charles O. Smith, Warrant Officer Edward Woicak, and C. Conrad Wright.

*New faculty appointments* included the following: Egon Orowan, Professor in Mechanical Engineering; Carl Wagner, Visiting Professor in Metallurgy; Associate Professors Joseph C. R. Lickliger in Electrical Engineering, Walt W. Rostow in English and History, Captain Horatio C. Sexton in Naval Architecture; Assistant Professors Francis L. Friedman in Physics, Frank A. McClintock in Mechanical Engineering, R. H. Macmillan in Mechanical Engineering (on exchange with Norman C. Dahl), Joseph Byrne, Edward W. Merrill and Keith E. Rumbel in Chemical Engineering, James W. Mar in Aeronautical Engineering, Thomas H. Pigford at the Oak Ridge Practice School, and Augustine M. Fragala and Major Finis G. Johnson in Military Science and Tactics.

*Administration.* The sudden death of Everett Moore Baker, Dean of Students, in an airplane accident in Egypt on August 31, has meant the loss of a dearly loved member of the M. I. T. family. He will be grievously missed by all who knew him. In the three years he was with us he greatly enriched our student life. He was a resolute protagonist of the student as a human being and he lost no opportunity to promote his welfare. He was an alert antagonist to every policy or act which placed material values above human values. He was also a superb human being, gracious, gay, warm, and understanding. He is missed, if possible, most of all by the students.

In the interim period while in search for a successor to Dean Baker, we are fortunate in the willingness of Dr. Dana L. Farnsworth, our Medical Director, to serve as Acting Dean of Students. Thomas L. Hilton has been appointed Assistant Dean of Students.

It was with deep regret that we accepted the resignation of Professor William W. Wurster, Dean of the School of Architecture. Under his administration the School of Architecture flourished, and his stimulating presence will be missed in our administrative councils.

The retirement of the Institute's Vice-President, Edward L. Moreland, has brought another change. Dr. Moreland headed the Department of Electrical Engineering from 1935 to 1938 and was for eight years Dean of Engineering before becoming Executive Vice-President in 1946. In all these capacities his contribution has been a significant one, and his retirement means a major loss to the Institute.

Robert M. Kimball, who has been on leave from M. I. T. since 1948, returned from serving as Administrative Associate Director of the Los Alamos Scientific Laboratory to become Executive Assistant to the President. He serves as my deputy in a number of important administrative activities and represents me in all relations with the Institute's Development Fund Office. Mr. Kimball has also taken over Dr. Moreland's

position as chairman of the Building Committee and in this capacity has administrative responsibility for overseeing the Institute's building projects and for all space changes at M. I. T.

Leave of absence was given to Henry Loomis, Administrative Assistant to the President, so that he might serve as a member of the staff of the Director of the Research and Development Board of the National Defense Establishment.

Dr. John W. Chamberlain was appointed Associate Medical Director and Dr. Harriet L. Hardy, Assistant Medical Director.

Professor John R. Loofbourow was elected Chairman of the Faculty. He succeeds Professor Douglass V. Brown, who made an outstanding contribution to the teamwork of the Institute during his term in this office.

#### CONCLUSION

In conclusion, I want to emphasize the major contribution to the administration of the Institute being made by our Provost, Dr. Julius A. Stratton. He has a sound and deep understanding of education and a sure administrative touch. So likewise have the Deans, who, together with the Provost and the Chairman of the Faculty, make our Academic Council an effective instrument for the execution of educational policy.

The event of the year was the return full time to the Institute of Dr. Karl T. Compton following his happy triumph over illness. I can testify to the reassurance we all feel now that we again have the uninterrupted benefit of his vigor and leadership.

And finally, may I express to all members of the Corporation my appreciation for their effective service to this institution. By your leadership and example, we continue that harmonious combination of faculty, administration, students, and alumni which enables our institution to push steadily ahead.

Respectfully submitted,

JAMES R. KILLIAN, JR.

*President*

October 2, 1950

## ADMINISTRATIVE OFFICERS

### DEAN OF STUDENTS

On August 31, 1950, en route from India to his home, Dean Everett Moore Baker met with a tragic and fatal accident. His death is an irreparable loss, not only to the students of the Institute, but to his many friends and colleagues on the staff and Faculty.

Coming to the Institute in 1947 at a time when the post-war enrollment was at its peak, he quickly grasped the many problems of our complex life. At this transitory stage of the Institute's progress he gave wise counsel and stimulation to the future betterment of undergraduate life. He brought vigorous and resourceful leadership to all our student organizations and simultaneously championed the individual student with friendly and sympathetic understanding. The past reports of this office stand not only as a record of his accomplishment with our students, but also a testimonial to his vision of our future campus life at Technology.

#### *Student Life and Activities*

*Housing.* The completion of the new dormitory in the late summer of 1949 made it possible for this new self-contained living unit to be put into operation at the opening of the college year. The dormitory has been named the Everett Moore Baker House, with the unanimous approval of the students and staff of the Institute. Baker House is a signal achievement in the Institute's housing program for undergraduate students, a dormitory with full dining facilities for its occupants. The accompanying tabulation shows that approximately the same fraction of all students was accommodated in Institute housing, but most significant is the fact that the number housed in the temporary Barracks dormitory was substantially reduced. Ten proctors were assigned to the Barracks dormitory during the last year, which aided materially in keeping order in the inadequate and unattractive living quarters.

One of the interesting innovations at Baker House was the arrangement for "contract" feeding through which students

obtained fifteen meals per week, from Monday morning breakfast until dinner Friday evening. The success of this arrangement is due in large part to the efforts of Mr. Frank M. Baldwin, Director of Dining and Housing Facilities, who, by obtaining better storage space for food and other requirements,

<i>Tabulation 1</i>	<i>1948-1949</i>		<i>1949-1950</i>	
	<i>Number</i>	<i>Per Cent</i>	<i>Number</i>	<i>Per Cent</i>
Dormitories (including Women's Dormitory).....	737	14	1,084	20
Barracks.....	550	10.1	200	4
Graduate House.....	452	8.3	452	8
Student Houses.....	64	1	38	1
Westgate and Westgate West.....	270	5	271	5
Fraternities.....	861	16	873	16
Rooming houses or at home.....	2,519	46	2,540	46

was able to effect economies which could be passed on to the students so that the price for this five-day board bill was kept to \$10.00. A plan was also arranged to have Faculty and Administration members occupy the master's suite for two-week periods during the college year. As another means of improving student-faculty relations, this program appeared to be very successful.

On May 1, 1950 the Institute took title to the Riverside Apartments and thereby completed another step in the plan to house more students on the West Campus. It is planned that by the spring term of 1951 the alterations will be completed in this building and space for another 550 students to live on the campus will be available.

*Athletics.* The intramural program of competitive sports continued during the past year at about the same level of interest to furnish recreational opportunities for some 46 teams organized by 35 different groups. Due to weather conditions and other scheduling difficulties, the number of matches was reduced by approximately one-third over the previous year; however, some 2,382 students (48 per cent duplication) participated in this intramural program. In addition to this intramural activity, the Athletic Department conducted the usual instructional requirements in the Athletic Program that is required of all freshmen, as well as coaching and supervising some 943 undergraduates in varsity and freshman teams for

293 intercollegiate contests (187 varsity and 106 freshman).

Significant in this year's intercollegiate athletic competition was the achievement of some of the teams in winning championships and establishing new Technology records: namely, the Indoor-Track Mile Relay Team, the Rifle Team and the Nautical Association Sailing Team. The outstanding athletic performance of the year, however, was the Heavy-weight Varsity Crew winning the Eastern Association of Rowing Colleges Championships held at Annapolis, Maryland, in May.

The preceding paragraphs give in part a statistical summary of the students participating in organized athletics. We must not be unmindful that other members of our student body use and enjoy our recreational facilities, such as sailing, swimming pool, tennis courts, etc., and are not included in the statistics of the organized programs. By conservatively estimating that 5 per cent of our undergraduates fall into this category, we find that a grand total of 2,361 students (63 per cent) participated during the past year in our recreational and athletic opportunities.

*Fraternities.* Participation in the intramural athletic program by the fraternities was particularly enthusiastic this last year, with Theta Chi the leading fraternity team. Similarly, in all aspects of school life the responsible and mature leadership, which last year won the National Interfraternity Conference Award for the M. I. T. fraternities, continued with the same enthusiastic interest for the well-being of the school.

Tangible evidence of the efforts of this last year's I.F.C. may not be seen for several years, but three studies that may result in far-reaching changes were made. The reorganization of the traditional Hell Week into Greek Week along the lines suggested by the National Fraternities and the I.F.C. and also the advisability of deferring rushing for at least one term were carefully studied by special committees. An alumni committee of former I.F.C. members devoted many hours of study to the feasibility of housing fraternities in an Institute-sponsored dormitory-fraternity housing complex on campus. A special Corporation Committee has been appointed to review this many-sided question and establish a future policy.

The fraternities continued to aid generously the Foreign

Student Summer Project and the altruistic efforts of the National Students Association. Also, as last year, many members of the staff met with fraternity members under the Nonprofessional Discussion Program.

For many years student leaders have been aware that the student body tended to separate into three different living groups: fraternity men, dormitory men, and commuters. Last spring all three groups joined for the first time in sponsoring a very successful "All-Tech" dance.

*Student Life and Activities.* The "All-Tech" dance was a heartening event in that each group contributed equally in the planning and management, but it was an addition to what many believe to be an already overcrowded social calendar. The student organizations have never been more vigorous with total student participation in extra-curricular activities at a peak in the 95 activities. However, some groups — The Tech, WMIT — and other organizations have experienced difficulty in maintaining the large staffs they require, pointing to a manpower problem.

Perhaps we are approaching a "saturation point" extra-curricularly, judging by the poor attendance at events sponsored by class organizations and the discontinuance of the All-Tech Sing for lack of an adequate number of participants. Possibly more attention will have to be given to scheduling and proper distribution of events during the academic year. In general, the student activities continue to be a most valuable part of our student life. The campus radio station, WMIT, expanded its facilities to include Baker House and this fall will cover the Memorial Drive fraternities — an important addition to this growing medium of communication which is so greatly needed in the community. *Technique* improved its position financially by economies and more efficient business operation. Tech Show presented "Stranger in Town" before a record audience. Three excellent forums were presented by the Student-Faculty Committee as part of a broadened program which included the conversion of Room 2-290 to a modern lounge for student-faculty gatherings. With exceptional competence the Undergraduate Judicial Committee dealt with six difficult cases.

In its third year, during the regular Summer Session the



Foreign Student Summer Project provided M. I. T. life for 73 students from 25 different countries. In cooperation with the W.S.S.F., the National Students Association enabled five Displaced Persons to study at M. I. T., and through its International Association for Exchange of Students for Technical Experience enabled 29 M. I. T. students to work abroad during the summer, with 30 foreign students working in the Boston area. A newly formed sub-committee of the Institute Committee, the Freshman Coordinating Committee, studied the problems of entering freshmen and also incorporated into its program the promotion of the Honor System under which three freshman sections studied during the year.

To provide more space for expanded student activities several large offices were made available as a result of the moving of the English and History Library from Walker Memorial to the Hayden Memorial Library. Also, Building 18 was assigned to students' activities. The Athletic Association now occupies a large section of the building and a small stage for theatrical and musical rehearsals was constructed in the north end.

The membership of the Hobby Shop increased from 300 in 1948-1949 to 370 students and staff members in 1949-1950 and total attendance increased from 4,038 to 5,504 entries.

*Musical Activities.* The Musical Clubs, which now include the Glee Club, Symphony Orchestra, Concert Band, Tech-tonians, and the Logarithms (a newly organized octet, consisting of members of the Glee Club) gave a total of 19 concerts in the past season as compared to 10 in the previous year. In addition to the organizations of the Musical Clubs, an M. I. T. Choral Society has been formed, consisting of a mixed group of singers associated with M. I. T.

Outstanding this year was the presentation of Handel's "Messiah" by the Glee Club, Symphony Orchestra, and the Choral Society in Jordan Hall before a "sold-out" house. Return engagements were fulfilled by the Glee Club at Radcliffe, Smith, and in a broadcast of the Sunday afternoon series, "New England Colleges," sponsored by the Monsanto Chemical Company.

Besides participating in the "Messiah," the Symphony Orchestra presented two concerts at M. I. T. as well as a

combined concert at Colby Junior College. Several M. I. T. students appeared as soloists in these programs.

The Concert Band presented several open air concerts in the Great Court and at the Esplanade Shell, and combined forces with the Tufts College Band for a program at Tufts. The group also provided music for various occasions in the Rockwell Cage.

The Tectonians arranged for and participated in a Jazz Concert in which two outstanding and authentic jazz bands played for a capacity audience in Walker.

Along with the schedule of formal concerts, an informal program of madrigals, Bach cantatas, and songs by Brahms was presented by the Choral Society in the Music Room of the Hayden Library; and several small chamber music groups have met informally throughout the Institute.

*Freshman Orientation.* Early in the spring of 1949 a committee made up of students, Faculty, and members of the administration was appointed to study the Freshman Camp Program which had been conducted and successfully operated over a period of years by the Technology Christian Association. By agreement this committee took over the responsibility of planning and conducting future programs and started in the fall of 1949 by having the first day for this orientation period on the Institute campus and the following two days at Camp Wonderland, Sharon, Massachusetts. Camp Wonderland was filled to its maximum capacity with 555 freshmen in attendance at the camp part of the program. The committee plans further experimentation with the program and plans have been drawn to have the entire program conducted on the campus for the entering class of 1954.

All members of the entering class of 1953 were given the opportunity at the opening of the fall term to elect if they wished to have the benefit of a freshman adviser. Slightly more than half of the class signified their intentions, and advisers were appointed from the Faculty. At the close of the college year in June, reports from the Faculty who acted in the capacity of adviser again showed little improvement in student interest and use of this endeavor.

*Student Aid.* There was a material increase in the distri-

bution of financial aid granted undergraduates during the academic year 1949-1950. In total amount of dollars the grants both from scholarships and loans (from Institute funds) was almost double that of the previous year. The scale of scholarship awards was increased to offset the increase in tuition and more requests came from veterans whose Veterans Administration benefits had been completely expended.

<i>Tabulation 2</i>	<i>1949-1950</i>		<i>1948-1949</i>	
	<i>Number</i>	<i>Award</i>	<i>Number</i>	<i>Award</i>
Freshman Scholarships..	255	\$73,050.00	183	\$50,637.50
Other Undergraduate Scholarships.....	283	82,321.32	211	39,276.00
Total Scholarships.....	538	\$155,371.32	394	\$89,913.50
Undergraduate Loans...	218	113,130.00	98	46,600.00
Total Aid to Under- graduates.....	708*	\$268,501.32	463*	\$136,513.50

\* *Allowing for individuals receiving both scholarship and loan*

The tabulation includes only grants from the Institute's undergraduate scholarship endowment. As in past years, foundations and trusts have made gifts for scholarships to undergraduates. During 1949-1950 approximately \$33,000 were contributed from several organizations. The James C. Melvin Trust granted \$8,225 to help 24 undergraduates; the Foundry Educational Foundation gave \$12,550 to a total of 25 students; the Teagle Foundation, Inc. of New York contributed \$11,450 for 14 students; and the American Smelting & Refining Company aided one student to the extent of \$500.

From both graduate and undergraduate students the Loan Fund Board received 295 applications during 1949-1950 and acted favorably upon 264, or 89.5 per cent, \$137,851 being loaned. For 1948-1949 the corresponding figures were: 149, 134, 90 per cent, and \$61,050.

The cumulative record of the Fund from its establishment in 1930 up to June 1950 appears in Tabulation 3.

The Student Employment Bureau of the Technology Christian Association placed a total of 508 individuals, who earned \$124,933.95. During the previous year 458 individuals were placed earning \$98,657.24.

## ADMINISTRATIVE OFFICERS

## CUMULATIVE RECORD OF THE TECHNOLOGY LOAN FUND TO JUNE 30, 1950

<i>Tabulation 3</i>	<i>At June 30,</i> <i>1950</i>	<i>At June 30,</i> <i>1949</i>	<i>Net Changes</i> <i>During</i> <i>1949-1950</i>
<i>Items of Outgo</i>			
Number of Men Receiving Loans . . . . .	3,009	2,816	up 193
Total Amount Loaned . . . . .	\$2,179,511	\$2,041,660	up \$137,851
Average Per Capita Loan . . . . .	\$724	\$725	down \$1
<i>Items of Income</i>			
Number of Men Whose Indebtedness Has Been Completely Discharged . . . . .	2,241	2,144	up 97
Principal Repayments in Advance . . . . .	\$591,855	\$576,818	up \$15,037
Other Principal Repayments . . . . .	\$1,151,034	\$1,104,274	up \$46,760
Total Principal Repayments . . . . .	\$1,742,889	\$1,681,092	up \$61,797
Total Principal Matured, Considering "Advance Repayments" as Matured When Paid . . . . .	\$1,774,257	\$1,713,284	up \$60,973
<i>Collection Ratio, i.e., Percentage</i>			
of Total Maturities Paid . . . . .	98.2	98.1	up 0.1
Matured Principal in Arrears . . . . .	\$22,633	\$24,968	down \$2,335
Actual "Written Off" Accounts . . . . .	\$8,734	\$7,224	up \$1,510
Total Maturities Unpaid . . . . .	\$31,367	\$32,192	down \$825
Percentage "Written Off" to Total Loans . . . . .	0.4	0.35	up 0.05
Percentage Matured Loans in Arrears plus Amount "Written Off" to Total Loans . . . . .	1.44	1.58	down 0.14
Interest Received . . . . .	\$229,623	\$225,796	up \$3,827
Times Interest Received to Matured Loans in Arrears plus Amount "Written Off" . . . . .	7.3	7.0	up 0.3
<i>Notes Outstanding</i> . . . . .	\$427,887	\$353,344	up \$74,543

*Veteran Enrollment.* The number of students enrolled under the sponsorship of the Veterans Administration followed the anticipated decrease. The Veterans Administration has announced a deadline of July 22, 1951, after which Certificates of Eligibility will not be issued. This ruling, coupled with the completion of allotted time by a large portion of veterans enrolled, will continue to decrease the numbers substantially.

The comparative numbers of veterans is given in the following table:

<i>Tabulation 4</i>	<i>Veterans Enrolled under P.L. 16 or 346 and their Percentage of Total Registration</i>	
	<i>1948-1949</i>	<i>1949-1950</i>
Fall Term . . . . .	2,406 (44%)	1,991 (37%)
Spring Term . . . . .	2,380 (47%)	1,761 (34%)
Summer Term . . . . .	663 (33%)	467 (22%)

*Conclusion.* In previous reports a number of future projects for the enrichment of life of students and Faculty at the Institute have been suggested. It is a pleasure to state that through the gift from the Kresge Foundation and the aid of the Development Fund for a new Auditorium and Chapel, one of these proposals is about to be realized. Additional student housing will be provided by the conversion of the Riverside apartment house, bringing the total to approximately 1500 first class accommodations for undergraduates by the fall of 1951. Also, the completion of the loaming and seeding of the unfinished areas on the West Campus has added much to the attractiveness of this new area.

The critical international situation that has arisen during the past summer suggests that in the near future we may face new emergencies which will profoundly affect our whole Technology population. Although no clearly defined policies have been announced from Washington, Selective Service has been put into operation again and no one can foretell at this time the measurable effects that it will have during the year on our student enrollment.

THOMAS P. PITRE  
THOMAS L. HILTON

#### DEAN OF THE GRADUATE SCHOOL

As stated in the report for the year 1948-1949, an unprecedented number of 1,600 applications had been received up to July first for admission in September 1949.

The academic year 1949-1950 opened with a graduate student registration of 1,563; by November 1 this had increased to 1,602. In February, 119 recipients of advanced degrees and 8 withdrawals because of academic deficiencies together with 26 new admissions produced an enrollment in the Spring Term of 1,501.

By July 1, 1950, there were already 1,951 applications for admission, 700 vacancies expected from graduations in September 1949 and February and June 1950, and 800 new students had been admitted for 1950-1951. The overadmissions were based on previous experience in which the results had justified the forecast. The Graduate School enrollment has

been effectively stabilized at 1,600, a figure substantially equivalent to 1,100\* full-time students.

The custom among graduate students of continuing study and research through at least a portion of each summer is reflected by the enrollment in June 1950 of 846 students, of whom only 213 were newly admitted.

Foreign graduate students in September 1949 numbered 132, of whom 86 had been newly accepted from among 271 applicants. Twenty-one countries were represented by the total enrollment. The ratio of applications to admissions remains unchanged from last year.

During the year authorization was granted for the award of the degree, Mineral Engineer, Min. E. This is based upon a program of two years beyond the baccalaureate for one who is interested in professional exploitation of ores or mineral resources. This program normally will comprise subjects such as Chemical Engineering, Business Administration, Labor Relations, Finance, etc., in addition to Mineralogy, Advanced Mineral Dressing, X-ray Metallurgy, and the necessary supporting basic sciences, and will be arranged to fit individual objectives and aptitudes. The authorization of this new degree, after extensive consideration by the Committee on Graduate School Policy, is a recognition of instruction that has already been demonstrated as of superior and, in many respects, unique excellence under the leadership of Professor Antoine M. Gaudin in the Department of Metallurgy.

In memory of Harry Manley Goodwin, 1870-1949, the first Dean of the Graduate School, there has been established by gift of Mrs. Goodwin and her son, Professor Richard H. Goodwin, an award to recognize graduate student achievement in effective teaching. This award is the Goodwin Medal. It will be accompanied by a suitable citation and a cash award not to exceed \$1,000. Its purpose is to signalize the importance of effective teaching by recognition of conspicuously effective performance.

The Goodwin Medal may be awarded in any year (but not necessarily in every year) to a graduate student who is also a member of the academic staff; his teaching service may have been rendered either in classroom or in laboratory. Only

\* Cf. Report for 1948-1949 for the basis of this equivalence.

that teaching which is so outstanding that it cannot fail to be discerned by interested and alert observers will qualify a nominee for consideration.

Since it is unlikely that the exacting standards of qualification in teaching will be met in every year, and since the educational services of the Institute benefit from the extension of knowledge through research as well as through its dissemination, there has been established also the Goodwin Premium. The Goodwin Premium comprises a certificate and a cash premium not to exceed \$500. It may be awarded in any year (but not necessarily in every year) in which no candidate has qualified for the Medal. Its award is in recognition of conspicuously meritorious original research of a graduate student, as embodied in a thesis. "Conspicuous merit" is defined in this case, not in terms of contribution to knowledge solely, but more in respect to unusually convincing demonstration of research performance. The characteristics upon which the research of a nominee may be appraised include originality, ingenuity, validity and scholarly presentation.

Both the Medal and the Premium are to be withheld until clearly and unequivocally earned. It is intended that the recipients shall constitute a select group of deserved distinction.

The Committee of Award consists of the Provost; the Deans of Architecture, Engineering, Humanities, and Science; the Chairman of the Undergraduate Policy Committee, and the Dean of the Graduate School, as Chairman.

The administration of Graduate School affairs has been greatly facilitated through cooperation of the Department of Chemistry in permitting this office to draft the part-time services of Professor Ernest H. Huntress, and through his generous contribution of effective aid, which was recognized on March 1, 1950, by his designation as deputy dean of the Graduate School.

Industrially sponsored fellowships for graduate students for the academic year 1949-1950 numbered 68, paying approximately \$161,300.

During the twelve months succeeding July 1, 1949, three new fellowships were endowed by the following sponsors: Aviation Week (McGraw-Hill Publishing Company), Shell Oil Company, and Textron Incorporated.

The Institute is deeply appreciative of the confidence in and the aid to its educational program for graduate students which has been expressed by the donors of industrially sponsored fellowships.

Additional graduate scholarship aid from gifts and accumulated income of invested funds of the Institute was available in the sum of \$93,931, making a total available from all sources in the sum of \$255,231.

Net scholarship assistance was awarded in the sum of \$227,228 to 267 recipients.

M. I. T. Swope Fellowships were granted to Chen Chin, in Mechanical Engineering; Robert Oscar Crockett, Jr., in Industrial Economics; Arnold Henry Glaser, in Meteorology; Edward Michael Kerwin, in Electrical Engineering, Cooperative Course; and Thomas Richard Parsons, in Aeronautical Engineering.

During the period from July 1, 1949 through June 30, 1950 there were conferred 670 advanced degrees, distributed as follows:

*Advanced Degrees Awarded 1949-1950*

	<i>S.M.*</i>	<i>Engineer</i>	<i>Sc.D.</i>	<i>Ph.D.</i>	<i>Totals</i>
September 1949.....	143	2	18	33	196
January 1950.....	92	0	13	14	119
June 1950.....	227	40	39	49	355
Total.....	462	42	70	96	670

\* Includes M.Arch. and M.C.P.

The number of Air Force, Army, Coast Guard and Navy officers enrolled in the Graduate School as of June 1, 1950 was 177.

JOHN W. M. BUNKER

REGISTRAR

Last year was the fourth successive time that the total number of students has exceeded 5,000. The registration of 5,458 was an increase of only 25 over the previous year. The Graduate School continued at its peak with 1,602 students. In the Undergraduate School the Senior Class of 1,177 was



the largest in the history of M. I. T., while each of the other undergraduate classes was smaller than the preceding year. The Freshman Class, 744 students, decreased for the third successive year which indicates a further decline in the Undergraduate School. With a stabilized entering class of 750 students the total undergraduate enrollment would be about 3,200 as contrasted with 3,856 in the Undergraduate School last year.

The combination of the largest Senior Class in history and the continued large Graduate School made the June, 1950 graduation the largest ever held. The number of degrees awarded was 902 Bachelors, 227 Masters, 40 Advanced Engineering, and 88 Doctors, or a total of 1,257 degrees.

The statistics for the year 1949-1950 and the summary statistics for the preceding years follow.

JOSEPH C. MACKINNON

**STATISTICS ON  
REGISTRATION AND DEGREES**

# REPORT OF THE REGISTRAR FOR THE YEAR 1949-1950

All statistics on registration and staff as of the Fifth Week of the Fall Term, except: 1943-1944 as of August 2, 1943; 1944-1945 as of November 27, 1944; 1945-1946 as of July 30, 1945.

**TABLE 1. REGISTRATION OF STUDENTS  
SINCE THE FOUNDATION OF THE INSTITUTE\***

Year	Number of Students	Year	Number of Students	Year	Number of Students
1865-66	72	1894-95	1,183	1923-24	2,949
1866-67	137	1895-96	1,187	1924-25	2,938
1867-68	167	1896-97	1,198	1925-26	2,813
1868-69	172	1897-98	1,198	1926-27	2,671
1869-70	206	1898-99	1,171	1927-28	2,712
1870-71	224	1899-00	1,178	1928-29	2,868
1871-72	261	1900-01	1,277	1929-30	3,066
1872-73	348	1901-02	1,415	1930-31	3,209
1873-74	276	1902-03	1,608	1931-32	3,188
1874-75	248	1903-04	1,528	1932-33	2,831
1875-76	255	1904-05	1,561	1933-34	2,606
1876-77	215	1905-06	1,466	1934-35	2,507
1877-78	194	1906-07	1,397	1935-36	2,540
1878-79	188	1907-08	1,415	1936-37	2,793
1879-80	203	1908-09	1,461	1937-38	2,966
1880-81	253	1909-10	1,479	1938-39	3,093
1881-82	302	1910-11	1,506	1939-40	3,100
1882-83	368	1911-12	1,559	1940-41	3,138
1883-84	443	1912-13	1,611	1941-42	3,055
1884-85	579	1913-14	1,685	1942-43	3,048
1885-86	609	1914-15	1,816	1943-44	1,579
1886-87	637	1915-16	1,900	1944-45	1,198
1887-88	720	1916-17	1,957	1945-46	1,538
1888-89	827	1917-18	1,698	1946-47	5,172
1889-90	909	1918-19	1,819	1947-48	5,662
1890-91	937	1919-20	3,078	1948-49	5,433
1891-92	1,011	1920-21	3,436	1949-50	5,458
1892-93	1,060	1921-22	3,505		
1893-94	1,157	1922-23	3,180		

\*From 1943-46 Army and Navy Students omitted. See Table 3-B in reports for 1943-46.

**TABLE 2. THE CORPUS OF INSTRUCTORS**

	'37	'38	'39	'40	'41	'42	'43	'44	'45	'46	'47	'48	'49
<b>Faculty Members of the Staff . . .</b>	267	273	282	285	292	313	319	317	330	379	398	413	435
Professors . . . . .	87	90	98	99	95	97	97	107	113	110	118	124	131
Associate Professors . . . . .	89	98	89	92	99	104	108	105	103	128	131	131	141
Assistant Professors . . . . .	76	72	83	83	86	98	99	102	101	125	137	133	138
Ex-Officio . . . . .	5	6	7	7	7	8	9	10	10	11	11	10	10
Professors Emeriti (Lecturers) . . . . .	—	—	—	—	—	—	—	—	—	—	—	14	13
Instructors . . . . .	3	3	3	3	2	3	3	—	—	—	—	—	—
Technical Instructors . . . . .	—	—	—	—	1	1	1	1	1	1	—	—	—
Research Associates . . . . .	7	4	2	1	2	2	2	2	2	2	—	—	2
Library Fellows . . . . .	—	—	—	—	—	—	—	—	—	2	1	1	—
<b>Other Members of the Staff . . . . .</b>	331	368	401	396	395	370	306	222	252	694	846	824	861
Instructors . . . . .	101	97	99	91	101	100	97	70	82	119	154	142	151
Technical Instructors . . . . .	—	—	—	—	6	7	8	6	8	14	17	15	15
Administrative Assistant . . . . .	—	—	—	—	—	—	—	—	—	1	—	—	—
Teaching Assistants . . . . .	—	—	—	—	—	—	1	—	—	—	—	—	—
Teaching Fellows . . . . .	52	52	52	55	52	60	52	8	18	74	77	72	91
Fellows in Applied Math . . . . .	—	—	—	—	—	—	—	—	—	4	3	—	—
Assistants . . . . .	69	79	78	85	87	75	49	44	47	127	137	116	124
Consultant . . . . .	—	—	—	—	—	—	—	—	—	—	—	—	1
Lecturers . . . . .	29	28	31	31	17	18	16	7	7	11	10	13	11
Research Consultant . . . . .	—	—	—	—	—	—	1	—	—	—	—	—	—
Research Associates . . . . .	22	25	36	35	47	34	23	33	39	151	176	155	120
Research Assistants . . . . .	42	72	90	91	84	64	59	54	51	193	272	311	348
Research Fellows . . . . .	16	15	15	—	8	—	—	—	—	—	—	—	—
National Research Council Fellows . . . . .	—	—	—	—	1	—	—	—	—	—	—	—	—
Staff Members (D. I. C.) . . . . .	—	—	—	—	—	12	—	—	—	—	—	—	—
<b>Total . . . . .</b>	598	641	683	681	687	683	625	539	582	1073	1244	1237	1296
<b>Other Members of the Faculty . . . . .</b>	28	28	28	32	37	40	39	44	52	60	67	50	50
Professors: Emeriti (not Lecturers)* . . . . .	27	27	27	31	36	39	38	43	51	59	66	49	49
Non-Resident . . . . .	1	1	1	1	1	1	1	1	1	1	1	1	1

\*Beginning 1948-49

TABLE 3. CLASSIFICATION OF STUDENTS BY COURSES AND YEARS

COURSE NAME AND NUMBER	1947-48						1948-49						1949-50					
	YEAR						YEAR						YEAR					
	1	2	3	4	G	Total	1	2	3	4	G	Total	1	2	3	4	G	Total
Aeronautical Engineering XVI	78	53	74	58	83	346	58	52	52	47	95	304	40	44	37	50	85	256
Aeronautical Engineering (Cooperative) XVI-B																		
Architecture IV-A, IV-B	34	29	33	23	14	133	27	41	33	29	17	147	25	30	39	31	19	144
Architecture (IV-A) Fifth Year						11			22			22				25		25
Biology																		
Quantitative VII	7	22	7	13	32	81	5	14	19	3	29	70	8	14	12	16	22	72
Physical VII-A						1			2			7		5		6		13
Building Engineering and Construction XVII	11	24	23	27	13	98	12	31	32	25	11	111	11	31	35	33	14	124
Business and Engineering Administration XV	53	106	192	167	556	47	95	111	160	36	449	46	99	115	122	33	415	
Chemical Engineering X	140	117	140	127	111	635	124	114	128	72	105	543	98	84	128	94	120	593
Chemical Engineering Practice X-A, X-B						58				14	54	58				31	28	58
Chemistry V	33	45	35	33	146	292	33	34	41	34	138	280	35	30	28	33	145	281
City Planning IV-B			4		25	35		2	7	2	24	35	2	2	1	5	23	33
Civil Engineering I (in Civil Eng. Department)	51	45	55	20	49	220	47	53	62	47	49	258	56	49	61	57	44	267
Economics and Engineering XIV					7	7				2		2						10
Economics and Engineering XIV	6	35	21	7		69	1	28	42	14		85	5	16	25	35		81
Economics and Natural Science																		
Electrical Engineering VI	214	190	211	212	259	1,086	190	158	134	143	273	898	167	160	130	133	262	832
Electrical Engineering (Cooperative) VI-A						17				51	44	153			33		49	144
Food Technology XX, XX-A	4	11	11	7	8	41	7	10	12	11	19	59	1	5	11	15	14	40
General Engineering IX-B			24	27		51		22	33			57			22	40		62
General Science IX-A			2	4		6			2	5		7			4	6		10
Geology XII	3	12	4	1	18	38	4	14	14	3	24	61	7	22	19	11	27	86
Group Psychology					15	15				4		4						
Industrial Economics					26	26				40		40					46	46
Marine Transportation XIII-C	4	9	7	2		22	4	8	12			24	2	7	8	6		23
Marine Transportation (XIII-C) Fifth Year						5						5				3		3
Mathematics XVIII	9	26	13	15	53	116	16	13	23	7	78	137	12	26	18	26	83	105
Mechanical Engineering II	132	178	156	146	135	747	124	130	193	117	127	691	106	133	134	189	131	693
Torpedo Engineering (in Mech. Eng. Dept.)					2	2												18
Mechanical Engineering (Cooperative) II-B	4	40	23	15	63	145	9	38	41	19	85	192	10	45	47	40	89	231
Metallurgy III					10	10						11						12
Ceramics (in Metallurgy Department)																		
Meteorology XIX		4	5	5	32	46	8	6	9	10	33	66	3	9	6	12	35	65
Naval Architecture and Marine Eng. XIII	21	10	13	7	101	88	14	18	12	10	98	61	17	9	22	12	6	66
Naval Construction and Engineering XIII-A					187	187					98	98					98	98
Physics VIII	80	80	54	58	187	459	89	78	73	49	180	469	93	77	66	70	172	478
Sanitary Engineering XI					14	14					16	16					21	21
Total	884	1,040	1,161	1,053	1,524	5,662	819	939	1,130	943	1,602	5,433	744	807	1,038	1,177	1,602	5,458

\* These totals include fifth year in Architecture IV-A and Marine Transportation XIII-C.

TABLE 4-A CLASSIFICATION OF STUDENTS BY COURSES, OPTIONS AND YEARS

No.	NAME	OPTION	Opt.	YEAR										TOTAL	COURSE NUMBER	
				1		2		3		4		5				G
				Opt.	Tot.	Opt.	Tot.	Opt.	Tot.	Opt.	Tot.	Opt.	Tot.			
I	Civil Engineering	{ 1. Theory and Design 2. Planning and Administration 3. Construction and Management	1	56	49	61	19	44	57	54	277	I				
	Army Engineer		2			30										
	Mechanical Engineering	{ 1. Power Manufacturing 2. Material, Design, and Mfg. 3. Automotive Engineering 4. Textile Technology	3	106	133	134	46	124	189	131	693	II				
II-B	Mechanical Engineering — Cooperative		1													
	Metalurgy	{ 1. Metallurgy 2. Mineral Engineering	2			18										
III	Ceramics		1	10	45	37	36	83	40	101	243	III				
IV-A	Architecture		2	25	30	47	4	12	19	169	IV-A					
IV-B	City Planning		1	2	2	39	25	5	23	33	IV-B					
V	Chemistry		3	35	30	28	1	5	145	281	V					
VI	Electrical Engineering	{ 1. Electric Power 3. Electrical Communications 4. Electronic Applications	4	167	160	130	48	133	262	852	VI					
VI-A	Electrical Engineering — Cooperative		1			8	17	62	49	144	VI-A					
VII	Quantitative Biology	{ 1. Electric Power 3. Electrical Communications 4. Electronic Applications	3	8	14	11	33	30	15	72	VII					
VII-A	Physical Biology		4			14	12	16	6	13	VII-A					
VIII	Physics		1	93	77	66	70	66	70	478	VIII					
IX-A	General Science		1	98	84	22	4	40	129	10	IX-A					
IX-B	General Engineering		1	98	84	128	94	35	28	62	IX-B					
X	Chemical Engineering		1	7	22	19	11	11	21	53	X					
X-A	Chemical Engineering Practice — Graduate		1	17	9	22	12	12	27	35	X-A					
X-B	Chemical Engineering Practice — Undergraduate		1	2	7	8	6	9	98	28	X-B					
XI	Sanitary Engineering		1	5	16	9	13	35	81	35	XI					
XII	Geology		1	46	79	101	115	122	98	415	XII					
XIII	Naval Architecture and Marine Engineering		2	40	44	37	24	50	18	256	XIII					
XIII-A	Naval Construction and Engineering		1	11	31	27	35	33	14	124	XIII-A					
XIII-B	Marine Transportation		2	12	26	9	7	26	83	165	XIII-B					
XIII-C	Fifth Year		1	1	5	11	15	15	1	65	XIII-C					
XIV	Economics and Engineering	{ 1. Human Relations 2. Industrial Economics	2	744	897	1,038	1,177**	1,602	5,458	81	XIV					
XV	Business and Engineering	{ A. Physical Sciences B. Chemical Sciences	A	46	99	101	115	122	98	415	XV					
XVI	Aeronautical Engineering		B	40	44	37	24	50	18	256	XVI					
XVI-B	Aeronautical Engineering — Cooperative		1	11	31	27	35	33	14	124	XVI-B					
XVII	Building Engineering and Construction	{ 1. Heavy Construction 2. Light Construction	2	12	26	9	6	26	7	83	XVII					
XVIII	Mathematics		1	3	3	3	3	3	3	15	XVIII					
XIX	Meteorology		1	1	1	1	1	1	1	5	XIX					
XX	Food Technology		1	1	1	1	1	1	1	1	XX					
XXI	Food Technology		1	1	1	1	1	1	1	1	XXI					
XX-A	Industrial Economics		1	1	1	1	1	1	1	1	XX-A					
XX-B	Economics and Engineering		1	1	1	1	1	1	1	1	XX-B					
	Total			744	897	1,038	1,177**	1,602	5,458							

\* First Year, 38. Second Year, 33. Third Year, 27.

\*\* This total includes fifth year in Architecture and Marine Transportation.

TABLE 4-B  
CLASSIFICATION OF SPECIAL STUDENTS BY COURSES AND YEARS  
(Included in Table 4-A)

COURSE	YEAR					TOTAL	COURSE
	I	2	3	4	G		
I Civil Engineering . . . . .	—	—	1	—	1	2	I
II Mechanical Engineering . . . . .	1	—	—	4	9	14	II
III Metallurgy . . . . .	—	—	1	4	4	5	III
IV-A Architecture . . . . .	—	—	1	4	—	5	IV-A
V Chemistry . . . . .	1	—	—	1	—	2	(Fifth Year)
VI Electrical Engineering . . . . .	3	—	3	4	45	55	V
VII Quantitative Biology . . . . .	—	—	1	—	4	5	VI
VII-A Physical Biology . . . . .	—	—	—	2	—	2	VII
VIII Physics . . . . .	2	1	—	4	9	16	VII-A
X Chemical Engineering . . . . .	—	—	—	1	9	10	VIII
XIV Economics and Engineering . . . . .	—	3	—	—	—	3	X
XV Business and Engineering Administration . . . . .	—	—	—	5	1	6	XIV
XVI Aeronautical Engineering . . . . .	—	—	—	—	21	21	XV
XVII Building Engineering and Construction . . . . .	—	1	—	3	—	4	XVI
XVIII Mathematics . . . . .	1	4	2	1	24	32	XVII
XIX Meteorology . . . . .	—	—	—	4	10	14	XVIII
XX Food Technology . . . . .	—	—	4	1	3	8	XIX
Industrial Economics . . . . .	—	—	—	—	7	7	XX
Total . . . . .	8	9	14	41	152	224	Ind. Econ.
							Total

TABLE 4-C  
CLASSIFICATION OF FORMER STUDENTS WHO RETURNED THIS YEAR\*  
(Included in Table 4-A)

COURSE	YEAR					TOTAL	COURSE
	I	2	3	4	G		
I Civil Engineering . . . . .	1	1	1	—	—	3	I
II Mechanical Engineering . . . . .	—	6	9	4	7	26	II
III Metallurgy . . . . .	1	—	1	—	1	3	III
IV-A Architecture . . . . .	—	2	1	1	—	4	IV-A
V Chemistry . . . . .	1	—	1	1	2	5	V
VI Electrical Engineering . . . . .	2	4	3	7	4	26	VI
VII Quantitative Biology . . . . .	—	1	—	1	1	3	VII
VIII Physics . . . . .	1	1	1	2	2	7	VIII
IX-A General Science . . . . .	—	—	2	1	—	3	IX-A
IX-B General Engineering . . . . .	—	—	6	4	—	10	IX-B
X Chemical Engineering . . . . .	1	1	5	1	2	10	X
XI Sanitary Engineering . . . . .	—	—	—	—	1	1	XI
XII Geology . . . . .	1	2	1	—	3	7	XII
XIII Naval Architecture and Marine Engineering . . . . .	—	—	1	—	2	3	XIII
XIII-A Naval Construction and Engineering . . . . .	—	—	—	—	2	2	XIII-A
XIV Economics and Engineering . . . . .	—	2	2	—	—	4	XIV
XV Business and Engineering Administration . . . . .	2	1	4	6	1	14	XV
XVI Aeronautical Engineering . . . . .	—	—	—	—	5	5	XVI
XVII Building Engineering and Construction . . . . .	1	2	—	2	—	5	XVII
XVIII Mathematics . . . . .	—	—	3	2	1	6	XVIII
XIX Meteorology . . . . .	—	—	1	—	4	5	XIX
Industrial Economics . . . . .	—	—	—	—	2	2	Ind. Econ
Total . . . . .	11	24	42	32	42	151	Total

\* Excludes 38 special students.

TABLE 5. CLASSIFICATION OF STUDENTS BY COURSES SINCE 1942

	1942-43	1943-44	1944-45	1945-46	1946-47	1947-48	1948-49	1949-50
<i>Engineering Courses</i> . . . . .	1,861	1,276	976	1,225	4,092	4,398	4,094	4,055
<i>Total</i> . . . . .	169	199	136	208	425	346	304	274
Aeronautical Engineering XVI, XVI-B . . . . .	16	9	11	15	70	98	111	124
Building Engineering and Construction XVII . . . . .	177	68	61	73	490	556	449	415
Business and Engineering Administration XV . . . . .	360	278	185	220	695	693	611	596
Chemical Engineering X, X-A, X-B, X-C . . . . .	72	72	62	63	209	220	258	271
Civil Engineering I . . . . .	—	—	—	—	4	69	87	81
†Economics and Engineering XIV . . . . .	287	237	218	303	1,091	1,215	1,051	996
Electrical Engineering VI, VI-A . . . . .	38	20	10	12	32	51	57	62
General Engineering IX-B . . . . .	330	200	139	178	718	749	691	711
Mechanical Engineering II, II-B . . . . .	88	40	36	31	135	155	203	243
Metallurgy III . . . . .	141	19	15	12	46	46	66	65
†Meteorology XIX . . . . .	115	52	25	26	85	85	92	92
Naval Architecture and Marine Eng. XIII, XIII-C . . . . .	62	79	75	81	78	101	98	98
Naval Construction and Engineering XIII-A . . . . .	6	3	3	3	14	14	16	21
Sanitary Engineering XI . . . . .	341	265	187	269	895	1,037	1,090	1,151
<i>Science Courses</i> . . . . .	79	42	13	21	66	85	77	85
§Biology and Public Health VII, VII-A, VII-B, VII-T . . . . .	—	—	—	4	29	41	59	46
**Food Technology XX, XX-A . . . . .	112	95	77	108	272	292	280	281
Chemistry V . . . . .	12	3	1	3	3	6	7	10
General Science IX-A . . . . .	13	6	3	4	27	38	61	86
Geology XII . . . . .	22	19	20	36	105	116	137	165
Mathematics XVIII . . . . .	103	100	73	93	393	459	469	478
Physics VIII . . . . .	77	30	30	40	156	179	204	202
<i>Architecture Courses</i> . . . . .	77	30	30	40	156	179	204	202
Architecture IV-A . . . . .	77	30	30	40	156	144	169	169
*City Planning IV-B . . . . .	—	—	—	—	—	35	35	33
<i>Economics and Eng. or Natural Science, Industrial Economics, and Group Psychology</i> . . . . .	15	8	5	4	29	48	45	50
<i>Total</i> . . . . .	39	—	—	—	—	—	—	—
<i>Total</i> . . . . .	715	—	—	—	—	—	—	—
† <i>First Year (not including Course IV)</i> . . . . .	—	—	—	—	—	—	—	—
Grand Total . . . . .	3,048	1,579	1,198	1,538	5,172	5,662	5,433	5,438

\* Prior to February 1947 included in Architecture.  
 † From September 1940 to November 1942, First Year Students not required to designate choice of course except for Course IV.  
 ‡ June 1941, Meteorology, formerly included in Aeronautical Engineering, changed to Course XIV. September 1946, Meteorology changed to Course XIX, Economics and Engineering, Course XIV started.  
 § June 1944, Public Health discontinued. \*\* Prior to July 1945, included in Biology and Public Health. From July 1945 to September 1946, Course VII-B, September 1946, changed to Course XX.

TABLE 6  
GEOGRAPHICAL CLASSIFICATION OF STUDENTS SINCE 1945

UNITED STATES	1945	1946	1947	1948	1949
<i>North Atlantic</i> . . . . . Total	951	3,441	3,837	3,633	3,590
Connecticut . . . . .	53	194	213	199	199
Maine . . . . .	8	36	44	43	52
Massachusetts . . . . .	450	1,569	1,817	1,710	1,672
New Hampshire . . . . .	8	43	54	51	47
New Jersey . . . . .	72	300	337	311	307
New York . . . . .	276	936	1,009	981	973
Pennsylvania . . . . .	62	300	285	262	267
Rhode Island . . . . .	21	46	57	53	51
Vermont . . . . .	1	17	21	23	22
<i>South Atlantic</i> . . . . . Total	92	341	351	343	308
Delaware . . . . .	4	16	17	14	8
District of Columbia . . . . .	26	72	57	50	49
Florida . . . . .	11	53	54	66	65
Georgia . . . . .	4	17	14	18	10
Maryland . . . . .	18	65	79	68	61
North Carolina . . . . .	3	26	29	26	18
South Carolina . . . . .	3	16	19	12	11
Virginia . . . . .	17	51	56	63	65
West Virginia . . . . .	6	25	26	29	21
<i>South Central</i> . . . . . Total	44	196	210	194	200
Alabama . . . . .	6	22	21	15	25
Arkansas . . . . .	2	16	19	15	14
Kentucky . . . . .	3	18	17	25	28
Louisiana . . . . .	7	24	26	29	20
Mississippi . . . . .	5	11	12	10	9
Tennessee . . . . .	7	32	41	36	33
Texas . . . . .	14	73	74	64	71
<i>North Central</i> . . . . . Total	151	664	675	641	659
Illinois . . . . .	45	181	189	175	174
Indiana . . . . .	7	25	31	37	38
Iowa . . . . .	2	16	21	20	22
Kansas . . . . .	7	22	21	17	14
Michigan . . . . .	16	79	83	88	97
Minnesota . . . . .	10	40	41	31	35
Missouri . . . . .	23	75	68	61	58
Nebraska . . . . .	3	16	19	18	28
North Dakota . . . . .	2	8	8	5	3
Ohio . . . . .	24	158	144	136	140
South Dakota . . . . .	—	5	4	2	3
Wisconsin . . . . .	12	39	46	51	47
<i>Western</i> . . . . . Total	56	258	276	282	290
Arizona . . . . .	2	4	8	6	7
California . . . . .	21	95	95	97	99
Colorado . . . . .	1	17	21	22	28
Idaho . . . . .	—	9	6	7	8
Montana . . . . .	1	6	7	10	8
Nevada . . . . .	1	4	3	4	3
New Mexico . . . . .	1	10	11	7	7
Oklahoma . . . . .	7	29	34	39	33
Oregon . . . . .	4	20	25	22	17
Utah . . . . .	2	8	13	13	15
Washington . . . . .	12	54	49	50	58
Wyoming . . . . .	4	2	4	5	7
<i>Territories and Dependencies</i> . . . . . Total	7	13	11	20	26
Alaska . . . . .	1	—	1	2	4
Canal Zone . . . . .	—	—	—	3	6
Hawaii . . . . .	1	7	7	9	12
Puerto Rico . . . . .	5	6	3	6	4
<b>Total for United States</b> . . . . .	<b>1,301</b>	<b>4,913</b>	<b>5,360</b>	<b>5,113</b>	<b>5,073</b>

(Continued on page 55)



TABLE 6 — (Continued)

FOREIGN COUNTRIES	1945	1946	1947	1948	1949
Total . . . . .	237	259	302	320	385
Afghanistan . . . . .	—	—	—	—	1
Africa . . . . .	—	—	1	—	—
Argentina . . . . .	5	8	7	8	9
Australia . . . . .	—	—	4	2	2
Austria . . . . .	—	—	—	—	1
Belgian Congo . . . . .	1	1	—	—	—
Belgium . . . . .	—	—	1	1	4
Bolivia . . . . .	1	—	—	1	2
Brazil . . . . .	11	9	10	12	13
British Honduras . . . . .	—	1	—	—	—
British West Indies . . . . .	2	3	2	1	3
Burma . . . . .	—	—	—	—	1
Canada . . . . .	10	53	57	60	76
Ceylon . . . . .	—	—	—	—	1
Chile . . . . .	3	2	1	1	1
China . . . . .	69	24	30	22	21
Colombia . . . . .	3	3	6	6	6
Costa Rica . . . . .	1	—	—	—	—
Cuba . . . . .	12	17	20	16	17
Cyprus . . . . .	—	1	1	1	1
Czechoslovakia . . . . .	—	—	2	2	—
Denmark . . . . .	—	2	—	1	2
Dominican Republic . . . . .	—	—	1	1	3
Ecuador . . . . .	1	1	3	6	6
Egypt . . . . .	1	—	8	13	12
England . . . . .	—	7	2	2	2
Finland . . . . .	—	—	—	—	—
France . . . . .	2	5	14	10	15
French West Indies . . . . .	—	1	1	1	—
French Indochina . . . . .	—	—	—	—	1
Gold Coast . . . . .	—	—	—	—	6
Greece . . . . .	—	—	4	6	3
Guatemala . . . . .	4	2	1	4	—
Honduras . . . . .	2	1	2	2	—
Hong Kong . . . . .	—	—	—	—	5
Hungary . . . . .	—	—	2	—	—
Iceland . . . . .	5	5	2	4	3
India . . . . .	27	13	25	27	34
Iran . . . . .	4	—	—	—	—
Iraq . . . . .	9	4	5	3	5
Israel . . . . .	1	1	3	2	3
Italy . . . . .	—	2	2	3	4
Korea . . . . .	—	—	—	1	1
Lebanon . . . . .	1	2	—	—	2
Libya . . . . .	—	1	—	—	—
Luxembourg . . . . .	—	1	—	1	1
Malaya . . . . .	—	—	—	1	2
Mexico . . . . .	9	10	9	11	13
Morocco . . . . .	—	—	1	—	1
Mozambique . . . . .	—	—	—	—	1
Netherlands East Indies . . . . .	—	—	3	3	2
Netherlands West Indies . . . . .	—	—	1	1	2
Netherlands . . . . .	1	2	1	2	1
Newfoundland . . . . .	—	1	—	—	—
New Zealand . . . . .	—	—	—	2	2
Nicaragua . . . . .	—	—	—	1	2
Norway . . . . .	1	22	26	33	31
Pakistan . . . . .	—	—	—	—	1
Panama . . . . .	5	5	2	2	—
Peru . . . . .	13	10	9	5	3
Philippines . . . . .	—	7	6	11	13
Poland . . . . .	2	1	—	—	1
Portugal . . . . .	—	1	2	2	5
Rhodesia . . . . .	—	1	—	—	—
Salvador . . . . .	—	2	2	2	—
Scotland . . . . .	—	1	—	—	2
Singapore . . . . .	—	—	—	—	1
South Africa . . . . .	—	—	1	—	—
Spain . . . . .	—	1	2	4	2
Straits Settlements . . . . .	1	—	—	—	—
Sweden . . . . .	—	2	4	3	3
Switzerland . . . . .	—	2	4	2	3
Tanganyika . . . . .	—	—	—	—	1
Thailand . . . . .	—	—	—	—	3
Turkey . . . . .	15	11	8	6	5
Union of South Africa . . . . .	5	4	2	3	4
Uruguay . . . . .	2	1	1	1	4
Venezuela . . . . .	8	4	—	3	7
Yugoslavia . . . . .	—	—	—	1	1
Grand Total, United States and Foreign . . . . .	1,538	5,172	5,662	5,433	5,458

## ADMINISTRATIVE OFFICERS

TABLE 7. NEW STUDENTS ENTERING FROM OTHER COLLEGES AS CANDIDATES FOR DEGREES

Class Joined at the Institute	Years Spent at College				Total
	One	Two	Three	Four or more	
First Year . . . . .	30	16	4	1	51
Second Year . . . . .	40	86	20	17	163
Third Year . . . . .	5	48	56	51	160
Fourth Year . . . . .	—	—	2	4	6
Graduate Year . . . . .	—	—	94	403	497
Total . . . . .	75	150	176	476	877

TABLE 8. WOMEN STUDENTS CLASSIFIED BY COURSES AND YEARS

Course	Year					Total
	1	2	3	4	G	
II Mechanical Engineering . . . . .	—	—	2	—	—	2
IV-A Architecture . . . . .	4	—	2	4	1	11
Fifth Year . . . . .	—	—	—	1	—	1
V Chemistry . . . . .	2	—	—	1	6	9
VI Electrical Engineering . . . . .	—	1	—	—	1	2
VII Quantitative Biology . . . . .	2	—	—	—	4	6
VII-A Physical Biology . . . . .	—	—	—	1	—	1
VIII Physics . . . . .	4	3	—	—	5	12
IX-B General Engineering . . . . .	—	—	1	—	—	1
X Chemical Engineering . . . . .	—	1	—	1	—	2
XII Geology . . . . .	1	—	1	—	1	3
XIV Economics and Engineering . . . . .	—	2	—	—	—	2
XVII Building Engineering and Construction . . . . .	—	—	—	1	—	1
XVIII Mathematics . . . . .	—	4	—	—	6	10
XIX Meteorology . . . . .	—	—	—	—	1	1
XX Food Technology . . . . .	—	1	1	1	2	5
Industrial Economics . . . . .	—	—	—	—	2	2
Total . . . . .	13	12	7	10*	29	71

\*This total includes fifth year in Architecture.

TABLE 9. OLD AND NEW STUDENTS

Year	1944-45	1945-46	1946-47	1947-48	1948-49	1949-50
Students registered at end of last academic year (including specials) . . . . .	500	653	2,762	4,118	3,663	3,639
Students who have previously attended the Institute but were not registered at end of last academic year (including specials)	98	62	1,242	261	262	189
New students who entered by examination . . . . .	118	313	460	530	501	433
New students who entered without examination . . . . .	266	336	241	294	261	241
New students who entered from other colleges as candidates for degrees . . . . .	179	136	406	396	645	877
New students (specials, not candidates for degrees) . . . . .	37	38	61	63	101	79
Total . . . . .	1,198	1,538	5,172	5,662	5,433	5,458

TABLE 10. LIST OF AMERICAN COLLEGES AND UNIVERSITIES WITH NUMBER OF GRADUATES ATTENDING THE INSTITUTE

College	College	College
Aeronautical University . . . . . 1	Houston, University of . . . . . 1	Pomona College . . . . . 3
Alabama Polytechnic Inst. . . . . 8	Howard University . . . . . 1	Pratt Institute . . . . . 3
Alabama, University of . . . . . 8	Idaho, University of . . . . . 1	Princeton University . . . . . 15
Alfred University . . . . . 6	Illinois Inst. of Technology . . . . . 5	Principia College . . . . . 3
American International Coll. . . . . 1	Illinois, University of . . . . . 27	Purdue University . . . . . 18
American University . . . . . 1	Indiana, University of . . . . . 1	Queens College, N.Y. . . . . 1
Amherst College . . . . . 6	Iowa State College of Agric. . . . . 1	Radcliffe College . . . . . 2
Antioch College . . . . . 3	and Mech. Arts . . . . . 7	Reed College . . . . . 1
Arizona, University of . . . . . 3	Iowa State Teachers College . . . . . 1	Rensselaer Polytechnic Inst. . . . . 24
Arkansas, University of . . . . . 5	Johns Hopkins University . . . . . 3	Rhode Island State College . . . . . 5
Baldwin-Wallace College . . . . . 1	Juanita College . . . . . 1	Rice Institute . . . . . 4
Ball State Teachers' College . . . . . 1	Juilliard School of Music . . . . . 1	Ripon College . . . . . 3
Bard College . . . . . 2	Kansas State College of . . . . . 1	Rochester, University of . . . . . 8
Bates College . . . . . 2	Agric. and Applied Science . . . . . 2	Rose Polytechnic Inst. . . . . 5
Beloit College . . . . . 1	Kansas, University of . . . . . 5	Russell Sage College . . . . . 1
Bennington College . . . . . 1	Kent State University . . . . . 1	Rutgers University . . . . . 4
Bethany College . . . . . 1	Kentucky, University of . . . . . 4	San Diego State College . . . . . 1
Boston College . . . . . 13	Kenyon College . . . . . 2	Seattle University . . . . . 1
Boston University . . . . . 1	Lafayette College . . . . . 4	St. Joseph's College . . . . . 1
Bowdoin College . . . . . 8	Lehigh University . . . . . 7	St. Lawrence University . . . . . 3
Bradley Polytechnic Inst. . . . . 1	Lincoln Inst. of Technology . . . . . 1	St. Michaels College . . . . . 1
Bridgewater College . . . . . 1	Louisiana Polytechnic Inst. . . . . 1	Shurtleff College . . . . . 1
Brigham Young University . . . . . 5	Louisiana State University . . . . . 1	Simmons College . . . . . 3
Brooklyn College . . . . . 10	and Agric. and Mech. Coll. . . . . 7	Smith College . . . . . 4
Brooklyn Polytechnic Inst. . . . . 10	Louisville, University of . . . . . 2	South, University of the . . . . . 1
Brown University . . . . . 13	Lowell Textile Institute . . . . . 3	South Carolina, University of . . . . . 4
Bryn Mawr College . . . . . 1	Lynchburg College . . . . . 1	South Dakota School of Mines . . . . . 2
Bucknell University . . . . . 3	Maine, University of . . . . . 10	and Technology . . . . . 1
California, University of . . . . . 26	Macalester College . . . . . 1	South Dakota, University of . . . . . 1
at Berkeley . . . . . 26	Maryland, University of . . . . . 3	Southern California, Univ. of . . . . . 1
California, University of . . . . . 4	Maryville College . . . . . 1	Southern Methodist Univ. . . . . 3
at Los Angeles . . . . . 4	Massachusetts Inst. of Tech. . . . . 488	Southern Illinois University . . . . . 2
California Inst. of Tech. . . . . 11	Massachusetts, University of . . . . . 8	Southwestern College . . . . . 1
Calvin College . . . . . 1	Miami University (Ohio) . . . . . 9	Spring Hill College . . . . . 1
Carleton College . . . . . 1	Miami, University of . . . . . 1	Stanford University . . . . . 10
Carnegie Inst. of Technology . . . . . 7	Michigan College of Mining . . . . . 1	State College of Washington . . . . . 1
Case Inst. of Technology . . . . . 12	and Technology . . . . . 2	State University of Iowa . . . . . 1
Chicago, University of . . . . . 8	Michigan State College . . . . . 4	Stevens Inst. of Technology . . . . . 7
Cincinnati, University of . . . . . 4	Michigan, University of . . . . . 26	Susquehanna University . . . . . 1
Citadel, The . . . . . 7	Michigan Western State . . . . . 1	Swarthmore College . . . . . 8
Claremont Men's College . . . . . 1	Teachers College . . . . . 1	Syracuse University . . . . . 7
Clark University . . . . . 1	Middlebury College . . . . . 5	Temple University . . . . . 3
Colby College . . . . . 3	Minnesota, University of . . . . . 10	Texas, University of . . . . . 10
College of City of New York . . . . . 29	Mississippi State College . . . . . 5	Texas Agric. and Mech. . . . . 12
College of Wooster . . . . . 3	Missouri State College, . . . . . 1	College . . . . . 6
Colorado College . . . . . 1	Southwest . . . . . 1	Texas Technological College . . . . . 6
Colorado School of Mines . . . . . 2	Missouri, University of . . . . . 9	Toledo, University of . . . . . 2
Colorado, University of . . . . . 9	Montana School of Mines . . . . . 4	Trinity College . . . . . 1
Columbia College . . . . . 2	Montana State College . . . . . 3	Truist College . . . . . 3
Columbia University (N.Y.) . . . . . 10	Montana State University . . . . . 1	Tufts College . . . . . 17
Cooper Union . . . . . 5	Mt. Holyoke College . . . . . 1	Tulane University . . . . . 3
Cornell University . . . . . 19	Nebraska, University of . . . . . 9	Tulsa, University of . . . . . 1
Creighton University . . . . . 2	Nevada, University of . . . . . 2	Union College (N.Y.) . . . . . 7
Dartmouth College . . . . . 14	Newark Coll. of Engineering . . . . . 3	U.S. Coast Guard Academy . . . . . 20
Davidson College . . . . . 1	New Hampshire, Univ. of . . . . . 8	U.S. Military Academy . . . . . 29
Davis and Elkins College . . . . . 1	New Jersey State Teachers . . . . . 1	U.S. Naval Academy . . . . . 77
Dayton, University of . . . . . 2	College . . . . . 1	Utah State Agricultural Coll. . . . . 3
Delaware, University of . . . . . 1	New Mexico College of Agric. . . . . 1	Utah, University of . . . . . 7
Denver, University of . . . . . 5	and Mech. Arts . . . . . 1	Vanderbilt University . . . . . 5
Detroit, University of . . . . . 3	New Mexico, University of . . . . . 3	Vermont, University of . . . . . 4
DePauw University . . . . . 3	New York State College for . . . . . 1	Villanova College . . . . . 1
Dickinson College . . . . . 2	Teachers . . . . . 1	Virginia Military Institute . . . . . 3
Doane College . . . . . 3	New York State Maritime . . . . . 1	Virginia Polytechnic Inst. . . . . 9
Drexel Inst. of Technology . . . . . 3	College . . . . . 2	Virginia, University of . . . . . 6
Duke University . . . . . 3	New York University . . . . . 22	Washington, University of . . . . . 21
Eastern Nazarene College . . . . . 1	North Carolina State College . . . . . 5	Washington-Jefferson College . . . . . 3
Emmanuel College . . . . . 1	North Carolina, University of . . . . . 1	Washington-Lee University . . . . . 2
Emory University . . . . . 1	North Dakota Agric. Coll . . . . . 2	Washington University . . . . . 6
Fenn College . . . . . 1	North Dakota, University of . . . . . 1	Wayne University . . . . . 3
Florida, University of . . . . . 3	Northeastern University . . . . . 25	Webb Inst. of Naval Arch. . . . . 10
Fordham University . . . . . 2	North Texas State Teachers . . . . . 1	Wellesley College . . . . . 3
Franklin College . . . . . 1	College . . . . . 3	Wesleyan University . . . . . 4
Franklin and Marshall Coll. . . . . 2	Northwestern University . . . . . 7	Western Reserve University . . . . . 1
Furman University . . . . . 1	Notre Dame, University of . . . . . 8	West Virginia, University of . . . . . 4
Gannon College . . . . . 1	Norwich University . . . . . 3	West Virginia Wesleyan Coll. . . . . 1
George Washington Univ. . . . . 5	Oberlin College . . . . . 4	Whitman College . . . . . 1
Georgetown University . . . . . 2	Ohio Northern University . . . . . 1	William and Mary College . . . . . 12
Georgia School of Technology . . . . . 15	Ohio State University . . . . . 11	Williams College . . . . . 5
Gettysburg College . . . . . 2	Ohio University . . . . . 2	Wisconsin, University of . . . . . 11
Good Counsel College . . . . . 1	Ohio Wesleyan University . . . . . 3	Worcester Polytechnic Inst. . . . . 11
Goucher College . . . . . 1	Oklahoma, University of . . . . . 9	Yale University . . . . . 22
Grinnell College . . . . . 2	Oklahoma Agric. and Mech. . . . . 1	
Hamilton College . . . . . 2	College . . . . . 2	Total . . . . . 1,793
Hamden-Sydney College . . . . . 1	Olivet College . . . . . 1	Number of American . . . . . 243
Hardin-Simmons University . . . . . 1	Oregon State College . . . . . 3	Colleges Represented . . . . . 243
Harvard University . . . . . 49	Oregon, University of . . . . . 2	Number of Foreign Colleges . . . . . 102
Haverford College . . . . . 2	Pennsylvania State College . . . . . 11	Represented (not listed) . . . . . 102
Hiram College . . . . . 1	Pennsylvania, University of . . . . . 12	
Holy Cross, College of the . . . . . 2	Pittsburgh, University of . . . . . 4	Total . . . . . 345

TABLE II  
REGULAR STUDENTS FROM COLLEGES CLASSIFIED BY COURSES

COURSE	No Previous Degree			Graduates of Other Colleges						S.B. Degree 1949		Graduates of M. I. T. Taking Graduate Work	
	Entered			Entered						S.B. Degree 1949	Other Graduates	Total	
	Sept. 1949	Pre-vious Years	Total	Sept. 1949		Previous Years		Total					
				Under-grad.	Grad.	Under-grad.	Grad.						
Aeronautical Engineering XVI	27	15	42	—	31	—	18	49	8	7	15		
Architecture IV-A	11	22	33	8	11	10	7	30	1	—	4		
Biology VII, VII-A	3	3	6	1	7	—	8	16	—	2	4		
Building Engineering and Construction XVII	11	13	24	3	5	2	5	15	—	4	4		
Business and Engineering Administration XV	29	15	44	5	22	4	6	37	2	2	4		
Chemical Engineering X, X-A, X-B	22	21	43	3	54	4	68	129	17	9	26		
Chemistry V	12	10	22	1	48	—	80	129	3	9	12		
City Planning IV-B	1	1	2	—	5	—	17	22	1	—	1		
Civil Engineering I	20	21	41	1	32	3	15	51	3	3	6		
Economics and Engineering	—	—	—	—	—	—	—	—	4	—	4		
Economics and Engineering XIV	—	8	10	1	—	1	—	2	—	—	—		
Electrical Engineering VI, VI-A	82	51	133	14	68	6	113	201	51	34	85		
Food Technology XX, XX-A	1	1	2	—	—	1	7	8	4	—	4		
General Engineering IX-B	—	8	8	1	—	—	—	1	—	—	—		
General Science IX-A	—	1	1	—	—	—	—	—	—	—	—		
Geology XII	2	1	3	—	5	—	16	21	3	3	6		
Industrial Economics	—	—	—	—	—	—	—	—	—	—	—		
Mathematics XVIII	6	5	11	—	11	—	25	36	3	3	6		
Mechanical Engineering I	55	42	97	12	21	—	25	46	12	11	23		
Mechanical Engineering II	6	9	15	3	37	2	46	106	2	18	30		
Metallurgy III	—	—	—	—	—	—	—	—	—	—	—		
Meteorology XIX	1	5	6	—	5	1	14	20	5	1	6		
Naval Architecture and Marine Eng. XIII, XIII-C	9	11	20	4	36	1	—	93	—	2	2		
Naval Construction and Engineering XIII-A	—	—	—	—	—	—	—	—	—	—	—		
Physics VIII	18	11	29	5	40	—	85	130	8	30	38		
Sanitary Engineering XI	—	—	—	—	9	—	9	18	1	2	3		
Total	318	274	592	62	497	35	664	1,258	132	157	289		

TABLE 12. NUMBER OF DEGREES AWARDED IN SEPTEMBER 1949, FEBRUARY 1950, AND JUNE 1950

Name of Course	S.B.			B.Arch. and B.C.P.			S.M.			M.Arch. and M.C.P.			Adv. Eng.			Ph.D.			Sc.D.			Total		
	Sept.	Feb.	June	Sept.	Feb.	June	Sept.	Feb.	June	Sept.	Feb.	June	Sept.	Feb.	June	Sept.	Feb.	June	Sept.	Feb.	June	Sept.	Feb.	June
	Aeronautical Engineering . . . . .	2	3	46	—	—	—	12	6	24	—	—	—	—	—	—	16	0	75	16	0	75	16	0
Architecture . . . . .	—	—	—	4	3	14	—	—	—	10	3	3	—	—	—	—	—	—	—	—	—	—	—	—
Biology . . . . .	1	—	26	—	—	—	3	1	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Building Eng. and Constr. . . . .	14	13	102	—	—	—	2	1	19	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Business and Eng. Admin. . . . .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Ceramics . . . . .	5	3	82	—	—	—	18	13	20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Chemical Engineering Practice . . . . .	2	2	30	—	—	—	10	11	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Chemistry . . . . .	2	2	30	—	—	—	3	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
City Planning . . . . .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Civil Engineering . . . . .	2	3	52	—	—	—	3	4	19	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Economics and Engineering . . . . .	3	3	31	—	—	—	1	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Electrical Engineering . . . . .	16	25	126	—	—	—	40	21	54	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Food Technology . . . . .	2	1	11	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Engineering . . . . .	2	4	26	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Science . . . . .	2	—	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Geology . . . . .	—	1	10	—	—	—	1	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Industrial Economics . . . . .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Marine Engineering . . . . .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Marine Transportation . . . . .	—	1	2	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mathematics . . . . .	—	—	17	—	—	—	3	2	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mechanical Engineering . . . . .	12	12	164	—	—	—	14	8	26	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Metalurgy . . . . .	1	—	36	—	—	—	5	6	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Meteorology . . . . .	—	—	6	—	—	—	1	2	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Naval Architecture . . . . .	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Naval Arch. and Marine Eng. . . . .	—	—	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Physics . . . . .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Physical Biology . . . . .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Quantitative Biology . . . . .	4	—	57	—	—	—	3	2	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sanitary Engineering . . . . .	3	1	12	—	—	—	1	1	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Textile Technology . . . . .	—	—	—	—	—	—	1	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Without Course Classification . . . . .	—	—	—	—	—	—	4	7	10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total . . . . .	72	70	888	4	4	14	130	88	213	13	4	14	2	—	40	18	13	39	272	103	1,257	272	103	1,257



TABLE 13 — (Continued)  
DEGREES OF BACHELOR OF SCIENCE ACCORDING TO CLASS IN WHICH THEY WERE AWARDED

Class (Calendar Year)	Aeronautical Eng.	Architectural Eng.†	Architecture	Biology or Natural Hist. (Inc. VII-A)	Bldg. Eng. & Constr.	Business and Eng. Adm.	Chemical Eng.	Chemical Eng. Practice X-B	Chemistry	Civil Engineering	Economics and Engineering	Electrical Eng. (Inc. VI-A)	Electrochemical Engineering*	Food Technology	General Eng.	General Science or General Course	Geology	Mathematics	Mechanical Eng. (Inc. II-A)	Metalurgy**	Meteorology	Military Eng.	Mining Eng. and Metallurgy	Naval Arch. and Marine Eng.	Physics	Sanitary Eng.	Total	Total by Decades	
1911																													
1912																													
1913																													
1914																													
1915																													
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Total	879	178	865	372	242	2,558	2,324	284	1,059	2,555	60	4,132	301	34	675	273	107	135	4,200	1246	53	5	880	752	596	264	24,023		

\* Prior to 1900 this Course was designated as Option 3 (Electrochemistry) of Course VIII.

† Two received the degree in Naval Architecture, Course XIII-B, in 1916 and three in 1917.

\*\* Prior to 1923 degrees were awarded in Architecture.

‡ Includes only February and June degrees.

TABLE 14  
DEGREES OF MASTER OF SCIENCE AWARDED

Class (Calendar Year)	Aeronautical Engineering	Architecture	Biol. & P. H. (Inc. VII-A)	Bldg. & Eng. Constr. XVII	Business and Eng. Admin.	Ceramics	Chemical Engineering	Chem. Eng. Practice X-A	Chemistry	Civil Engineering	Economics and Engineering or Natural Science	Electrical Eng. (Inc. VI-A)	Food Technology	Geology	Marine Engineering	Mathematics	Mech. Eng. (Inc. II-A)	Metallurgy	Meteorology	Naval Architecture	Naval Construction & Eng.†	Petroleum Engineering	Physics	Sanitary Engineering	Without Course Classification	Total	
1886																										1	
1887																											1
1888																											1
1889																											1
1890																											1
1891																											1
1892																											1
1893		1																									1
1894											1																1
1895		1									1																1
1896		3									1																3
1897		3									1																3
1898		1									2																3
1899		1									1																3
1900																											3
1901		2																									4
1902		3									3																8
1903		5																									8
1904		4									1																12
1905		9										2															18
1906		3									1																9
1907		6									1											2					15
1908		1									1											3					12
1909		6									2											7					12
1910		6									2											3					17
1911		5									2											3					19
1912		4									3											4					20
1913		4									3											4					20
1914		3									2											2					25
1915		4									5											2					25
1916		7									3											2					35
1917		4									3											2					35
1918		5									1											2					30
1919		2									3											9					15
1920											4											2					50
1921		3									6											20					93
1922		5									29											10					126
1923		10									6											20					170
1924		4									41											12					146
1925		5									3											12					123
1926		6									20											12					142
1927		9									26											9					161
1928		9									4											6					169
1929		5									2											6					196
1930		3									14											6					170
1931		4									22											6					189
1932		5									33											7					237
1933		10									14											7					202
1934		7									19											13					182
1935		3									14											11					186
1936		3									19											10					173
1937		12									30											10					151
1938		13									28											8					221
1939		8									11											7					232
1940		9									37											16					267
1941		16									42											18					279
1942		9									3											10					173
1943		21									33											28					259
1944		22									36											28					194
1945		9									7											9					150
1946		47									2											55					121
1947		67									29											46					284
1948		40									32											3					456
1949		44									31											33					438
*1950		30									16											3					447
Total	457	84	55	18	184	6	495	767	170	452	27	1,497	11	59	32	77	673	131	134	56	478	5	106	72	696	6,742	

Total of degrees in discontinued courses, Architectural Engineering, Electrochemical Engineering, Fuel and Gas Engineering, General Science, Mining Engineering, Naval Construction (Foreign Students), and Railroad Operation (see 1940-41 Report) . . . . .

126

Grand Total . . . . .

6,868

\*Includes only February and June degrees.

†Beginning 1949 see Naval Engineer, Table 17.



TABLE 15

## DEGREES AWARDED IN ARCHITECTURE AND CITY PLANNING

Class (Calendar Year)	Bachelor in Architecture	†Bachelor in City Planning	Master in Architecture	Master in City Planning
1921 . . . . .	—	—	3	—
1922 . . . . .	—	—	2	—
1923 . . . . .	—	—	7	—
1924 . . . . .	—	—	8	—
1925 . . . . .	—	—	5	—
1926 . . . . .	—	—	9	—
1927 . . . . .	—	—	7	—
1928 . . . . .	—	—	6	—
1929 . . . . .	—	—	9	—
1930 . . . . .	—	—	7	—
1931 . . . . .	—	—	9	—
1932 . . . . .	11	—	5	—
1933 . . . . .	24	—	7	—
1934 . . . . .	27	—	—	—
1935 . . . . .	17	4	11	—
1936 . . . . .	14	4	4	2
1937 . . . . .	9	2	11	3
1938 . . . . .	19	1	3	3
1939 . . . . .	14	1	10	3
1940 . . . . .	11	2	21	7
1941 . . . . .	17	2	6	1
1942 . . . . .	15	1	4	4
1943 . . . . .	10	—	3	6
1944 . . . . .	8	—	2	3
1945 . . . . .	5	—	—	7
1946 . . . . .	7	—	2	8
1947 . . . . .	9	1	20	15
1948 . . . . .	11	3	14	13
1949 . . . . .	24	2	10	12
*1950 . . . . .	17	1	6	12
<b>Total . . . . .</b>	<b>269</b>	<b>24</b>	<b>211</b>	<b>99</b>

\* Includes only February and June degrees.

† From 1935 to 1944 Bachelor of Architecture in City Planning.

## ADMINISTRATIVE OFFICERS

**TABLE 16**  
**DEGREES OF MASTER IN PUBLIC HEALTH AWARDED**  
**(Discontinued after 1944)**

Class (Calendar Year)	Number of Degrees Awarded		Total
	Prior to 1948	1948*	
1923	—	2	2
1926	—	1	1
1927	—	2	2
1929	—	1	1
1930	—	5	5
1931	—	4	4
1933	—	7	7
1934	—	4	4
1935	—	4	4
1937	—	6	6
1938	—	2	2
1939	—	6	6
1940	—	6	6
1941	3	6	9
1942	11	1	12
1943	10	10	20
1944	7	5	12
<b>Total</b>	<b>31</b>	<b>72</b>	<b>103</b>

\*72 former recipients of the Certificate of Public Health were awarded the degree of Master in Public Health in June 1948 as of the class in which they received their Certificate of Public Health.

TABLE 17  
DEGREES OF ADVANCED ENGINEERING AWARDED

Class (Calendar Year)	Aeronautical Engineer	Electrical Engineer	Mechanical Engineer	Metallurgical Engineer	Meteorologist	Naval Engineer	Total
1949 . . . .	—	2	—	—	1	37	40
*1950 . . . .	1	5	6	1	—	27	40
Total . .	1	7	6	1	1	64	80

\* Includes only February and June degrees.

## ADMINISTRATIVE OFFICERS

TABLE 18  
DEGREES OF DOCTOR OF PHILOSOPHY AWARDED

Class (Calendar Year)	Biology	Chemistry	Electrical Engineering	Food Technology	Geology	Industrial Economics	Mathematics	Physics	Group Psychology	Total
1907	—	3	—	—	—	—	—	—	—	3
1908	—	3	—	—	—	—	—	—	—	3
1909	—	—	—	—	—	—	—	—	—	—
1910	—	1	—	—	1	—	—	—	—	2
1911	1	—	—	—	—	—	—	—	—	1
1912	—	3	—	—	3	—	—	—	—	6
1913	—	1	—	—	—	—	—	—	—	1
1914	—	2	—	—	—	—	—	—	—	2
1915	—	2	—	—	—	—	—	—	—	2
1916	—	1	—	—	1	—	—	1	—	3
1917	—	3	—	—	1	—	—	—	—	4
1918	—	3	—	—	1	—	—	—	—	4
1919	—	—	—	—	—	—	—	1	—	1
1920	—	4	—	—	1	—	—	—	—	5
1921	1	3	—	—	—	—	—	3	—	7
1922	—	4	—	—	1	—	—	—	—	5
1923	—	5	—	—	1	—	—	—	—	6
1924	2	10	—	—	—	—	—	2	—	14
1925	—	11	—	—	—	—	—	—	—	11
1926	—	2	—	—	2	—	—	—	—	4
1927	2	6	—	—	1	—	1	1	—	11
1928	1	5	—	—	1	—	1	—	—	8
1929	4	8	—	—	2	—	1	—	—	15
1930	—	5	—	—	2	—	3	—	—	10
1931	—	9	—	—	—	—	1	—	—	10
1932	1	12	—	—	—	—	1	2	—	16
1933	2	10	—	—	3	—	3	—	—	18
1934	2	10	—	—	2	—	2	1	—	17
1935	4	15	—	—	2	—	3	7	—	31
1936	—	15	—	—	—	—	3	12	—	30
1937	2	11	—	—	4	—	1	10	—	28
1938	2	12	—	—	2	—	4	7	—	27
1939	1	33	—	—	4	—	3	4	—	45
1940	3	19	—	—	5	—	4	5	—	36
1941	1	18	—	—	1	—	3	5	—	28
1942	1	19	—	—	5	—	1	8	—	34
1943	2	8	—	—	2	—	3	8	—	23
1944	2	12	—	—	—	1	—	9	—	24
1945	1	6	—	—	—	—	1	1	—	9
1946	2	5	—	1	—	4	4	1	—	17
1947	3	14	1	1	—	3	4	17	—	43
1948	3	27	—	—	5	1	8	34	5	83
1949	2	40	—	2	4	3	5	36	3	95
*1950	4	21	—	—	3	5	5	25	—	63
Total	49	401	1	4	60	17	65	200	8	805

\* Includes only February and June degrees.

TABLE 19. DEGREES OF DOCTOR OF SCIENCE AWARDED

Class (Calendar Year)	Aero. Eng.	Ceramics	Chem. Eng.	Chemistry	Civil Eng.	Elec. Eng.	Electrochem. Eng.	Food Technology	Geology	Mathematics	Mech. Eng.	Metalurgy	Meteorology	Min. Eng.	Naval Arch.	Petroleum Eng.	Physics	San. Eng.	Total
1911	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
1912	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1913	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1914	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1915	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
1916	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
1917	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
1918	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1919	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	3
1920	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
1921	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1922	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
1923	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	5
1924	—	—	2	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	6
1925	1	—	3	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	7
1926	—	—	1	—	—	—	—	—	—	—	—	4	—	—	—	—	—	—	9
1927	—	—	—	1	—	—	—	—	—	—	1	2	—	—	—	—	—	—	6
1928	1	—	5	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	10
1929	—	—	3	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	6
1930	—	—	9	—	—	6	—	—	—	1	3	1	—	—	—	—	—	—	20
1931	—	—	3	2	—	3	—	—	—	—	2	1	—	—	—	—	—	—	9
1932	—	—	5	—	1	2	—	—	—	—	2	1	—	—	—	—	—	—	14
1933	—	—	10	1	2	3	—	—	—	1	3	6	—	—	—	—	—	—	24
1934	—	—	3	—	—	2	—	—	—	1	3	2	—	—	—	—	—	—	13
1935	—	—	2	1	—	4	—	—	—	2	—	1	—	—	—	—	—	—	14
1936	2	1	12	—	—	1	—	—	—	—	2	3	—	—	—	—	—	—	24
1937	1	1	9	1	1	6	—	—	—	—	2	—	—	—	—	—	—	—	23
1938	—	—	12	—	—	7	—	—	—	—	2	—	—	—	—	—	—	—	38
1939	2	1	10	—	3	1	—	—	—	—	2	5	—	—	—	—	—	—	38
1940	—	—	12	—	3	1	—	—	—	—	2	4	—	—	—	—	—	—	26
1941	1	1	15	3	—	3	—	—	—	—	2	2	—	—	—	—	—	—	29
1942	1	1	14	—	2	—	—	—	—	—	3	8	—	—	—	—	—	—	41
1943	—	—	10	—	—	—	—	—	—	—	1	3	—	—	—	—	—	—	26
1944	2	—	4	—	—	—	—	—	—	—	—	5	—	—	—	—	—	—	20
1945	—	1	7	—	2	—	—	—	2	—	1	4	—	—	—	—	—	—	15
1946	—	—	11	—	3	—	—	—	—	—	1	3	—	—	—	—	—	—	15
1947	2	1	10	—	2	4	—	—	—	—	2	1	—	—	—	—	—	—	23
1948	3	1	10	—	3	3	2	—	—	—	2	11	—	—	—	—	—	—	37
1949	2	5	21	—	6	8	—	—	—	—	4	9	—	—	—	—	—	—	46
*1950	4	1	12	1	5	6	—	1	—	—	7	15	—	—	—	—	—	—	71
Total	27	21	215	11	37	72	2	3	12	5	48	107	30	5	1	1	37	5	639

\*Includes only February and June degrees.

## ADMINISTRATIVE OFFICERS

TABLE 20  
DEGREES OF DOCTOR OF PUBLIC HEALTH AWARDED  
(Discontinued after 1944)

Class (Calendar Year)	Number
1924	1
1927	1
1928	1
1930	1
1939	1
1942	1
1944	3
<b>Total</b>	<b>9</b>

TABLE 21  
DEGREES OF DOCTOR OF ENGINEERING AWARDED  
(Discontinued after 1918)

Class (Calendar Year)	Electrical Engineering	Electrochemical Engineering	Total
1910	1	—	1
1914	1	—	1
1916	1	—	1
1917	—	1	1
<b>Total</b>	<b>3</b>	<b>1</b>	<b>4</b>

TABLE 22  
SUMMARY OF DEGREES AWARDED (1868-1950)

Bachelor of Science . . . . .	24,023
Bachelor in Architecture . . . . .	269
Bachelor in City Planning . . . . .	24
Master of Science . . . . .	6,868
Master in Architecture . . . . .	211
Master in City Planning . . . . .	99
Master in Public Health (Discontinued after 1944) . . . . .	103
Advanced Engineering . . . . .	80
Doctor of Philosophy . . . . .	805
Doctor of Science . . . . .	639
Doctor of Public Health (Discontinued after 1944) . . . . .	9
Doctor of Engineering (Discontinued after 1918) . . . . .	4
<b>Grand Total . . . . .</b>	<b>33,134</b>

DIRECTOR OF ADMISSIONS

This report, following the precedent of other years, covers the twelve-month period ending with the opening of the new academic year in September, 1950, which date marks the natural termination of the Admissions Office year.

The following tables compare, for this year and last, applications for admission to the freshman year, and those for transfer from other colleges.

*First Year Classes\**

	<i>September 1949</i>	<i>September 1950</i>
Total Applications.....	2,874	2,527
Admissions Granted.....	1,086	1,204
Actual Registration.....	736	780
Registration as Per Cent of Admissions.....	67.8	64.8
Number of Secondary Schools Represented. . . .	470	492

\* Exclusive of former students returning in the first year, but including college transfers entering the first year.

*College Transfers*

	<i>September 1949</i>	<i>September 1950</i>
Total Applications.....	1,273	940
Preliminary Applications not Followed Up. . . .	608	308
Admissions Granted.....	434	322
Actual Registration.....	380	248
Combined Plan of Study.....	62	53
Registration as Per Cent of Admissions.....	87.7	77.0

The second biennial guidance conference for college students looking forward to admission under the Combined Plan of Study was held April 12-14, 1950. Ninety students attended this three-day gathering, representing ten of the fourteen colleges in the Plan. Lectures and laboratory visits were arranged by each department, and opportunities provided for the conferees to meet faculty members as well as students already in residence from their respective colleges.

Although members of the Admissions Office staff have been visiting secondary schools regularly for many years, this

program was enlarged beginning in September, 1949. All visits are preceded by advance correspondence arranging appointments, and setting forth in some detail suggested procedure in order that both the school and the Institute might obtain maximum benefit from the occasion. Five members of the staff visited 352 secondary schools in 25 states. Of these, 100 were independent schools, and 252 were public high schools. Over 2,000 students were interviewed either singly or in small groups.

While the ultimate purpose of this program is to increase the number of well-qualified applicants, the program is expected to yield its results only over a considerable period of time. The chief values lie in the opportunities for personal contact and acquaintance with headmasters, guidance officers, and principals, as well as students and parents. These influences take effect slowly so that the value of the program is not to be judged solely by the immediate increase in applications for the following September. Some rough idea of this short-run effect may, however, be obtained from the results of the past year. The augmented program of school visits was initiated in a period of declining applications, these being 11 per cent below the preceding year. Some 306 of the schools included had not been visited the year before, and most of them not for a long time; this group of schools showed a gain of 11 per cent in applications over the preceding year. Thus the net effect of visits to these schools was to increase applications by something of the order of 22 per cent. A greater increase could have been secured by lessening the emphasis on smaller schools and smaller towns, and concentrating more heavily on the larger and better organized areas, but at the expense of reducing the geographical diversification which we deem important.

The increasing prevalence of "college nights" or "college conferences" at high schools makes it difficult for us to schedule appearances at more than a fraction of these events, which are often announced on short notice at widely separated locations. To reach them all would be expensive, and would curtail our systematic school visit program. This year we have taken the initiative in securing advance notice from the schools, so that our travel schedules may be adjusted to include these events wherever possible.



The Admissions Office has continued the large scale distribution of promotional literature. Over 75,000 copies of "Student Life at M. I. T." have been mailed to carefully selected lists of teachers, guidance officers, alumni, and other strategically placed individuals, and copies have been sent out in response to new inquiries from students. A special eight-page brochure on M. I. T. and another on the Biology Department, both in format designed by Mr. John I. Mattill, are being distributed through the packet service of the National Science Teachers Association to some 25,000 high school guidance officers. With these has been included a reprint of an Office of Education article on the demand for engineering graduates. The four-page leaflet on requirements for admission, which goes as a matter of routine to all schools and all inquiries, has been completely rewritten, with a format designed by Mr. Henry B. Kane. A leading object has been to eliminate the rather stiff and formal phraseology which usually characterizes such documents, and to substitute a letter in colloquial and direct style, intended to be more readable and attractive.

Preliminary work toward the mechanization of Admissions Office records has been completed by Mr. Arthur L. Bryant. It is expected that this step, carried on concurrently with other offices, will greatly increase the flexibility of our records, and will add to the analyses which will become available and to the operations which will be made possible.

The Wadsworth-Bryan statistical predictions of freshman performance are now in routine use, and further experimental work is in progress to increase the predictive validity of our data on applicants.

At the annual dinner for Honorary Secretaries and Alumni Club Officers last June, suggestions were made looking toward the more extensive organization of alumni for purposes of attracting the most promising students. The effective work of the Honorary Secretaries in this area for the past fifteen years has served as a pilot program of great value in demonstrating the importance of such alumni cooperation. A plan of enlisting younger alumni, carefully organized and in much larger numbers, to supplement the work of the Honorary Secretaries, is now under consideration as one phase of our more aggressive admissions policy.

Professor B. Alden Thresher is currently serving on a special committee of the College Entrance Examination Board, with a broad assignment to review the Board's national program of testing.

Mr. Franklin R. Kellogg has joined the Admissions Office staff, replacing Mr. N. McL. Sage, Jr., who participated effectively during the year in the program of school visits. Mr. Robert A. Plachta is being lent by the Electrical Engineering Department for several weeks of similar activity.

B. ALDEN THRESHER

#### DIRECTOR OF LIBRARIES

Occupancy of the Charles Hayden Memorial Library during the fiscal year 1949-1950 marks the culmination of long years of planning and slightly more than two years of actual construction from April 5, 1948, when ground was broken until May 19, 1950, when the building was formally dedicated.

The presentation and dedication of the Charles Hayden Memorial Library to students, faculty, and staff of former days, those now at the Institute and those to come in the future was held on May 19, 1950. The Central Library on the second floor was selected as the site and was handsomely decorated to receive over 500 invited guests. The program stressed the integration of the new library into the life of the Institute. The architect, Mr. Ralph T. Walker, formally delivered the building to Dr. Karl T. Compton, who accepted it on behalf of the Corporation. President James R. Killian, Jr. presented a gold master key to Mr. J. Willard Hayden. Two addresses, "The Bridge" by Dr. Julian P. Boyd, Librarian of Princeton University, and "The Coming Mobilization of Thought" by Mr. Norman Cousins, Editor of the *Saturday Review of Literature*, were featured. The dedication ceremonies included the first public performance of the "Trio in D minor" especially composed for the dedication by Bohuslav Martinu, and as a concluding number, Franz Schubert's "Trio in B flat major, Opus No. 99." Presumably, no other library in modern times has been similarly honored. Dean of Humanities John E. Burchard presided and the Director of Libraries spoke briefly about the library. Subsequently the entire building was

thrown open for inspection. The entire proceedings were recorded on tape and will form the substance of the M. I. T. Library Annual 1950 which is expected to be completed late in the year.

There is a wide gulf between the completion of a new building and its occupancy, particularly by a library. The process of moving books alone is bad enough; when over a million and a half catalogue cards together with vertical files and cases, records of all descriptions, furniture, office and other equipment are added, the situation becomes even more complex.

The library was extremely fortunate in its move. The long period of planning and preparation by the library staff and by personnel from the office of Buildings and Power paid excellent dividends. From first to last each operation moved steadily and smoothly without friction and without the loss of valuable time. The success is a tribute to the energy, loyalty and cooperation of all who participated.

Actually the move was not accomplished in a single galvanic leap. The English and History Library in the north wing was ready first, as that section of the building was given priority of construction to allow the use of offices on the upper three floors for the fall term. Shortly thereafter the English and History Library and associated collections, with the exception of music, were moved from the Walker Memorial. This initial transfer served as a useful trial run for procedures, equipment and personnel. The main move to the south wing took place in February between terms. Two streams of activity converged. One originated in the old Dewey Library (Building 5) and brought the collections relating to Business and Engineering Administration, Economics and Industrial Relations to the new Dewey Library on the ground floor and nearby basement stacks. The other brought a considerable segment of the main book and other collections from the dome of Building 10 to the new Central Library on the second floor, and to the basement stacks. The new administrative offices, processing area and work spaces were occupied at the same time, and the library was made sufficiently ready to be put to immediate use at the beginning of the second term.

Subsequent moves brought additional material from the dome to the new stacks, the music collection to its superb new

room, the Dard Hunter Paper Museum to the west wing basement beneath the Gallery, the Center for Scientific Aids to Learning to the area set apart for experimenting and testing, and located minor collections in new quarters. At the end of the year the process was still going on and must continue for some time to come.

The M. I. T. library system now includes the Central and nine branch libraries in seven physical locations; the Central and two branches are housed in the Charles Hayden Memorial Library, together with the main book stack, several special facilities and the administrative departments; the Vail and Biology-Food Technology branch libraries share the dome where the stacks in excess of their needs form a vital supplement to the main stacks in Central. The remaining five branch libraries are located in separate quarters in Buildings 5, 6, 7, 8, and 33. Several small working collections, exemplified by two different kinds of libraries, the Sloan and the Crafts, are under general library supervision although not operated as a part of the system; books in the former are included in the Institute catalogue. Several "document rooms" usually operated in connection with D.I.C. or sponsored projects have no connection with the library. In the new Biology building space has been set aside for the Biology-Food Technology branch library which, when ready, will raise the total locations to eight. The urgent need of the Geology Department for a separate branch library near the geographic center of department activities has been frequently and vigorously expressed during the year.

While the ensuing year must be spent in completing the several moves previously mentioned and in planning activities for the more or less immediate future, effective long range planning must take into account needs and trends that are now developing. First and foremost the propriety of adding more relatively small branch libraries to the system has been questioned in several circles. The library ideal is to provide completely adequate library service for the needs and convenience of the faculty, staff and students. To this end the branch library system has been adopted. The diametrically opposed alternative, a single central library on a large campus geographically and functionally as widely separated as is the case at the Institute, is manifestly unsuitable. Many universities

have elected a middle course by establishing a limited number of relatively large branch libraries polarized about like interests such as science, engineering, architecture, and humanities.

To approach the correct solution more information is needed about the actual use of the libraries by their patrons. Studies of this important and elusive subject, interrupted by the several moves this year, must be continued. If a dividing line between essential use and convenience could be drawn it would be most helpful.

The *Aeronautical Engineering Library* continued to manifest unusual activity; although the number of students in Course XVI slightly decreased, circulation increased by 11.5 per cent, more than making up the loss noted last year and surpassing the high point reached in 1948. Large quantities of new material, much of it timely serials and government documents, all required new books (130 titles); material from the Custodian of Alien Property and twenty Farmington Plan purchases were added to the library. Duplicate and new material generously donated to the library by staff and students has been of great service. An additional room adjacent to the library was equipped with tables and chairs and some salvaged temporary stacks and put to good use. It is hoped that other changes will free additional stacks for transfer to this area.

The *Biology-Food Technology Library* became an entity this year and was housed in the dome of Building 10. With the cooperation of a department committee, holdings in the field were screened to provide the basis of the working collection, which has been supplemented by new purchases of books and periodicals. Some older material has been retired to the inactive collection and some marked for disposal. The card catalogue is well advanced although far from complete. A faculty reading and study room, improvised in space made available by the move, has proved to be a much appreciated and useful adjunct. No basis exists for comparative circulation figures, but the average for the last five months of the year for overnight and two-week books was 450 per month.

The *Dewey Library* of Economics, Social Science, Business Engineering and Industrial Relations was moved to the ground floor, south wing, of the Charles Hayden Memorial Library in February. The collection totaled more than 21,000 cata-

logged items and over 4,000 volumes of periodicals. Despite the confusion of the move the library remained busy, and although circulation declined about twenty per cent in gross figures, the decrease fell largely in reserved books and toward the end of the year was again turning upward at a rapid rate. Increased pleasant reading space, more open shelves and an improved arrangement of resources contribute to the popularity of the library. The Corporation File and the Marketing Workroom, formerly of necessity outside the library, are now well housed within it. An exhibit of the American Management Association Personnel Workshop in the library proved both practicable and useful. The Industrial Relations section has benefited noticeably from new and adequate space, although limitations of personnel here as in the Dewey Library generally are beginning to be felt. The move to the new library solved many chronic Dewey problems while creating only a few new ones for attention in the future.

The *Eastman Library* is even more crowded and heavily used than before, despite attempts to limit it to advanced students and faculty in the fields of Chemistry, Mathematics, and Physics. Circulation for the first ten months surpassed the total for the previous year, an increase for the year of 17.5 per cent. This busy library is plagued by two serious limitations; irregular withdrawal without return of its books and shortage of space. Both matters have been of concern to the Faculty Committee on the Library. Attempts to increase the area of the library have been unavailing. The entire area is in need of repainting, relighting and renovation.

The *Engineering and Naval Architecture Library*, a new full-fledged branch this year, was established in the old Dewey Library. Formerly, its operations were under the general supervision of the Dewey Librarian. Collections and other material pertaining to Civil, Mechanical, and Marine Engineering, Building Engineering and Construction, and Naval Architecture are housed in this area together with a reading room and the rare book collection accumulated in connection with the Nautical Museum. A marked increase in the use of the library, particularly during evening hours, has been noted. During the coming year certain minor alterations designed to

increase seating space by the transfer of unused stacks are expected to add considerably to its usefulness.

The *English and History Library*, formerly the Walker Library, was the first to move to the Charles Hayden Memorial Library and occupies the ground floor, north wing, of that building. At the same time collections of records, books and other items pertaining to music which had been a part of Walker were segregated. The Music Room is now regarded as a special facility, not as a branch library, and will be so reported. Use increased by 16.4 per cent generally and in the last six months the figure averaged 36 per cent. The increase is the more remarkable in the light of a deliberate policy decision not to attempt to acquire current general interest fiction including detective stories. Other arrangements for these categories, if they prove actually to be needed, will be made. The increasing trend toward the use of reserved books and other factors must profoundly influence the future course of the library. Certain background collections still remain in the dome pending the installation of additional stacks. The existing arrangement, though satisfactory and perfectly usable by the department most concerned, cannot be regarded as final.

In the *Lindgren Library* a two-year downward trend in use was sharply reversed. Statistically, circulation increased 40 per cent over last year and 36.5 per cent over 1947, the previous high. The collections continue to keep pace with current output and the only handicap to more efficient operation is the chronic shortage of space. The library urgently needs renovation, repainting, and relighting.

The *Rotch Library* of Architecture and Planning, despite an apparent slight decrease of 2.6 per cent in recorded circulation, remains heavily used. Space remains critical although the transfer of some material required for use in English and History provided some additional space. The removal of mounted photographs in special cases and the provision of needed shelving will permit much better organization and use of the library. Noteworthy additions to the library included approximately 400 books, 141 photographs and 550 lantern slides.

The *Vail Library* of Electrical Engineering has inherited

the dome reading room in Building 10, adjacent work areas and as much stack as its collections require. The move became for Vail a time of mixed tribulation and rejoicing. Separation of the entire card catalogue from the Institute Union Catalogue proved to be a lengthy, painstaking process, and Vail books had to be segregated, assembled and reshelved. For the first time the library may be studied as a unit. Faculty reading and study rooms became possible. Eventually a workable plan for the library that is intended to serve the primary needs of roughly 20 per cent of the entire M. I. T. community can be evolved. Actually the library is a combination of the historically valuable collection formed by Theodore N. Vail, supplemented by more recent additions, and the current working library for students and faculty. The two are not at all incompatible, but they represent phases of interest and points of view that must be resolved in terms of need and budget. The future of the Vail Library is intimately bound up with the developing plan for the utilization of the dome itself.

The overall picture of the Institute Libraries shows that during the year 15,325 volumes were added to the library to bring the book stock to the official count of 450,479 volumes. Duplicates, unprocessed, surplus and miscellaneous other volumes not included in the total bring actual holdings well beyond the half million volume mark. In terms of circulation, an increase of 6 per cent over the past year and 37 per cent over the figures five years ago, was registered. Periodical subscriptions now total 2,506. In addition to all of the catalogue work incident to the move, 8,000 new titles were catalogued; 17 languages other than English were represented. Binding totaled 3,068 volumes without counting 376 paper-bound volumes completed in the library.

At M. I. T. the central reference department must bear the brunt of inquiries by letter, telephone and personal visit from all sources within and without the Institute. Requests averaging over 50 per day throughout the year ran from the vaguest to the most highly specific topics. Virtually all requests were satisfactorily filled through the resources of the Central and branch libraries. A part of reference work, inter-library loan, was exceedingly active; about 4.5 times as much material was loaned as borrowed. Photostatic and microfilm



reproductions continue in demand. The new location of the department near the main catalogue surrounded by the reference collections has contributed greatly to efficient and easy operation. Projects involving theses, rare books and special collections are now possible and are under way. A critical review of library publication in relation to exchanges is also being undertaken. Reference is truly coming into its own.

As a result of the move, the Central Library has emerged as the general service library for the entire Institute. The Union Library Catalogue which lists all books in any Institute Library, the main reference and bibliographic collections, theses, rare books, special collections, basic periodical and other files, and the main book collection render the Central of utmost value to all Institute interests.

Of the several special functions that are part of the Central Library, the most spectacular is without doubt the Music Room. The large, beautifully appointed lounge with seven smaller individual and group listening rooms around its periphery each equipped with specially designed record players is intended for "required listening" in connection with music courses as well as for the general recreational enjoyment of music and the study of foreign languages or transcriptions of poetry, drama or public affairs. The record stocks of standard (78 r.p.m.) and LP (33 $\frac{1}{8}$  long playing) records and the collection of books, scores and other materials have been considerably augmented. Regular programs of recorded music of general interest will be featured during the fall term, 1950. The new Music Room bears no resemblance to the facilities improvised in Walker and its popularity is daily more apparent. Use increased 41 per cent over the past year despite the fact that the new room was only put in use in March. Nearly 3,000 records were loaned to Radio Station WMIT during the year with perfect satisfaction to all concerned.

Among other specialized facilities is the *Dard Hunter Paper Museum* of handmade paper and printing which with its associated library is a pleasant and useful resource. The experimenting and testing area which houses the Center for Scientific Aids to Learning offers facilities and instruction in the microtechniques of documentary reproduction for student and faculty member alike. The Boston Stein Club Map Room

which houses the great Orographical Globe, to be described in another connection, will contain all but the most highly specialized maps in the library. A well equipped projection room seating 50 will be used for planned programs of 16 mm. motion pictures and for other purposes.

Although it is frequently overlooked, one aspect of library work is a most important teaching function. Students are supplied with guides which are in effect textbooks to the entire library, special publications dealing with individual branches or sections are prepared as required; through group tours and lectures by members of the library staff and finally through individual consultation, students are taught the efficient use of time in a library. If well learned, library research techniques may become one of the most useful skills acquired at M. I. T. Students and instructors alike benefit from the several lists of current acquisitions, finding aids, bibliographies, reference services and, on occasion, interlibrary loans.

Publications originated by the library during the year followed the usual pattern and included many of the lists specified above. Others are:

*Brief Guide to Institute Libraries*

*List of Periodical Publications 1948-1949* (Included in *President's Report*, reprinted for exchange.)

Descriptive Leaflet, Charles Hayden Memorial Library

*How to Use the Library* (Reprinted from earlier edition; new, completely revised edition in process.)

*Technology Bookshelf, 1868 to Date* (To accompany an exhibition of books.)

To the foregoing should be added material for the dedication, including the attractive souvenir program prepared by Mr. Ralph T. Walker and financed by the architectural firm of Voorhees, Walker, Foley and Smith, the Friends of the M. I. T. Library, and the library itself; the program for the exhibition "The Painter and the City" designed by Professor Gyorgy Kepes; and an article by John E. Burchard and Vernon D. Tate, "The Charles Hayden Memorial Library — A Brief Preview" published in the *Technology Review* and reprinted for general distribution. It is a matter of regret that the proposed *M. I. T. Library Annual, 1949*, was not completed during

this fiscal year; it is expected to appear early in the fall of 1950.

Learned societies, other institutions, members of the staff, the student body, alumni and individuals not connected with the Institute have generously given books, monographs, pamphlets, periodicals and sometimes complete collections to enrich the library. All of these unfortunately cannot be listed in this report; they have been otherwise acknowledged. Two large collections, the George R. Underwood (M. I. T. '83), and George Abbot Morison gifts brought a well-selected chemistry collection and a large collection of books, reports, monographs and long and complete runs of bound scientific and technical journals. The largest single gift of the year was the Radio Corporation of America—Clark Collection of Radioana, containing between five and six thousand volumes comprising radio patents, correspondence files, photographs, log books, unpublished biographies, scrap books and clippings reflecting the early development of radio.

Last year mention was made of the gift by Mr. Harry H. Young '91 of a six-foot relief globe for the Boston Stein Club Map Room. The great Orographical Globe has now been installed and will be ready for use during the fall term. The horizontal scale is one inch to 114 miles; the vertical, 20 times the horizontal, is one inch to 30,000 feet. At the request of the donor, a "perspex" meridian, the first attempted by the maker for a globe of this size, was successfully completed. The mounting is arranged for continuous or intermittent rotation, one complete revolution each  $2\frac{1}{2}$  minutes. The new globe, the only one of its type in this country, fulfills a need long felt at the Institute for a satisfactory teaching and general reference globe. It is, moreover, exceedingly decorative.

Through the generosity of the Friends of the M. I. T. Library organization, numerous titles, principally in the history of science and engineering, were added during the year. As individuals the Friends have made significant contributions from their personal collections to several growing library interests. With the new library a reality, space is available to implement the broader program planned by the Friends.

On Alumni Day a symposium, "Access to Ideas—Is Reading Obsolete?" was held in the Central Library; over 500 alumni and friends attended. Many other groups found the

Charles Hayden Memorial Library an irresistible attraction. Among these was the Massachusetts School Library Association; in cooperation with the Admissions Office the Association was provided with details about student life and educational facilities that may prove of value to future M. I. T. students. Guests included prominent librarians from many parts of the United States and abroad.

The staff gave excellent and loyal support through a difficult year. Notwithstanding greatly increased M. I. T. demands, several members of the staff found time to participate in local regional, and national professional society meetings and activities including the preparation of papers and articles for publication.

The long anticipated reality, a new library building, has been reached in this mid-century year, but a building can only be a creation of stone, wood and metal albeit a handsome one. The library is inside. As a traveler of old upon arriving at a milestone fixed his eyes on the next distant landmark, the library has new and equally important goals for the year to come.

VERNON D. TATE

#### DIVISION OF INDUSTRIAL COOPERATION

The dollar volume of research in the Division declined, largely due to reduction in government research funds. Comparing 1950 with 1949, there has been little change in the character of the work. Construction for facilities has been substantially completed. Departmental reports give information on the Division work done by the individual departments.

#### *Fiscal Report for the Year Ending June 30, 1950*

<i>Dollar Volume</i>	<i>Fiscal Years</i>	
	<i>1949-1950</i>	<i>1948-1949</i>
General Government . . . . .	\$12,445,000*	\$14,566,000†
Industrial . . . . .	414,000	907,000
<i>Total</i> . . . . .	<u>\$12,859,000</u>	<u>\$15,473,000</u>

\* Includes \$391,000 for new construction

† Includes \$1,746,000 for new construction

<i>Active Projects</i>	<i>Number on July 1, 1949</i>	<i>Additions</i>	<i>Expirations</i>	<i>Number on June 30, 1950</i>
General Government	145	64	34	175
Industrial.....	70	19	27	62
<i>Total.....</i>	215	83	61	237

<i>Personnel</i>	<i>As of June 30, 1950</i>	<i>As of June 30, 1949</i>
D.I.C. Staff.....	500	535
D.I.C. Non-staff.....	900	879
M. I. T. Staff.....	483	469
	1,883	1,883

The Institute has been very fortunate in maintaining relationships with the government on research on the very highest professional plane, with great satisfaction to both parties. A great deal of this success has been due to the teamwork between government accounting and the Division fiscal office, and to the high character of local representatives of the military services.

Total research volume decreased \$2,614,000 chiefly because of a decrease in construction, purchases of materials, and services. However, salaries and wages increased \$129,000 over the fiscal year, 1948-1949.

NATHANIEL McL. SAGE

#### ADVISER TO FOREIGN STUDENTS

In the academic year 1949-1950, the Institute maintained its position of previous years in having the most cosmopolitan student body of any institution of higher learning in the country. There were enrolled at the Institute 445 students who were citizens of 69 foreign countries; of these 241 were undergraduates and 204 graduate students. They represented 8.23 per cent of the total enrollment. The next highest institutions in percentage of foreign students to total enrollment were: Harvard University, 5.72 per cent; Howard University, 5.59 per cent; University of Chicago, 4.22 per cent; and Teachers College, Columbia University, 4.20 per cent.

The Institute's foreign representation came from the following areas: Latin America, 69 students; British Commonwealth and Empire, 123; Northern Europe, 53; Western Europe, 39; Central and Southern Europe, 46; Near East, 23; Far East, 95; Canada, 85. The countries sending the largest delegations were, besides Canada: Norway, 35; China, 32; India, 32; France, 18; England, 17; and Cuba, 16.

For admission in September 1950, 1,490 foreign students made informal application and 600 filed complete applications. These figures compare with 1,981 and 681 for the previous year. The applications filed, however, were of such excellent quality that the number admitted was considerably higher than in the previous year, 208 as against 163 in 1949.

Two programs for foreign students initiated and managed by undergraduate students have made important contributions this past year. The Foreign Student Summer Project, which was begun in 1948, is in its third successful year. FSSP brings each summer to the Institute a group of over 70 young engineers and scientists from countries all over the world for four months of study and research. All expenses are paid, so that financial status will not be an element in the selection, and the student committee assumes all responsibility for raising funds. The Corporation of the Institute has granted for these students a waiver of tuition fees for the summer session. FSSP is on a sound financial basis and is well managed by a devoted and able student committee under the leadership of Herbert W. Eisenberg, a third-year student in Course XV. This project is believed to be unique among student projects in this country in its scope and achievement and has in the past three years greatly enhanced the prestige of M. I. T. abroad.

A student group at the Institute became interested in the plight of the students among the Displaced Persons in Europe. A committee approached President Killian with the proposal that the Institute grant waiver-of-tuition scholarships for one year for up to ten D.P. students if the committee assumed responsibility for all their other expenses. The Corporation agreed. By much hard work raising funds and careful checking of credentials with the Admissions Office, seven D.P.'s were brought over from Europe under the sponsorship of the student committee and were enrolled as Special Students. The experi-

ment has worked well. These men are good prospective American citizens and will, of course, be much more valuable citizens with M. I. T. training. The student committee has decided, with the agreement of the Corporation, to continue the program for another year.

An important development at the Institute during the past two years has been a great increase in interest on the part of both student body and staff in study and research abroad. It has long been recognized that in order to realize the greatest benefits from our academic international exchange, that exchange should be two-way. So far as our staff is concerned this has been true for a long time. Last year the Institute listed 392 civilian faculty members. (These were by no means all of those on the teaching staff, but only those of Faculty rank.) Of these 392, 61 hold at least one degree from a university outside of the United States. This is not nearly a complete measure of the foreign academic contacts of our staff, since many have studied abroad, or taught or carried on research, though they do not hold degrees.

The case has been very different with the Institute's students. American students have long been impelled to complete their studies abroad in such fields as language, music, and the arts, but for the last several decades this country has felt rather self-sufficient in the fields of science and particularly of engineering. There has been good reason for this feeling, but there is real danger that we may suffer from too intense a parochialism. The implementation of the Fulbright Act in 1948 has begun to affect that attitude. This Act authorizes the Department of State to use credits acquired through the sale of surplus property abroad for programs of educational exchange with other nations. Bilateral agreements have been signed with 16 countries, and 648 men and women are going abroad next year on full-maintenance scholarships for study, research, or teaching.

In the first year of the program, 1949-1950, two M. I. T. students were chosen for graduate study, both in England. For 1950-1951, 12 M. I. T. students have won Fulbright awards. Five will study in England, two in France, two in the Netherlands, one each in Belgium, Italy, and New Zealand. In addition to these, several members of the Institute teaching

staff have won Fulbright awards and will be attached to foreign universities next year. Over 50 students made application for the awards. They were given preliminary screening by an Institute selection committee under the cochairmanship of Professor David A. Dudley of the Admissions Office and Professor Paul M. Chalmers, who had previously been appointed Fulbright Program Adviser at the Institute.

Professor Chalmers was for 1949-1950, Second Vice-President of the National Association of Foreign Student Advisers, and for 1950-1951, was elected President.

PAUL M. CHALMERS

#### PLACEMENT OFFICER

Reports on Alumni Placement, which is under the direction of Mrs. James A. Yates, and Student Placement, which is under the direction of Professor Carlton E. Tucker, follow:

*Student Placement.* In the fall of 1949, the best advice that we could get from industry was that the placement of 1950 graduates would be much more difficult than in previous years. For this reason, and because of the large number of students we were handling, it seemed advisable that the Institute appoint an assistant to Professor Tucker who could give substantially full time to the placement problem. Accordingly, Charles O. Jackson, Jr. was appointed in October.

Despite the gloomy fall picture, the actual placement of the class was good, and the increasing placements during the summer have brought us up to a point which is considerably ahead of our best prewar records.

One hundred and seventy-two companies conducted interviews at the Student Placement Bureau for the September 1949, February 1950, and June 1950 groups. Several companies interviewed members of more than one graduating class. Correspondence was received from 388 other companies who wished to hear from qualified students but were unable to send representatives to the Institute.

From September 1949 to June 1950, 76 fewer representatives visited the Institute than during the previous year. As this decrease was expected, students heeded the warnings of



the Placement Lecture Series and spent a great deal of time looking for openings on their own. Because of fewer openings in the Spring, grades played an important part in the offers which were made.

At the time of graduation 63 per cent of the June class was placed. This class was the largest in the history of the Institute. As of September 1, 1950, 83 per cent of the June class are known to have jobs. Placement of all three groups, September 1949, February 1950, and June 1950, stands at 85 per cent.

Grand totals of September 1949, February 1950, and June 1950 groups (as of Graduation Day) are as follows:

*Classes Graduating During 1949-1950*

	<i>Individuals</i>	<i>Reported Placed</i>	<i>Per Cent</i>
Bachelors.....	1,000	561	54
Masters.....	462	334	72
Engineering Degree..... (Two-Year Graduate)	42	40	95
Doctors.....	166	133	80
<b>Total.....</b>	<b>1,670</b>	<b>1,068</b>	<b>64</b>
As of September 1, 1950			
Bachelors.....	1,000	790	79
Masters.....	462	429	93
Engineering Degree.....	42	42	100
Doctors.....	166	162	98
<b>Total.....</b>	<b>1,670</b>	<b>1,423</b>	<b>85</b>

*Alumni Placement.* The relation between number of jobs, available men, and placements is shown in the following table:

	<i>July, 1949-June, 1950</i>	<i>July, 1948-June, 1949</i>
<i>Number of Jobs.....</i>	2,304	2,392
<i>Men Who Went on Available List...</i>	1,065	1,059
<i>Men Who Came Off Available List..</i>	553	609
<i>Placements.....</i>	169	184

The fiscal year 1949-1950 was the first since the end of World War II in which engineers have found it really difficult to relocate. Although the number of positions listed with us fell off by less than 100, at least 300 of these positions eventually

found their way to the Student Placement Office because companies decided that they would not pay for a man with experience. The number of jobs was increased by the fact that company management took to heart government statistics published last spring indicating an oversupply of engineers. On the basis of these statistics there was once more a great deal of 'shopping' for manpower. An unusual number of companies, when confronted with the necessity for making a promotion, listed the opening with this office and with the employment agencies, to check their in-plant candidate against the field. Nine times out of ten, of course, they concluded their search by promoting the man who was next in line in their own organization.

When a vacancy existed in a company for which the organization had no logical candidate, companies insisted upon looking over a great many men before reaching a decision. One company in eastern Massachusetts considered 104 men before hiring a plant engineer at \$375 a month. They eventually decided on an M. I. T. graduate who had been the second man interviewed.

On the whole, the younger engineers had a great deal more difficulty in obtaining new positions during the first six months of this fiscal year than older men with exceptional experience. Our records show that we found ten chief engineers for large companies during the past year, almost an equal number of sales managers, and two vice presidents. Opportunities for assistant chief engineers, plant managers, and so forth, were fairly numerous, and we could have placed many more had we had on our available list enough people who were suitably trained for the openings.

Because the general experience of the men listed with us during this past year did not, in a great many instances, meet the requirements of the excellent positions which we heard about, we spent a considerable amount of time and effort making up a list of outstanding graduates in various fields. The original list made in this office from such information as we had available, was broken into department lists, and then the department lists were checked by department heads and professors in order that they might add to the list or subtract

from it. It is our hope to be able to keep this record up to date. It has already proved its value.

As this report is written, we are beginning to feel the effect of war in Korea. Once more, companies are looking for young men, and they are especially interested in electronics engineers and physicists. The demand for chemical engineers, which fell off seriously during the 1949-1950 fiscal year, is increasing rapidly. Companies are showing marked anxiety over the fact that so many of their young executives are Reserve Officers, a difficulty which they did not have to consider back in 1941 and 1942.

NATHANIEL McL. SAGE

#### INDUSTRIAL LIAISON OFFICER

As of the end of the fiscal year, 29 companies had given, or had expressed the intent to give, a minimum total of \$4,555,000, each over a period not exceeding five years. While the level of income is one yardstick, it is not the most important. M. I. T. since its founding has had an illustrious history of associations with industry. In those areas where such associations have been the closest, our own departments have become the strongest; the resultant cross-fertilization has brought to our engineering faculty new strength and vitality. Through the liaison program M. I. T. will be able to render an important contribution in many areas of industrial endeavor and at the same time stimulate the professional programs at the Institute.

The initiative and enthusiasm requisite to ultimate success of the Liaison Program must perforce come from the faculty. The role of the Liaison Office is simply to construct the circumstances of environment most conducive to such development. This is accomplished through the provision of a central office where the companies may seek specific help requiring detailed knowledge of the Institute's resources, and where faculty and industrial representatives can be brought together systematically in all areas of common interest. The informal symposium for faculty and industrial research personnel provides an especially effective medium in which to discuss progress and prospects in their technical specialties.

Two significant steps have been taken since early 1949 to promote closer relations between faculty and participating companies. The office has had the privilege of working with the departments and interdepartmental laboratories through specifically designated faculty members who have been asked to assist in the Industrial Liaison Program. This has greatly facilitated not only the dissemination of information about the Program, but also has provided an opportunity for them to become informed about current research activities. This kind of cooperation will be further encouraged.

The second important step, taken last fall, was the appointment by the faculty of a standing committee under the chairmanship of Professor A. G. Hill to serve in this connection. This committee has taken as its objectives to consider the long range effects of the Industrial Liaison Program on the operation and character of the Institute, to advise the administration on the program, to aid in planning liaison activities, and to insure that both collectively and individually the time and energy of the faculty are not being overtaxed or improperly diverted. Continuing collaboration between the Liaison Office and the faculty committee will prove to be an important element in the implementation of the program as a whole.

A major augmentation of staff took place during the year. Dr. Rowland S. Bevans and William R. Weems were appointed Technical Industrial Liaison Officers. Also, Professor Emeritus W. K. Lewis of the Department of Chemical Engineering accepted an appointment as Consultant.

Following is a list of the companies within the Industrial Liaison Program at the close of the fiscal year:

Aluminum Company of America; Atlantic Refining Company; Godfrey L. Cabot, Incorporated; Campbell Soup Company; Cities Service Research & Development Company; Continental Oil Company; Draper Corporation; Goodyear Tire & Rubber Company, Incorporated; Humble Oil and Refining Company; International Telephone and Telegraph Corporation; Liquid Carbonic Corporation; National Dairy Products Corporation; Phelps Dodge Corporation; Saco-Lowell Shops; A. O. Smith Corporation; Socony-Vacuum Oil Company, Incorporated; Sperry Gyroscope Company; Standard Oil Company of California; Standard Oil Company (Indiana); Standard

Oil Company, New Jersey; Stone & Webster Engineering Corporation; Sylvania Electric Products, Incorporated; Texas Company; Union Oil Company of California; United Fruit Company; and U. S. Steel Corporation.

ROBERT V. BARTZ

#### PERSONNEL OFFICER

During the past year there were few changes in personnel policy; it was a year of living with the changes made during the preceding years and of becoming adjusted to them. There were no changes in the wage structure. The only important change in policy was a supplemental pension plan for the employees who were here prior to inauguration of the current annuity contract with the John Hancock Life Insurance Company. This provided additional benefits based on the length of service and the average wages over a ten-year period.

During the year there were a number of layoffs among laboratory employees in different departments, and some progress was made in working out a procedure for transferring employees from one department to another. It was not necessary to displace employees with short service. This was mainly due to the fact that layoffs were not very extensive. It is realized that a major reduction in research funds will cause many serious seniority problems.

Again we had a year of good relations with the three unions, the Building Service Employees' International Union (A. F. of L.), the M. I. T. Employees' Union (Independent), and Cooks and Pastry Cooks Association (A. F. of L.). All grievances were quickly settled in the first stage; in fact, none were handled in a formal fashion. There were a number of problems, however, which were worked out by discussion between union representatives and the Institute.

The employment functions of the Personnel Office have been implemented by an increase in space which provides two offices for interviewing instead of one. This makes it possible for Miss I. L. Tapley to concentrate on the hiring of office employees, Mrs. S. Chernick to assist in the hiring and transferring of laboratory employees, and Miss P. Knight to assist in the employment of the maintenance force. In addition, it

has provided room for typing tests, and by dividing the work up it has made it possible for us to do a more thorough job of checking references and recruiting employees.

The Personnel Office has been operating on the premise that the people responsible for the administration of the research, teaching, and administrative functions must establish the policies which the Personnel Office endeavors to carry out. To this end, a new committee is being established this year and there has been some change in the composition of the current boards and committees. Below are the current and proposed committees on personnel policies.

The Personnel Board is the central policy body. It is headed by the Treasurer and includes the Executive Assistant to the President, the Bursar, the Assistant to the Director of D.I.C., a Professor from the Industrial Relations Section of the Economics Department and the Personnel Officer.

The Classification Committee is the advisory committee on laboratory policies. It is composed of the heads and executive officers of most of the large academic departments and research projects. It drew up the current wage and classification policy and it reviews recommendations for changes in rates and classifications. In addition, it considers numerous other personnel policies, such as sick leave, transfers, seniority, and work schedules. This year its membership was expanded to include more projects.

A new advisory committee is being established for policies concerning office employees. It will be composed of six or seven staff members from academic departments, administrative offices, and D.I.C. projects.

The committees which negotiate the various union contracts are made up of officers and faculty members responsible for the work done by the union employees. For example, Professor A. G. Hill, Director of the Research Laboratory of Electronics, and Mr. A. F. Sise, Executive Officer of the Servomechanisms Laboratory, and the Personnel Officer, compose the Institute's negotiating committee for the laboratory group. When negotiating with the Union representing the maintenance employees, the Institute's committee includes: Mr. C. M. F. Peterson, Superintendent of Buildings and Power, Mr. P. A. Stoddard, Assistant to the Superintendent of Buildings and

Power, Mr. F. M. Baldwin, Director of Dining and Housing Facilities, Mr. H. K. Dow, Manager of the Graduate House. The committee which negotiates with the Cooks and Pastry Cooks Association includes Mr. F. M. Baldwin, Mr. H. K. Dow, and Mr. A. W. Bridges, Manager of Walker Dining Service.

The following statistics show the number of employees as of June 30, 1950, and the annual turnover rates:

	<i>Office</i>	<i>Laboratory</i>	<i>Building and Power</i>	<i>Dining Service</i>	<i>Dormitory Operations</i>	<i>Totals</i>
Number of Employees	673	785	273	84	85	1,900
Annual Turnover	35%	12%	19%	45%	13%	23%

These figures include only regular employees; part time, temporary, and student employees are excluded.

R. COLIN MACLAURIN

MEDICAL DIRECTOR

Medicine may be construed as a technical specialty which comes into action only when the individual has suffered some illness or injury, or it may be thought of as a broad province of knowledge whose diffusion into the thinking and actions of individuals will increase their ability to live full and satisfying lives. The Medical Department subscribes to this latter broad view of the function of medicine, and its work is a reflection of it. Thus the physician does not think of health as the absence of diagnosable disease, but a positive quality possessed by an individual which enables him to live with a minimum of pain, anxiety and frustration.

For several years in succession the Institute has been fortunate in having no acute epidemic illnesses to contend with. As a result the Medical Department has been able to devote a progressively larger share of its time each year to preventive measures. It is of interest that as the number of consultations and laboratory procedures has increased, the number of patient-days in the Infirmary has decreased. Whether these two trends are cause and effect phenomena is difficult to prove. The total number of calls for all purposes for the last four years, together with patient-days in the Infirmary, is as follows:

## ADMINISTRATIVE OFFICERS

	<i>Total Clinic Visits</i>	<i>Patient-Days in Infirmary</i>
1946-1947.....	43,488	3,517
1947-1948.....	43,572	3,792
1948-1949.....	46,341	3,406
1949-1950.....	47,718	3,143

It is probable that a part of the decrease of patient-days in the Infirmary is attributable to a fairly liberal use of antibiotics, particularly penicillin, in the out-patient clinics. A part is due to the general improvement of the health of the country.

The number of visits to the different services were as follows:

Surgical.....	10,228
Medicine.....	9,554
Psychiatry and Neurology.....	2,421
Otolaryngology.....	907
Ophthalmology.....	1,201
Dermatology.....	1,153
Dental.....	2,677
Emergency Clinic.....	4,502
Physical Examinations.....	3,130
Occupational Medicine.....	684
Radiology.....	11,261
Total.....	47,718

The Clinical Pathology Service had almost the same amount of work as last year, namely 10,810 procedures. Of these 728 were blood counts done as a part of the Occupational Medicine program. There were 370 laboratory tests of considerable complexity this year as compared to 381 the year before.

In the Infirmary the total number of patient-days was 3,143. Of this number 63 per cent were taken up by students, the remainder by staff and employees. Of the total number of individual admissions to the Infirmary, namely 695, 74 per cent were students. The average length of stay for each student was three and one-half days, and if we take out of this average about half a dozen students who had prolonged illnesses, the average stay for the remainder is only slightly more than two days. Thus there is little validity to the often repeated



criticism that students are detained longer in the Infirmary than is necessary.

The contagious disease incidence hit an all-time low with only two cases of mumps and one of chicken-pox being reported. Immunization of all entering students against tetanus by means of tetanus toxoid is now a requirement for admission to the Institute. This should result in the practical elimination of tetanus as a disease threat and should save much discomfort from serum sickness in those who formerly had to take tetanus antitoxin following penetrating wounds.

The Student Health Insurance Plan has now been in effect for two years. During the first year 45 per cent elected to take insurance, 55 per cent the second. In general the plan has worked satisfactorily, although in several instances the cost of an injury to a student ran far above the upper limit of \$500. As a result of these and other considerations the plan was modified to make the upper limit of coverage \$1,000 and to include practically all students except those who sign a waiver a week before school opens.

During the past year the Department was entirely redecorated on the first floor, and new furniture and a new record file room were added. The latter has added to the efficiency of the office staff by relieving office congestion.

Due to the generosity of the Charles Hayden Foundation and through the interest and courtesy of Mr. J. Willard Hayden, a member of the Medical Department Visiting Committee, a new X-ray table has been added to the equipment of the X-ray department. This, added to the chest survey equipment which was purchased two years ago by the Hayden Foundation, gives this department the highest possible quality of apparatus for the conduct of an effective diagnostic radiological service.

The Occupational Medical Service during 1949 and 1950 has completed its staff with the appointment of Miss Janet Walkley as Industrial Hygiene Chemist and Mr. F. J. Viles, Jr., as Industrial Hygiene Engineer. A technically skilled man has been engaged to repair and construct equipment for the radiation protection activities.

As previously pointed out, the plans for the Occupational Medical Service include teaching in appropriate departments as well as direct service for prevention and treatment of occu-

pational illness. During the past academic year the point of view of occupational medicine was presented to the academic council. Several invitations were extended to the Occupational Medical Service to give teaching seminars on a trial basis. This was done in Inorganic Chemistry and Metallurgy during the spring term. The Industrial Hygiene Chemist, the Industrial Hygiene Engineer and the Physician presented their respective activities and gave examples of actual field work done in the Institute. It is planned, as the Occupational Medical Service gains time from straight service work, to offer informal teaching to any department that might be interested in general or specific content.

During the past year 185 physical examinations were done on persons who were potentially exposed to harmful substances and 361 field trips were made by members of the staff. These activities were in addition to the usual routine functions of protective supervision.

During the past year weekly meetings have been held of the staff of the Psychiatric Service, Dean's Office, and representatives of other departments interested in problems affecting student morale and mental health. At these meetings individual cases are not discussed because of the necessity of protecting the privacy of patients, but general sources of strain and dissatisfaction among students have been frequently discussed at great length to the benefit of all those who attended.

A psychologist, Dr. John V. Gilmore, has been added to the staff of the Dean's Office for work with problems of study habits, reading disabilities, career choice, and other orientation difficulties confronting students. The close cooperation between the two departments has thus been made tangible since Dr. Gilmore works in a close relationship with the psychiatric service to the great advantage of many students.

As a result of the addition of a full-time psychiatrist to the staff, the Psychiatric Clinic increased in efficiency and showed a considerable increase in the number of patients seen. The total number of persons seen during the year was 308, 229 of whom were students. The total number of interviews was 2,421. In addition the Psychological Service, which is a part of the Dean's Office but which works in close collaboration

with the Psychiatric Service, interviewed a total number of 41 students.

DANA L. FARNSWORTH, M.D.

#### EXECUTIVE VICE PRESIDENT OF THE ALUMNI ASSOCIATION

Since its organization by a group of 23 graduates who met on March 17, 1875, in the old Rogers Building on Boylston Street, Boston, the membership rolls of the Alumni Association have grown to a present total of 43,011 names. Upon the occasion of its Seventy-fifth Anniversary, however, the Association of 1950 continues mindful of the fundamental purpose which prompted its establishment — a purpose preserved in the language of Article I of today's Constitution as follows:

“Its object shall be to further the well-being of the Institute by fostering the interest of the Alumni in the Institute and in each other.”

Sustaining evidence of this is to be found particularly in the keen interest displayed by alumni everywhere in the remarkable progress of the Institute's Committee on Financing Development towards its \$20,000,000 goal. Of the 716 individuals on that Committee's roster, 677 are alumni; and one may estimate conservatively that there are six times as many more alumni participating actively as members of the Development Program's numerous local subcommittees in presenting these merits face-to-face to other alumni. Such a cross-fertilization of acquaintanceships among our alumni on any such scale is unprecedented. From the viewpoint of the Association the far-reaching consequences of these contacts, wholly aside from the Development Program's current enrichment of the Institute's resources, will come to be appreciated more and more as time goes on.

To coordinate all current fund-raising efforts with the plans of the Development Program, no separate solicitation of the Alumni Fund will be conducted during 1950-1951. It seems appropriate, therefore, to summarize here the initial ten-year accomplishment of the Alumni Fund, which was started in 1940 on the assumption that the alumni at large would welcome an automatic opportunity to contribute nominal sums annually toward Institute purposes.

At that time it was hoped, of course, that the Institute would continue to receive larger gifts from alumni with increasing frequency; but it was recognized that many of these larger gifts would go directly to the Institute's treasury and not be noted to swell the statistics of receipts via the Alumni Fund. Hence, the primary mission of the Alumni Fund was to seek many-modest-gifts-from-many rather than to concentrate on larger-gifts-from-a-few.

The sagacity of those who established the Alumni Fund in 1940 is now attested amply by the fact that during its first decade contributions totaled \$1,387,251. Moreover, as further evidence of the interest of the alumni in the "well-being of the Institute" between the summers of 1940 and 1949, contributions *by and on behalf of alumni* other than those made directly through the Alumni Fund totaled \$4,936,075. Alumni gifts to M. I. T. during the 1940's thus averaged over \$630,000 annually.

HAROLD E. LOBDELL

# SCHOOL OF ENGINEERING

## AERONAUTICAL ENGINEERING

*Enrollment.* The decline in undergraduate enrollment which followed decreasing employment in the aircraft industry appears to have about stopped. Employment opportunities for Bachelor of Science graduates in Aeronautical Engineering were sharply curtailed in favor of graduate students with advanced training when the industry turned from production of standard types to development of new types of airplanes and missiles. Freshmen and, presumably, their parents were influenced by news of economy moves in Washington to cut back Naval Aviation and the Air Force.

At the same time, demand from the industry and from government laboratories has been greatly in excess of the supply of graduate students equipped to deal with supersonic aerodynamics, structural dynamics, automatic controls and jet propulsion. Pressure for admission to the Graduate School continues, and well-qualified applicants exceeded the quota again this year. Many graduate students, before undertaking certain advanced studies, must remove undergraduate deficiencies. The fact that the undergraduate quota was not filled allowed these graduate students to be absorbed in the regular undergraduate sections.

The Department will recommend next year that the graduate quota be raised and the undergraduate quota be lowered to reflect this situation.

Sophomore enrollment has shown the following trend:

<i>Year</i>	<i>Sophomores</i>	
1946-1947.....	83	(quota 60)
1947-1948.....	53	(quota 60)
1948-1949.....	52	(quota 60)
1949-1950.....	44	(quota 60)
1950-1951 (estimated)	41	(quota 60)

In March, the Department held open house as usual for interested freshmen with the assistance of enthusiastic members of the student chapter of the Institute of the Aeronautical

Sciences. The program was not very well attended, a fact which confirms the view expressed before that enrollment really reflects the current employment situation in the aircraft industry.

*Placement.* In July, 31 of the 43 graduates of the class of 1950 were suitably placed. Since that time, calls from several aircraft companies have been received for many more than the remaining 12. Before their graduation, each of our 30 post-graduates had several offers and all were promptly placed.

*Cooperative Course.* The first year of this special program has been completed. Students who elect the Cooperative Course spend six months as junior engineers in the field and make up the academic time lost by attendance at summer school in order to be in step with their classmates at the beginning of the senior year. Reports both from the students and their employers were very favorable. Nineteen out of a class of 50 juniors elected the course last year. For the coming year, 24 students out of a class of 43 have elected the Cooperative Course.

The cooperating employers are:

Chance Vought Aircraft Division, Dallas, Texas.

National Advisory Committee for Aeronautics:

Langley Aeronautical Laboratory, Langley Field,  
Virginia.

Ames Aeronautical Laboratory, Moffett Field,  
California.

Lewis Flight Propulsion Laboratory, Cleveland, Ohio.

United Aircraft Corporation, Hartford, Connecticut.

*Honors Course.* Students selected for the Honors Course follow a five-year program for the Bachelor's and Master's degrees awarded simultaneously. Under the supervision of Professor C. Stark Draper, they have considerable latitude in making substitutions for regularly prescribed senior subjects. This year the group of 14 students has cooperated voluntarily in holding a monthly dinner meeting for the discussion of professional topics. As students of superior aptitude, their placement on graduation is no problem. An informal check of former Honors Course graduates shows them to be making good progress.

*Graduate Students.* This was the first year in which the Department offered the two-year program for the professional degree of Aeronautical Engineer. Five students chose this program and one received the degree in June. Six men followed the special interdepartmental plan for the Doctor of Science degree in Instrumentation. Three completed the requirements in June. The Doctor of Science degree in Aeronautical Engineering was awarded to three men in June, leaving six further candidates continuing their studies.

Statistics on Master's degrees are in the Registrar's report. There is a demand for a Master's degree in Instrumentation and the Department recommends that this be authorized.

The Navy and Air Force continue to send officers for graduate training. During the past academic year there were eight from the Navy for fire control and five for power plants, one Marine officer for fire control, eight from the Air Force for fire control and two for advanced aeronautical engineering. One civilian engineer was granted leave by the National Advisory Committee for Aeronautics to follow a special program of graduate study. Some 18 members of the research staff of sponsored projects took one or more graduate subjects as special students. There appears to be a desire on the part of the junior research workers to take advantage of the opportunity to continue formal study.

*Visiting Committee of the Corporation.* The Committee met in March to examine the programs and facilities of the Department and approved the proposal to provide a transonic blow-down nozzle for the Wright Brothers Wind Tunnel, the Honors and Cooperative courses of instruction, and the graduate curriculum for the professional degree of Aeronautical Engineer. With regard to classified research, the Committee reported: "The Institute is performing an important and unusual service to the nation by research in certain fields. When the progress of such research can be accelerated, or when necessary confirmation of theory is required for practical evaluation and future orientation, the development of suitable 'hardware' becomes in effect a phase of research."

The Committee directed attention to the opportunities for engineering graduates in solving the problems involved in airways and airports, and recommended consideration of the best

way to utilize the Institute's special facilities and faculty. In response to this suggestion, a three-day "Conference on Ground Facilities for Air Transportation" has been arranged under the leadership of the Department of Civil Engineering for September 1950, with the sponsorship of the Civil Aeronautics Authority, Massachusetts Aeronautics Commission, and the Port of New York Authority. Participation is expected from leading operators of air lines and airports, as well as from architects, city planners and engineers. It is hoped to obtain guidance as to a possible interdepartmental program of graduate study in preparation for work in this new field of technical service to the community.

*Design.* The Department has continued to emphasize aircraft design as the student's opportunity to apply his scientific and engineering studies and to test his professional competence. Junior engineers are usually employed on details of design, however, and may serve many years in industry before general design is entrusted to them. While the safety and operational success of an aircraft depend very largely on the quality of detail design, such design practice is usually omitted in engineering schools. Substantial progress in improving this phase of instruction is believed to have resulted from our recent change of the second-year machine design course to deal with detail design of airplane parts and fastenings.

Research by Professor Rene H. Miller on a problem of helicopter design has been supported by the National Advisory Committee for Aeronautics. An allocation from the Carnegie Fund has permitted thesis research on helicopter vibration and stability by means of wind tunnel models.

Professor Otto C. Koppen, who has general charge of all design subjects, is engaged in applying the principles of his teaching to the development of a commercial airplane incorporating novel design features and corresponding unconventional performance. This is a private venture, but of great interest to his students.

*Instrumentation.* This division of the Department has continued under the general direction of Professor C. Stark Draper, supported by Professor Walter McKay for unclassified research and by Dr. Walter Wrigley for classified research. All unclassified work is handled in Building 33, while classified



work, both teaching and research, is confined to guarded premises in the Hood and Whittemore buildings, at Fort Heath and at Bedford Airport.

Professor McKay has extended his basic instrumentation course to two terms to encompass a unified treatment of dynamic performance problems in several fields. Professor Robert C. Seamans, Jr. has extended his subject on automatic control of airplanes to include high performance types. Professor James E. Forbes has added to his laboratory equipment for instruction in vibration measurement and analysis.

During the year Professor William R. Weems transferred to the Industrial Liaison Office and Professor Draper took over, on a temporary basis, his teaching of vector kinematics and the theory of gyroscopic instruments. Professor Sidney Lees was appointed as replacement for Professor Weems. Professor Dominic Amara has been in charge of classified fire control teaching of student-officers, both in lectures and in laboratory work.

About 70 graduate students, registered for degrees in several Departments, were enrolled in instrumentation subjects. Twelve Master's and three Doctor's theses were completed in this division.

Research Associates Yao-Tzu Li and Yuan-Chiu Loh continued their research on automatic engine controls and, with the cooperation of the Sloan Automotive Laboratory, made tests of an engine equipped with an optimizing control system. A paper reporting this work is in preparation. A new indicated mean effective pressure meter utilizing the Li pressure indicator was also developed and is being reported. A low-pressure range unit of the Li device designed for gas turbine work is under test.

Eight classified research projects for the Air Force and Navy in the field of automatic navigation or fire control are currently in progress in the Division. Research has progressed to the point where production on four major items of equipment is being arranged. This work is based on the application of new gyroscopic devices in the organization of complete systems.

During the past year an additional 5,000 square feet has been occupied in the Hood Building. The Flight Facility at Bedford is being expanded to provide more test and assembly space, part of which will be for Project Meteor. In addition

to the B-26 and B-29 aircraft already at Bedford, a jet airplane is scheduled to be delivered in the near future for the installation of an automatic flight control system developed by this Division. The Instrumentation Laboratory was equipped with an electric analogue computer for instruction, thesis research and general use.

The Instrumentation Division is served by six faculty members of the Department, two research associates, one instructor, and four research assistants. The research staff includes 100 Division of Industrial Cooperation staff members and 175 nonstaff members, plus 45 engineers and draftsmen detailed from the firm of Jackson and Moreland in accordance with a current contract.

The classified research of the past year has been reported to, and distributed by, the sponsoring agencies in 50 documents. The theory of an important aspect of aircraft dynamic performance was published by Professor Robert C. Seamans, Jr. and Doctors Benjamin P. Blasingame and Gerhardt C. Clementson in a professional paper.

*Structures.* During the year, no curriculum changes were made beyond the usual revisions of course content to reflect research results and advances in the art. However, a rather extensive redistribution of teaching and research assignments was made as a result of the departure at the end of the first term of Professor Manfred Rauscher, to accept the chair of Professor of Aeronautics at the Federal Technical University, Zurich, Switzerland. Such recognition of a colleague is an honor to the Department but his loss is serious. Professor Rauscher's teaching of aeromechanics and supervision of research in aeroelasticity and flutter was taken on by his colleagues with the addition of junior staff members.

Teaching of subjects in aeronautical mechanics will be facilitated by the publication of a comprehensive textbook prepared by the staff and now ready for the printer. A new senior elective has been developed by Professor Holt Ashley to be offered in the fall. It is designed to prepare for advanced subjects in aerodynamics and instrumentation and will introduce open- and closed-loop linear systems and the theory of compressible fluid.

The special laboratory for structures and aeroelasticity has

been supervised by Professor Raymond L. Bisplinghoff, with Mr. Lawrence E. Beckley as manager. The sum of the allowed expenditures on sponsored research contracts was about \$790,000. Some 12 research projects were supported by the Naval Bureau of Aeronautics, Office of Naval Research, Air Forces, and the National Advisory Committee for Aeronautics. Research services were rendered by this laboratory to the Instrument Laboratory's own projects and to Project Meteor.

Graduate students employed part-time on sponsored research completed seven Master's theses. Two Doctor's theses were in progress. Twelve other students did their theses research in the laboratory. Classified research results were reported to the sponsors in eight reports. Unclassified studies were published in nine professional papers.

*Wright Brothers Wind Tunnel.* This tunnel was placed in operation in 1938 and was at that time of an advanced and, in some respects, unique design. It has been continuously engaged in the aerodynamic analysis for industry of models of their new designs or modifications. During the war, the tunnel was in great demand and two-shift operation was required. Since the war, industrial demand has slackened due, first, to reduced activity of the industry and, second, to the provision of similar wind tunnels of their own by the larger airplane firms. Furthermore, recent emphasis on transonic and supersonic problems requires a testing speed beyond the present capacity of the Wright Brothers Wind Tunnel.

During the past year the tunnel was occupied about half of the time for five industrial clients. At this rate of utilization, revenue from fees covered operating and maintenance expenses.

Anticipating further obsolescence and reduction in demand, the staff, under the direction of Professors Shatswell Ober and Joseph Bicknell, took advantage of their free time to explore two possible ways to modernize the tunnel and its equipment.

The first is to develop equipment to predict the dynamic characteristics of an airplane design in addition to its static or fixed attitude parameters. This has been attempted before without success, but now seems feasible with a model support giving five degrees of freedom.

The second possibility for modernizing the tunnel involves use of the main shell as a pressure vessel or storage tank whose

content can be blown down through a nozzle to create a range of test velocities through the velocity of sound. Such a transonic nozzle would operate for only a short period but long enough to permit aerodynamic pressure and force measurements on a model. The storage tank could be pumped up again in an hour for another run. It is believed that operating costs will be so low that the tunnel can be made available for student instruction when not required for clients.

Funds accumulated in the wind tunnel depreciation account will be used to provide the two features of modernization described.

*Naval Supersonic Laboratory.* Dedication exercises and a demonstration of supersonic air flow at twice the velocity of sound took place December 1, 1949. Speakers at the ceremony were President James R. Killian, Jr.; Rear Admiral Albert G. Noble, Chief of the Bureau of Ordnance; Dr. Hugh L. Dryden, Director of Research of the National Advisory Committee for Aeronautics; Dr. Edwin G. Schneider, Director of Project Meteor, which this laboratory was designed to serve; and Professors Jerome C. Hunsaker and John R. Markham.

During the past year, all machinery has been installed, the six-component force-measuring balance has been adjusted and calibrated, and aerodynamic pressure and optical instrumentation have been put in precise working order. Two supersonic nozzles for Mach numbers 1.75 and 2.00 have been calibrated, and a third for Mach 2.5 designed. A satisfactory electrical power supply contract was negotiated which imposes only slight restrictions to avoid peak loads.

Professor Markham is in charge of the laboratory and its staff of 45.

*Gas Turbine Laboratory.* This laboratory, staffed jointly with the Department of Mechanical Engineering, is administered by the latter Department which will report on it. Professor Edward S. Taylor of this Department has continued as Director. Several graduate students in Aeronautical Engineering have conducted thesis research in the Gas Turbine Laboratory and two aeronautical research projects are located there. The first is Professor H. Guyford Stever's Air Force sponsored project to construct and experiment with a "shock tube" to study the behavior and effects of shock waves travers-

ing still air. The second, also supervised by Professor Stever, is the construction of a small hypersonic wind tunnel, sponsored by the National Advisory Committee for Aeronautics, for the study of the condensation of oxygen in the air at very low pressure and temperature. A velocity seven times that of sound has been reached.

*Project Meteor.* The Department assumed a greater share of responsibility for this project at the end of the past year with the appointment of Professor Seamans as Chief Engineer and the detail of Professor Joseph Bicknell to take charge of aerodynamic and structural design. A team of development engineers was transferred with Professor Seamans from the Instrumentation Division so that the engineering group working with Professors Seamans and Bicknell comprised some 30 people located in the Naval Supersonic Laboratory.

*Conference on Fatigue and Fracture of Metals.* In view of the lack of knowledge pertaining to the effects of repeated loading and of a consequent inability of engineers to predict the service life of their designs, a "Conference on the Fatigue and Fracture of Metals" was held June 19 to 22, 1950 under the auspices of the Departments of Aeronautical Engineering, Naval Architecture and Marine Engineering, Metallurgy, Physics, and Mechanical Engineering, and with the sponsorship of some twelve professional societies. Participation was limited to invited experts in various aspects of the field. On the last day the conference was divided into five panels, each charged with reporting "a critical comparison of working concepts in different fields of engineering with recommendations for research."

The conference had a distinguished membership and, perhaps for the first time, brought together engineers and research workers in the fields of airplanes, ships, motor vehicles, railways, and machinery generally, with metallurgists and physicists. The proceedings will be published by the Technology Press.

This Department, in cooperation with the Departments of Mechanical Engineering and Metallurgy, is conducting a research supported by the National Advisory Committee for Aeronautics on the fundamental nature of fatigue damage to certain aluminum and steel alloys used in airplane construction.

*Outside Activity.* Members of the staff have been encouraged to make their professional skills available to the government, professional societies and to industry. Among the more important government services are the following:

Professor Holt Ashley: Air Forces, Reserve Weather Detachment, Bedford Airport.

Professor Raymond L. Bisplinghoff: National Advisory Committee for Aeronautics, Committees on Vibration and Flutter and on Aircraft Construction.

Professor C. Stark Draper: Air Forces, Science Advisory Board; Department of Defense, Ordnance Committee of the Research and Development Board; consultant to Air Forces and to Department of Justice.

Professor Walter H. Gale: National Advisory Committee for Aeronautics, Committee on Aircraft Structures; Navy Department, Air Reserve Advisory Council.

Professor Jerome C. Hunsaker: Chairman, National Advisory Committee for Aeronautics; Naval Ordnance Laboratory, Advisory Board; Smithsonian Institution, Board of Regents.

Professor Rene H. Miller: National Advisory Committee for Aeronautics, Committee on Helicopters.

Professor Shatswell Ober: Department of Defense, Piloted Aircraft Panel, Research and Development Board.

Professor H. Guyford Stever: Air Forces, Science Advisory Board and Defense Systems Engineering Committee; Atomic Energy Commission, consultant to Los Alamos Scientific Laboratory.

JEROME C. HUNSAKER

#### BUILDING ENGINEERING AND CONSTRUCTION

A committee has been appointed to study the possibilities of closer liaison between the Department of Architecture and this department. During the year another committee of the staff has been reviewing the curriculum to determine what changes could be made to allow for more courses in the Humanities and still maintain the vigor of the professional courses which have been very effective during the past. It is expected

that joint problems may be arranged to provide material for this cooperative educational effort.

Five members of the staff completed their work and were awarded their advanced degrees. Walter J. Gailus, Research Associate, and Steven Yurenka, Research Assistant, were awarded their Sc.D. degrees in the Department of Mechanical Engineering; Earl E. Patterson, Research Assistant, was awarded his Sc.D. in the Department of Chemical Engineering; Ray W. Shade, Research Assistant, was awarded his S.M. degree in the Department of Chemical Engineering, and will continue his studies for the doctorate in the same department; Robert G. Cheatham, Research Assistant, was awarded his S.M. degree in this department, and will continue his studies for the doctorate.

Three members of the staff have continued their studies leading to advanced degrees—Professor Howard Simpson for the doctorate; Thomas A. Hood, Instructor, for the professional degree; Herman C. Fischer, Research Associate, for the master's degree.

*Grants-in-Aid.* Research work under the sponsorship of the National Lime Association, Plastics Materials Manufacturers' Association, and Revere Copper and Brass Incorporated has continued with substantial grants-in-aid.

The National Lime Association program under the direction of Professor James A. Murray with the assistance of Herman C. Fischer, Research Associate, and Ray W. Shade, Research Assistant, has completed the calcination studies of pure calcite. Thermal analyses of representative commercial limestones and the classification of limestones on the basis of their thermal analysis were also completed. Studies of the chemical changes which occur during the aging of finish coat plasters are still underway and will be continued during the coming year. Calcination studies of commercial limestones will be conducted in a manner similar to the procedure followed with pure calcite.

The Plastics Materials Manufacturers' Association program, under the direction of Professor Albert G. H. Dietz, and with the assistance of Walter J. Gailus, Research Associate, and Steven Yurenka and Robert G. Cheatham, Research

Assistants, has continued with a study of the fundamental mechanical behavior of polymethyl methacrylate as affected by molecular structure, time, and temperature. A program of research was also undertaken to determine the effect of orientation of molecules by elongation upon the mechanical properties of polystyrene, as a function of time and temperature. A start was also made upon a program to see if some method could be formed to measure the modulus of elasticity (complex, true, or imaginary) of thermosetting plastics as they undergo cure under heat and pressure.

The Revere Copper and Brass Incorporated program under the direction of Professor Walter C. Voss, and assisted by Albert J. O'Neill, Dr. James A. Polychrone, and Thomas A. Hood, has resulted in the completion of the studies of the behavior of deformed sheet metal shapes of aluminum, Monel metal, stainless steel and galvanized iron. These tests and studies have again substantiated the theoretical approach previously made with copper and have greatly clarified many problems previously matters of serious controversy. The work of the coming year will involve a study of the heat capacitance and transfer characteristics of various sheet metals and the relation of these properties to the previously developed structural theories. A study of the stress-strain relations which exist when metal tubing or pipe is used in radiantly heated concrete slabs will also be started.

*Division of Industrial Cooperation Projects.* Two projects are being carried on under the direction of Professor Dietz. These are sponsored by Army Ordnance. The first of these is on adhesives, wherein the nonbiological factors causing deterioration of adhesives is being studied. The previously developed ultrasonic vibrational method of measuring changes in complex modulus of elasticity as affected by deterioration of metal to metal bonds has been applied to this study. The second is for the purpose of determining the mechanical behavior of solid rocket propellants under high velocity loading.

*Solar Energy.* The small solar house, operated under the direction of a four-man committee drawn from Architecture, Chemical Engineering, Mechanical Engineering, and this department, has been operated for another year and detailed



records of its performance are giving more conclusive evidence on the efficacy of using solar energy in this area.

*Conferences.* The Department carried on a well-planned series of Construction Lectures during the year. This work was planned and administered by Professor Howard R. Staley. The talks were all given by well-known men in industry or education, and included seven talks on matters related to the activities of the builder.

The summer conference on the "Mechanical Properties of Plastics" was held from June 20 to 22 of this year and was under the direction of Professor Dietz as Chairman. This conference, addressed by outstanding men in research and production in the plastics field, was attended by more than 200 interested participants, and the papers, 23 in all, will be published during the next year. Four of these were presented by Walter J. Gailus, Steven Yurenka, Earl E. Patterson, and Robert G. Cheatham of the staff of the department.

*Placement.* Professor Staley has continued his supervision of placement assistance to students and has been assisted by Mr. Thomas A. Hood. All of the June graduates, 27 including graduate students, were placed before the end of June or decided to continue their academic study. The department's policy of direct contact assistance has continued to produce excellent results.

*Professional Staff Activities.* Professor Dietz continued his administrative work in professional societies as chairman of Committee C-19 on Structural Sandwich Constructions and as a member of the Administrative Committee on Papers and Publications of the American Society for Testing Materials; in the Society of the Plastics Industry, he is chairman of the Committee on Plastics Education which recently issued a brochure entitled "A Program for Plastics Education in Science and Engineering." Professor Murray has taken over the duties of chairman on the Sub-Committee on Research of Committee C-7 on Lime of the American Society for Testing Materials. Professor Voss continues as chairman of Committee C-7 on Lime of the Administrative Committee on Research, of Sub-Committee V (Admixtures) of Committee C-12 on Masonry Mortars of the American Society for Testing Materials; Pro-

fessor Voss is a member of the Division of Industrial Research and Development and its Building Research Advisory Board of the National Research Council, a member of the Board of National Advisory Counselors of the Revere Quality Housing Division of the Southwest Research Institute and is a consultant to the New York State Building Code Commission and to the Massachusetts Special Commission on the Structure of the State Government. Besides their administrative interests, all members of the staff have taken active part in many of the professional societies.

*Talks.* Professor Dietz addressed the New England District of the American Society for Testing Materials in January, 1950 on "Solar Heating" and talked on the same subject to the Framingham Engineers Club in May 1950. Professor Staley spoke at the Annual Convention of the New England Building Officials Conference in May. Professor Murray spoke to the National Lime Association convention in May, reporting on the research being done at the Institute under the Association's Fellowship. Professor Voss again presided at the Research Session of the National Lime Association's Convention in May, and was chairman of the Second Technical Session of the New England Regional Meeting of the American Concrete Institute held in Boston in November, 1949.

WALTER C. VOSS

#### BUSINESS AND ENGINEERING ADMINISTRATION

Departmental activities during the past year have concerned themselves largely with orientation to the new quarters in the Hayden Library building and with a continuation of an intensive effort to improve organization and procedures.

Problems and opportunities before the Department were of so diverse a nature that it seemed wise to make use of the committee system in delegating the study of these questions.

*Transfer Committee Activities.* Early in the year it became clear that the problem of transferring the Department from Building One to its new location in the Hayden Library Building would involve a large amount of detailed planning and scheduling. A committee of junior members of the Department was thereupon appointed, with Mr. C. C. Herrmann as Chair-

man. As a result of careful and detailed preliminary studies the transfer was effected in a minimum of time and with extraordinarily little difficulty. Many minor details involving utilities were cared for in advance by this method, and prompt committee action enabled the faculty to adjust itself to the normal teaching and conference demands in the fall of the year with a minimum of disturbance and delay. Much credit is due Mr. Herrmann and his associates on this committee for their accomplishment.

*Input Committee Activities.* This committee under the chairmanship of Professor James S. Cross was asked to study and report upon the experimental procedure whereby members of the staff are permitted to spend one-half of one term per year in activities of a sort designed to increase their teaching capacity.

As a result of an extended investigation the committee reported its conclusions in February. It found that the present plan satisfies a genuine need in the Department for periods of unassigned time to be used for professional advancement or creative work; that the program should be scheduled with such flexibility as to allot appropriate work to the individual in coordination with Institute policy. The report included further details relating to planning, appraisal of results, the protection of those engaged in input research programs from distracting departmental duties. The two-year experimental period given to the trial of this input program has now been completed and the plan has been instituted as a permanent part of the departmental faculty activities.

*Registration Committee Activity.* The registration committee comprised of the registration officers for the various classes in the Department under the chairmanship of Professor Van Alan Clark was requested early in the year to consider the problem of continuity in registration practice. It has long been the custom of registration officers to remain with a given class from its entrance into the Department until its graduation. The hazard of this procedure is that of occasional lapses in policy application due to changing requirements in the upper years. The committee undertook, through a series of conferences, to provide for a more general dissemination of information on these matters.

*Graduate Committee Activities.* The graduate committee, under the chairmanship of Professor Ronald H. Robnett, has given a large measure of its time to the problem of admissions of graduate students into the work of the Department. Special consideration has been given to such problems as the extension of service to other departments where students want some graduate work in administration, the relationship of the departmental quota for graduate students to the total teaching load upon members of the Department, and the nature of departmental graduate offerings. The committee has also strongly stressed the need of increased fellowships in this division of the Department activities.

*Curriculum Committee Activity.* The curriculum committee, which was appointed last year for the purpose of reviewing the undergraduate program and of recommending such changes as may seem appropriate, was continued during the past year under the chairmanship of Professor R. M. Cunningham. Weekly meetings of the committee were held throughout both semesters.

Early in the committee discussions, the proposal was made that consideration be given to the development of a two-term introductory business subject in the field of administration to be accompanied by a coordinate subject in the field of economics. This possibility has been given extended attention by the committee and has resulted in a detailed study of possible content for such subjects. The committee plans to continue its investigations during the coming year.

*Visiting Committee Activity.* The Department visiting committee under the chairmanship of Mr. William C. Potter of the Corporation, made an extended survey of Department activities and submitted a report to the Corporation. At a meeting of this committee with members of the Department faculty, stress was laid upon the importance of the input period for purposes of the development of teaching material and background. The committee also formally recommended that additional efforts be made to utilize the summer interims more effectively so that undergraduates would be better acquainted with the environment and problems of industry upon graduation. The Department is now taking steps to implement these recommendations.

*Policy Committee Activity.* Just prior to the beginning of this school year, a committee on departmental policy consisting of the senior faculty members was appointed to assist the head of the Department in dealing with the increasing number of policy questions which come about as the result of accelerating changes in the fields of industry and education. This committee has had many meetings and has been of inestimable assistance in dealing with current issues and problems.

Professor Ross M. Cunningham was asked to undertake, in conjunction with this committee, a study of the criteria or qualifications for permanent tenure on the part of younger members in the Department. Announcement of this undertaking was made at an early meeting and requests for comments and suggestions asked of all departmental members. After extensive discussions a final draft of suggested criteria was submitted to the staff for comment and a final draft presented to the administration for Institute approval. The preparation of these criteria has proved very helpful in relationships with the younger members of the staff and much credit is due Dr. Cunningham for the painstaking and extended effort and thought which was given to this project.

*Student Activities.* The undergraduate student professional society known as the Management Association completed a most successful year. Eight evening meetings were held and close to two-thirds of the undergraduate student body in the Department have taken membership. In addition to the regular activities of the Association, it organized and carried forward a special exhibition of personnel forms and procedures loaned to the Association by the American Management Association of New York. Its members also collaborated in the organization of exhibits for the annual Open House. One of the most useful contributions of the Association has been the publication of a bulletin giving details of the background and interests of all members of the Department faculty and instructing staff for distribution to the entire student body of the Department.

*Alumni Activities.* Four letters have been issued to alumni during the past year and heavy correspondence with individuals has resulted. In December, a convocation of Presidents and Proprietors was held in Boston at which fifty graduates of the

Department who filled such offices attended. Possibilities of further and closer collaboration between the alumni, the faculty, and the Institute were discussed at a luncheon and afternoon and evening session. This is the first, it is hoped, of many such meetings in the future.

On Alumni Day senior members of the Department presented a series of brief discussions for the benefit of alumni who found attractive the idea of a brief return to the classroom as part of the day's activities.

*Faculty Service Activities.* The service of faculty members to the Institute, apart from their regular duties, has been extensive.

Professor Ronald H. Robnett has for the past three years served as an active member of the committee of Educational Survey and has also acted as Fiscal Officer of the Division of Industrial Cooperation. He is a member of the Admissions and the Nominating Committees, and Chairman of the Athletic Administrative Board.

Professor Douglass V. Brown has acted as chairman of the Faculty after completing a year of service as President of the Faculty Club. He is currently serving on the Undergraduate Policy and Student-Faculty Committees.

Other staff members serve on a total of sixteen Institute committees or boards.

During the year, in connection with the Technology Fund campaign, Professor Schell has addressed alumni groups in Massachusetts, Rhode Island, Connecticut, Wisconsin, Minnesota and Colorado.

*Sloan Program Activities.* The Executive Development Program under the auspices of the Alfred P. Sloan Foundation completed its first year since wartime suspension of this activity. The ten young executives selected from nominations by companies participated in a program of special seminars with distinguished administrators, visits to progressive industrial organizations, and a substantial curriculum of graduate subjects as offered by this department and by the Department of Economics. In order to spread more widely the substantial benefit derived from this program, the number of recipients of these fellowships for the coming year has been increased to 14.

During the period of 20 years that this program has been in operation a number of other schools have initiated intensive, shorter term programs for industrial executives. The M. I. T. Sloan Program, however, continues to be unique in its selectivity and in its longer scope of 12 months.

*Curricular Additions.* During the year three additions have been made to the curriculum. A new elective subject entitled "New Enterprise Planning" has been organized and presented by Mr. Oliver P. Swope, Jr. Professor Edwin A. Boyan has also presented for the first time a graduate subject dealing with Production Management and Practice.

As an adjunct to the Executive Development Program, but available to all graduate students in Economics and Business Administration, a series of noncredit science and engineering seminars was initiated. During the course of this seminar the significance of new developments in various scientific and engineering fields was discussed by professors from several departments of the Institute. This program proved of such value that the Department plans to continue and expand it during the coming year.

*Cooperating Lecturers.* During the year the Department has continued to draw heavily upon the information of distinguished industrialists in the presentation of lectures, discussions and seminars with both undergraduate and graduate students. A partial list of individuals who have thus contributed directly to the educational work of the Department includes:

Lawrence A. Appley, President, American Management Association; Melvin H. Baker, President, National Gypsum Co.; Solomon Barkin, Labor Economist, Textile Workers Union of America; John W. Barriger, III, President, Chicago, Indianapolis & Louisville Railway Co.; Clark Belden, Executive Secretary, New England Gas Association; John Bidwell, Director of Market Research, Dewey and Almy Chemical Co.; Frederick S. Blackall, Jr., President and Treasurer, The Taft-Pierce Manufacturing Co.; Richard L. Bowditch, President, C. H. Sprague & Co.; Carroll Boyce, Associate Editor, Factory Management and Maintenance; Alvin Brown, Vice-President of Finance, Johns-Manville Corporation; A. A. Brown, Deputy Director, Operations Evaluations Group, U. S. Navy; Samuel L. H. Burk, Director of Industrial Relations, Pittsburgh Plate Glass Co.; Paul J. Cardinal, Vice-President, Hoffman-LaRoche,

Inc.; Donald F. Carpenter, General Manager, Rayon Division, E. I. du Pont de Nemours and Company; Horace M. Chadsey, Vice-President, First National Bank of Boston; Arthur C. Daniels, Executive Secretary, Institute of Life Insurance; James E. Drew, Public Relations Director, Lever Brothers Co.; William C. Decker, President, Corning Glass Works; Arthur S. Dewing, President, Northern States Power Co.; John T. Dunlop, Harvard University; Donald D. Durrell, Dean, Boston University; David F. Edwards, President, Saco-Well Shops; Robert Elder, Management Consultant.

Lounsbury Fish, Organization Counsel, Standard Oil of California; Wyman Fiske, Management Consultant; Ralph G. Follis, Chairman of the Board, Standard Oil of California; Walter S. Frost, Vice-President, Burnham Soluble Iodine Co.; Roy Fugal, Manager of Personnel, Appliance and Merchandise, General Electric; J. Kenneth Galbraith, Harvard University; William W. Garth, Jr., President and Treasurer, Lithomat Corp.; Dr. Lillian Gilbreth, President, Gilbreth, Inc.; Reginald Gillmor, Vice-President, Sperry Corp.; Ben S. Graham, Director of Future Demands, Standard Register Co.; Samuel Groves, Vice-President, United Carr Fastener; Luther Gulick, President, Institute of Public Administration; J. E. Harrell, President, New England Telephone and Telegraph Co.; Thomas H. Hoare, Executive Director, Massachusetts Association of Small Loan Companies; Harvey P. Hood, President, H. P. Hood & Sons Co.; Alan F. Howard, President, Bemis Associates; Holgar J. Johnson, President, Institute of Life Insurance; Lawrence E. Joseph, Blaw-Knox Co.; John S. Kier, Executive Vice-President, Dennison Manufacturing Co.; Duncan R. Linsley, Executive Vice-President, First Boston Corp.; Royal Little, President, Textron, Inc.; Donald B. McCammond, Director of Industrial Relations, Monsanto Chemical Co.; Fowler McCormick, Chairman of the Board, International Harvester Co.; Richard McEntire, Commissioner, Securities and Exchange Commission; Frank Maconi, Vice-President, Graton & Knight; Lowell B. Mason, Commissioner, Federal Trade Commission; James Mitchell, Director of Industrial Relations, Bloomingdale's.

W. H. Nichols, Treasurer, W. H. Nichols & Sons; William A. Patterson, President, United Air Lines; William C. Potter, Chairman of the Executive Committee, Guaranty Trust Co.; Theodore Rehm, Executive Vice-President, Keystone Custodian Funds; Albert S. Redway, President, American Paper Goods Co.; Fred Rudge, President, Fred Rudge, Inc.; Beardsley Ruml,



Management Consultant; Peter Seitz, General Counsel, Federal Mediation and Conciliation Service; S. L. Sholley, President, Keystone Custodian Funds; Sumner H. Slichter, Harvard University; Frank M. Surface, Director of Market Research, Standard Oil of New Jersey; James Truslow, Vice-President, Saco-Lowell Shops; Hugo de Haan, Secretary General International Committee on Scientific Management; Bernard Walker, President Union, Bird & Son; Martin J. Walsh, United Steelworkers of America, C.I.O.; Colston Warne, President, Consumers' Union, Amherst College; D. R. Weedon, Assistant Manager, Blanchard Machine Tool Co.; John Willard, Partner, Bigelow, Kent, Willard; Reginald H. Zalles, Administrative Director, Massachusetts State C.I.O. Council; Arnold Zurcher, Executive Director, Alfred P. Sloan Foundation.

The Department is deeply indebted to these people who have contributed so greatly to its educational work.

*Cooperating Industries.* The cooperation of manufacturing industries in permitting students access to their establishments, and in arranging for conferences and interviews while there, constitutes one of the marked developments in modern administrative education. At the present time the list of establishments in Greater Boston thus willing to cooperate includes over 650 concerns. The following organizations were called upon during the past year and were of direct assistance to the Department:

Acushnet Process Co.; Allcraft Manufacturing Co.; Alles and Fisher, Inc.; American Brake Shoe & Foundry Company; American Can Company; American Hide and Leather Co.; American Ice Company; American Optical Company; American Sugar Refining Company; American Tool and Machine Company; B. C. Ames Company; Arlington Mills; Armstrong Cork Company; Arnold-Copeland Co., Inc.; Ashton Valve Company; Atlantic Register Co.; B. B. Chemical Company; E. B. Badger & Sons Co.; N. P. Baker Button Co.; Walter Baker and Company; L. G. Balfour Company; Barbour Stockwell Co.; Beggs and Cobb, Inc.; Ben-Burk, Inc.; William W. Bevan Co.; Bird and Son, Inc.; Boston Athletic Shoe Company; Boston Beer Co.; Boston Envelope Company; Boston Woven Hose & Rubber Company; Brown Durrell Company; A. & G. J. Caldwell, Inc.; Carpenter and Paterson, Inc.; Carter's Ink Company; Chelsea Clock Company; Christian Science Publishing Co.; Converse Rubber Co.; Cote Motor

Company; S. H. Couch Company; Croft Brewing Company; Crompton and Knowles Loom Works.

Daggett Chocolate Co.; Dennison Mfg. Company; Dewey & Almy Chemical Company; Doelcam Company; Draper Bros. Co.; Draper Corporation; Dupont Viscoloid Company; Eastern Gas and Fuel Associates; Elliott Addressing Machine Company; Esso Standard Oil Co.; Fanny Farmer Candy Shops, Inc.; Farrington Manufacturing Company; Felton & Sons, Inc.; Wm. Filene's Sons Co.; The Forbes Lithograph Mfg. Co.; Ford Motor Company; Gamewell Company; General Electric Company; General Ice Cream Corporation; General Radio Company; Gillette Safety Razor Company; Ginn & Co.; The Green Shoe Mfg. Company; Haartz-Mason, Inc.; A. E. Halperin Company, Inc.; Harvard Brewing Company; Hathaway Bakeries, Inc.; Henriett Shoe Company; Hersey Manufacturing Co.; Hesse Machine & Manufacturing Co.; Heywood Wakefield Company; H. P. Hood and Sons; Hood Rubber Company; Houghton Mifflin Company; Howard Clock Products, Inc.; Hunt-Spiller Manufacturing Corp.; Jackson and Moreland; Jordan Marsh Company.

Kendall Mills; Keystone Manufacturing Company; Kinney Manufacturing Company; Koehler Manufacturing Co.; Lawson Machine & Tool Co.; Lithomat Corporation; H. F. Livermore Co.; Manning, Maxwell & Moore; Mason-Neilan Regulator; Maxim Motor Co.; Melori Shoe Company; Merrimack Manufacturing Co.; Merriman Brothers, Inc.; Monsanto Chemical Company; Mystic Iron Works; National Casket Company; National Company; National Research Co.; New England Confectionery Company; New England Transformer Company; W. H. Nichols and Sons; Pacific Mills; Palmer Electric Manufacturing Co.; Perrine Quality Products Corporation; Pneumatic Scale Corporation; Potter Drug and Chemical Corp.; Quality Paper Box Co.; Raytheon Mfg. Co.; Recording and Statistical Corporation; The Reece Corp.; Revelation Bra Company; Revere Copper & Brass Co.; Revere Sugar Refinery; A. F. Robinson Boiler Works; James Russell Engineering Works, Inc.

Salada Tea Company; Sanborn Co.; Scully Signal Company; Sexton Can Company; Simplex Wire and Cable Company; Somerville Machine and Foundry Company; John P. Squire Co.; Star Brewing Co.; The Star Brush Mfg. Co., Inc.; The Stetson Shoe Company, Inc.; Sturtevant Mill Co.; Swank, Inc.; Sylvania Electric Products, Inc.; Taft Pierce Mfg. Co.; E. E. Taylor Corporation; Textile Thread Co.; Thompson Wire

Co.; Ucinite; William Underwood Company; United American Soda Fountain Company; United-Carr Fastener Company; United Shoe Machinery Corp.; Victory Plastics; Waltham Foundry Company; Waltham Grinding Wheel Company; Walworth Company; Warren Brothers Roads Co.; Westinghouse Electric Corporation, Sturtevant Division; S. A. Woods Machine Company.

This service to our students brings resource that cannot be otherwise provided or substituted for and the Department wishes publicly to express its very real appreciation for this continuing cooperation.

*Especial Mention.* The Department is especially appreciative of the generosity of John R. Macomber, '97, Howard D. Williams, '11, Newman M. Marsilius, '17, and H. W. Christopher, '49, for their gifts of unrestricted funds, which have been of great assistance.

ERWIN H. SCHELL

#### CHEMICAL ENGINEERING

The Department's operations continued at a high level during the past year, with large undergraduate classes and only a slight reduction in graduate registration. Thesis research was notably active and 17 doctorate degrees were awarded, nearly equaling the record of 20 which was established a year earlier. Participation by Department staff in broader Institute enterprises was marked by Dr. Lewis' chairmanship of the Committee on Educational Survey, which brought its report to the faculty last spring, and by the inclusion of two of the Department staff on the new Committee on Undergraduate Policy.

The School of Chemical Engineering Practice functioned effectively throughout the year. The number of graduate students last fall was a little below normal, but the spring enrollment of seniors in the X-B Practice School program taxed our facilities to the limit.

The Engineering Practice School at Oak Ridge, in its second year of operation, showed gratifying development in the scope and quality of its work. Both the Atomic Energy Commission and the Carbide and Carbon Chemicals Cor-

poration, operators of the three Oak Ridge installations, are enthusiastic about the School, and M. I. T. announced a plan last spring which would make its facilities available in the future to qualified graduate students from other universities. Eighteen M. I. T. students have taken the program during the past year, including seven from the Department of Mechanical Engineering. Wider participation, especially by other branches of engineering, is desirable.

Studies of the characteristics and possibilities of fluidized systems, in which fine solids are suspended in rising gas streams, have continued as a major line of research. The work on flow behavior of the solids and of the gas and on the mechanism of heat transfer between fluidized beds and solid surfaces helps to explain the high rates of heat dissipation which can be achieved in such systems and the relative uniformity of temperature within the system. It shows that the separate flow patterns of the gas and of the solids are complicated, differing markedly from simple piston action. The results afford good clues for establishing a sound basis for process design. Specific reactions which have been investigated in fluidized beds are the interaction of steam and carbon for the preparation of synthesis gas to be used in converting coal to liquid fuel, the reduction of carbon dioxide by coke, the reaction of solid carbon with oxygen, which is especially difficult to control because of high heat evolution and rapid reaction rates, and the use of metal oxides as oxygen carriers, in place of oxygen gas, for the production of pure sulfur dioxide and carbon dioxide.

Research on mass transfer phenomena covered several phases of this general problem. A thesis on the rates of solution and of subsequent chemical reaction in a system of small solid particles suspended in a liquid gave basic data which have proven useful in the design of equipment to manufacture sulfite cooking acid for the pulp industry. Further progress has been made on a fundamental study of gas absorption with simultaneous chemical reaction in the liquid phase. Analytical equations describing such systems have been set up, and an experimental program using a unique short wetted-wall column is under way to check the applicability of the theory. In connection with this work, the recently developed electrical analog machines in the Analysis Center have been useful.

In the study of combined heat and mass transfer, equipment has been constructed which will allow the boundary layer formed along a porous wall to be thinned or thickened as desired by movement of gas through the wall. The experimental work on this apparatus will be used to check the validity of the theoretical predictions and to extend measurements into regions where present theories are known to be inadequate.

The capacity limit of industrial fractionating columns is often determined by the ability of the bubble trays in the column to handle liquid without excessive hydraulic gradient across the tray. A study of this problem has shown that the foam of liquid and vapor created by the bubble caps exerts a high frictional drag across the plate; the results should permit marked improvements in design.

Ion exchange processes are achieving wide industrial importance. Work has been initiated to determine the importance of various factors and to develop better methods for translating laboratory data obtained from batch experiments into the design of continuous commercial equipment.

High-output combustion problems are still dominant in the program of the Fuels Research Laboratory, which is largely supported by Navy sponsorship. The two major projects are studies of fuel-oxidant mixture preparation, including spray-cloud production and spray diffusion in flowing gases, and studies of flame stabilization and propagation, including both homogeneous-gas and spray-cloud systems in straight-through and in vortex-flow patterns. A difficult instrumentation problem in the study of rapid chemical reactions which are controlled by the rate and degree of mixing, such as high-output combustion, is that of obtaining a representative sample from an incompletely mixed high-velocity stream. The effects of sampler design and operation have in part been predicted analytically and have received experimental confirmation. One phase of the Bituminous Coal Research project has been completed, giving quantitative information on the reaction of carbon with carbon dioxide when the gas is blown through a single layer of carbon particles on a screen. It is interesting to note that the reaction rates were nearly five times as fast as those which were obtained under fluidized conditions for

the same reaction. The comparison demonstrates that, despite the many outstanding advantages of the fluidized technique, it suffers the disadvantage of a lesser effective rate of reaction between gas and solid. The comparison also illustrates the benefits which accrue from the interplay of one field of department research with another. Two other phases of the Bituminous Coal project which were initiated during the year are the extension of the earlier work to high pressure and the reaction of carbon particles with air and steam in vortex-flow systems at atmospheric pressure.

Research on the properties and reactions of hydrogen peroxide has continued in cooperation with members of the Chemistry Department and with sponsorship from the Office of Naval Research. The development of techniques for safely producing concentrated hydrogen peroxide vapor at atmospheric and sub-atmospheric pressure was followed by determinations of the explosive limits of the vapor as a function of concentration, pressure and nature of diluent. This has contributed to an understanding of the homogeneous decomposition reaction as well as establishing specific regions of hazard in handling concentrated peroxide. Kinetic studies are proceeding on the heterogeneous decomposition of hydrogen peroxide vapor on a catalyst surface. At the vapor concentrations under investigation, the observed rates are controlled by the rate of mass transport to the surface. This case is an interesting example of combined heat and mass transfer under a large temperature difference, analogous to the combustion of carbon at high temperatures.

A program designed to explore possible applications of ultrasonic and microwave (radar) energy to chemical processes has been initiated. Such energy fields may exert desirable effects on chemical reaction rates and on the rate at which mass is transferred to and from catalytic surfaces. As part of the program of the Regional Meeting of the American Institute of Chemical Engineers at Swampscott, a survey was presented on the applications of sonic energy in the process industries.

The sulfur analog of hydrogen peroxide, hydrogen disulfide ( $\text{H}_2\text{S}_2$ ), has long been known. However, information concerning its preparation and properties is scanty. Preliminary

studies indicate that it may have industrial applications if a satisfactory synthesis can be achieved. A research program has been started whose purpose is to study the possibility of synthesizing hydrogen disulfide from cheap raw materials.

Some 20 years ago the Department developed graphical equations of state which were widely adopted in the petroleum and other industries for purposes of engineering design. It was early recognized that there were small but systematic deviations of individual compounds from the general equations. A program now under way promises to expand the value of the method by correlating these deviations with the temperature and pressure levels of the critical points of the individual compounds.

Systematic studies are in progress on the reinforcing properties imparted to natural and synthetic rubber by the incorporation of colloidal clays which have been rendered organophilic by appropriate surface treatments. The rubber laboratory equipment loaned by the Elastic Colloid Research Corporation has been helpful in this work.

Soil solidification research, sponsored by the Corps of Engineers of the U. S. Army, has been carried out as a joint project by the Civil Engineering and the Chemical Engineering Departments. Considerable progress has been made, and preliminary field tests indicate that a wet, silty clay solidified by the new treatment yields a resilient surface which is more satisfactory for vehicular traffic than the same soil treated with asphalt or cement. Essentially, the process involves mixing calcium acrylate and a suitable polymerizing catalyst into the soil. Subsequent rapid polymerization yields an elastic mass in a few moments, the strength of which increases over a period of hours.

The work on adhesion has disclosed that very thin films have unusually strong bonding affinities to each other and to other materials. The hypothesis of molecular-force fields which appears to explain the results may have considerable significance, particularly in the study of cellulose and of the beating process in the manufacture of paper as well as in the performance of adhesives.

A special three-week course on the "Colloid Chemistry of

Elastomers" which was given early this summer attracted a wide attendance of men from industries over the United States and Canada.

Professor William H. McAdams received the Walker Award of the American Institute of Chemical Engineers, and was also honored by that Society by being selected to give its first annual "Institute Lecture." Professor Edwin R. Gilliland delivered the fifth "Westerman Memorial Lecture" before the Canadian Institute of Chemistry. Professor Hoyt C. Hottel lectured in Paris, Delft, and London at the invitation of the International Project on Flame Radiation, a joint British-French-Dutch effort which is supported by both government and industry, and Professor Harold C. Weber lectured in Zurich and Paris and served as guest lecturer in the training program of the Army Chemical Center conducted by the University of Maryland.

Publication of papers by the Department showed a gratifying increase during the year, and the staff contributed notably to the success of the Swampscott meeting of the American Institute of Chemical Engineers this spring.

WALTER G. WHITMAN

#### CIVIL AND SANITARY ENGINEERING

During the past year there has been an increase of 10 per cent in the total enrollment of students in the Department, as summarized in the following table:

<i>Date</i>	<i>1st Year Civil</i>	<i>2d Year Civil</i>	<i>3d Year Civil</i>	<i>4th Year Civil</i>	<i>Graduate Civil</i>	<i>Graduate Sanitary</i>	<i>Total Department</i>
September 29, 1948 . . .	47	54	59	47	48	16	271
September 19, 1949 . . .	56	49	61	57	54	21	298

The Department enrollment now constitutes 5.4 per cent of the total Institute enrollment, as compared to 5.0 per cent a year ago. Not since 1926 have there been as many students in Civil and Sanitary Engineering at the Institute.

The Department Seminar program, initiated last year, was continued with six meetings each term, which were addressed by outstanding men in Civil and Sanitary Engineering. The Seminar was coordinated by a committee of which Professor



Myle J. Holley, Jr. was chairman. Our annual lecture on Conservation of Natural Resources was incorporated into the Seminar — this year's speaker being William H. Latham, '26.

The Corporation Visiting Committee for the Department held a well-attended meeting at the Institute in March, continuing its effective guidance and support of the Department under the able leadership of Thomas C. Desmond, '09.

In December another Department News Letter was sent to graduates of the Department who now total more than 2,600.

*Structural Division.* The research program being conducted in the Structural Dynamics Laboratory under Dr. Robert J. Hansen for the Office of Chief Engineers of the War Department on the behavior of structural elements under impulsive loads, has continued during the past year and will be carried on during the coming year. An investigation of leg braces has been made in collaboration with the Massachusetts General Hospital. Three new projects, all for the armed services, will start by July 1, 1950. Sponsored by the Welding Research Council, the research program dealing with the elastic stability of welded struts and flexural members has been continued in the Structural Analysis Laboratory by Dr. Charles H. Norris.

A number of papers have been given by members of the Structural Division, including papers by Professor Myle J. Holley, Jr. and Professor Melvin J. Biggs to the Boston Society of Civil Engineers. Dr. Norris was awarded the Designer's Section Prize of the Boston Society of Civil Engineers for his paper, "Localized Buckling of Structural Members."

Professor Wilbur, Dr. Norris and Dr. Hansen have continued as experts for the War Department; Professor Wilbur and Dr. Hansen have served as consultants to the Armed Forces Special Weapons Project; and Dr. Hansen has been a member of a five-man advisory panel to the Research Division of the Sandia Corporation. Professor Wilbur has been Chief Engineer of the consulting firms who are jointly designing Section I of the Boston Central Artery for the Massachusetts Department of Public Works. He is Senior Vice-President of the Boston Society of Civil Engineers, Civil Engineering Representative to the General Council of the American Society

for Engineering Education, a member of the Executive Committee of the Northeastern Section of the American Society of Civil Engineers, and a member of the Accrediting Committee of the Engineers' Council for Professional Development.

Professor Holley and Dr. Hansen have been promoted to the grade of Associate Professor.

*Hydraulics Division.* The most important event in the Hydraulics Division was the taking over of the new Hydrodynamics Laboratory in June. The building had been started in 1949, and considerable attention was given to the details of the new laboratory as its construction proceeded.

Research projects have included: "Studies and Experimental Investigations on the Validity and Applicability of the Hydraulic Analogy to Supersonic Flow of Gases," sponsored by the U. S. Army Air Forces; "Investigation of the Fluid Friction and Cavitation Phenomena in Unsteady Motion," and "An Experimental Investigation of the Solitary Wave," for the Office of Naval Research; "Development of Methods and Instruments to Determine the Characteristics of Turbulent Motion in Water," sponsored by the Engineering Foundation and by the American Society of Civil Engineers; "Fundamental Research on Methods of Air Dispersion to Secure Greater Efficiency in the Solution of Oxygen from the Air in the Activated Sludge Process for Sewage and Industrial Waste Treatment," for the U. S. Public Health Service; and "Transient Stability of a Non-Linear System," sponsored by the Research Corporation.

Dr. Arthur T. Ippen made an extensive trip through Europe, inspecting Hydraulic Laboratories, and attending both the meeting of the International Association for Hydraulic Research in Grenoble, France, and the International Navigation Congress in Lisbon, Portugal. At the latter, he was an official delegate of the United States, having been appointed by the State Department. He is active on committee work of professional societies and has presented two papers through the American Society of Civil Engineers. He has continued to serve as a member of the board of consultants for the Waterways Experiment Station at Vicksburg, Mississippi.

Dr. James W. Daily is a member of Hydraulics Division Committees of both the American Society of Civil Engineers

and the American Society of Mechanical Engineers, being Research Secretary to the Hydraulics Division of the latter. He has presented a paper to the American Society of Civil Engineers.

Mr. Donald R. F. Harleman has been promoted to the grade of Assistant Professor.

*Sanitary Division.* This year has been one of steady progress for the Sanitary Division, under the leadership of Dr. Rolf Eliassen. The research program of the Division was expanded by the acquisition of a contract for sponsored research with the U. S. Atomic Energy Commission which required the construction of three new small laboratories: one a pilot filtration plant for the removal of radioisotopes from water; one for radiochemistry; and one a counting room. Dr. Eliassen is supervisor of this project, which is the first of its type at any academic institution in this country. Under Dr. Murray P. Horwood and Professor William E. Stanley a new project was instituted in the Bacteriology Laboratory dealing with the effects of ultrasonic vibrations on the destruction of bacteria and the coagulation of colloidal solids in water. The cooperation of the Acoustics Laboratory has been most helpful in this project, which is sponsored by the National Institute of Health. Dr. Clair N. Sawyer's two research grants from the National Institute of Health have been continued, one on the study of the nutritional characteristics of the activated sludge and biological filtration processes, and the other on the development of the biochemical oxygen demand test for sewages and industrial wastes.

The first New England Industrial Wastes Conference was held at the Institute in June, under the direction of Doctors Eliassen and Sawyer, and cosponsored by the New England Council, the New England Sewage Works Association, and the Summer Session of the Institute. Over 200 representatives of industry, regulatory agencies, consulting engineers and research organizations attended.

Dr. Eliassen presented five professional papers during the year, Professor Stanley one, Dr. Horwood three, and Dr. Sawyer five.

Dr. Eliassen served as consultant to the Surgeon General of the U. S. Public Health Service, and to the U. S. Atomic

Energy Commission. In June, he was presented the George Westinghouse Award of the American Society for Engineering Education for "outstanding contributions to the art and science of teaching."

Dr. Sawyer was promoted to the grade of Professor. Dr. John R. Snell joined the staff as Special Lecturer in Sanitary Engineering. Assistant Professor Ariel A. Thomas resigned in January.

*Soil Mechanics Division.* The soil solidification project, sponsored by the Engineer Research and Development Board of the U. S. Army Engineers, and aimed toward the development of a chemical method of bonding soil particles together to make a surface satisfactory for the support of military vehicles, has continued during the year, and it is believed that significant progress has been made. This project is guided by a steering committee which includes members of the Department of Chemical Engineering and of which Dr. Harold C. Weber is Chairman. Dr. T. William Lambe is Executive Officer of the project. The project on triaxial shear on clays, sponsored by the U. S. Engineers, continued under the direction of Professor Donald W. Taylor.

Professor Taylor is secretary of the International Society of Soil Mechanics and Foundation Engineering, chairman of the committee on subsoils of the Boston Society of Civil Engineers and chairman of the subcommittee on the structural design of earth dams and their foundations of the American Society of Civil Engineers. During the year he has served on four consulting boards for the Corps of Engineers.

Dr. Lambe has presented three professional papers.

The instructional facilities of the Soil Mechanics Laboratory have been improved with credit due to Mr. Harl P. Aldrich, Jr.

*Transportation and Surveying Division.* Due to the large enrollment of students, it was again necessary to operate the Summer Surveying Camp at East Machias, Maine, in two sessions of four weeks each, but definite plans have been made for a single session camp in 1950. Professor Herman J. Shea is Director of the Camp, and Professor Allan T. Gifford, the Executive Officer. Professor Shea is chairman of the Surveying and Mapping Section of the Boston Society of Civil Engineers.

Professor John B. Babcock continues his very effective work as placement advisor for the Department. He has been successful in his efforts and has continued to place emphasis on summer jobs for undergraduates. He is active on professional committee work, including committees of the American Society for Engineering Education, the American Society of Civil Engineers and the Boston Society of Civil Engineers.

Professor Alexander J. Bone has acted as consultant on traffic problems in connection with the Boston Central Artery and is a committee member of the Highway Research Board. He is coordinator for a conference on Ground Facilities for Air Transportation, to be held at the Institute in September, 1950, cosponsored by the Institute, the Port of New York Authority, and the Civil Aeronautics Administration. He is negotiating with the Massachusetts Department of Public Works to arrange a cooperative research project in highway engineering for which it now appears that funds will be made available.

JOHN B. WILBUR

### ELECTRICAL ENGINEERING

Department activity in the graduate and undergraduate teaching phases, in the many sponsored research projects, and in services to government and other outside agencies continues at the same rapid pace which has been characteristic since the end of the war. Staff members have been called upon to meet both teaching and research functions, and they are doing so competently and effectively. Improvements are inevitable under this type of program, and the present-day Electrical Engineering student is benefiting from the new and dynamic ideas which are being fitted into his curriculum.

The Graduate Committee, under the chairmanship of Professor Gordon S. Brown, has reviewed and reformulated policies for graduate work. As a result of the work of this committee, and with the approval of the other members of the faculty, the Department has defined and implemented its specific requirements for the two-year degree of Electrical Engineer. In addition, a new form of doctoral examination has been set up, which comprises two parts. The first part,

to be taken early in the second year of graduate study, consists of a qualifying written and oral examination. The second part, to be taken near the end of the doctoral program, consists of an oral examination in the field of specialization. A Guidance Committee is appointed for each student who passes the first part of his doctoral examination. This committee has the responsibility of guiding the student in such a way that he acquires a thorough command of fundamentals and a high degree of technical skill in the major field, as well as judgment in the application of science and technology. Thus, our doctoral degree aims at broad professional competence to deal creatively, constructively, and wisely with new problems and situations.

After extended study, the Seminar subjects 6.501 and 6.502 have been dropped as graduate requirements, and an investigation is in progress of an alternate program to preserve most of the valuable educational aspects of seminar with more efficient use of student and faculty time.

With the easing of the postwar load, the Department is returning to more flexible individual laboratory instruction methods. The formal experiments for out-of-course students have been replaced by two-hour laboratory problems to improve motivation and to make better use of the 15 hours of assigned active laboratory time. For the Electrical Engineering power-option students, the program of a fixed number of individual experiments has been shifted to a more flexible system of project-type work in which the student is taught to keep an accurate notebook and to consult independent references such as the American Institute of Electrical Engineers Test Codes. Work on the Network Analyzer has been incorporated into the laboratory program.

New equipment has been added and the old revised to broaden the scope of the laboratory. Three generalized types of direct-current machines called metadynes have been installed; two machines for control work called Rototrols are to be delivered shortly by the Westinghouse Electric Corporation; equipment for studying steady-state and transient characteristics of servo motors has been built; and work is under way to improve the electronic switching units for studying electro-mechanical transients. Additional fractional-horsepower motors

have been obtained to provide a complete set of all common types, and a Vicker's Educational Saturable-Core-Reactor Set has been purchased. With this additional equipment, a large number of new experiments have been prepared. Revision of the report writing system is in process with the object of stimulating student interest. To implement high standards of written expression, each student will be required to submit at least one report each term to the English Department for criticism, recommendation for redrafting, final acceptance, and grading.

At the graduate level, several new academic subjects in Machine Computation and Numerical Analysis now provide a full Master's degree program. Professor Ernst A. Guillemin has introduced a new graduate subject, "Mathematical Methods in Electrical Engineering," to provide adequate background for the graduate network synthesis subjects. Since this same mathematical background is the basis for solving problems in most of the electrical engineering fields, the new subject is also broadly useful.

The Cooperative Course, VI-A, under the direction of Professor Eugene W. Boehne, continues to appeal strongly to both students and industry. An increasing number of well-known engineering organizations are asking to participate in the Cooperative Course, and more and more students are competing for admission. The flexibility of the course is indicated by the several inter-company transfers of students which occurred this year. Rhodes Scholarships for advanced study in England have been awarded to Mr. Eugene B. Skolnikoff and Mr. Herbert D. Benington, the fourth and fifth Rhodes Scholars from this department over a period of years. On invitation, Mr. John Alger and Mr. Skolnikoff spent the past summer with Dr. Harald Norinder at the Institute of High Tension Research in Uppsala, Sweden, working on lightning problems.

Last year's experiment of having a successful engineer from industry offer a senior elective in some aspect of engineering practice has been continued. Its purpose is to give to students some awareness of the nature, breadth, and scope of typical broad engineering problems encountered in practice, which are beyond the strictly technical aspects. During the

second term, Mr. George W. Gilman, '23, Director of Transmission Engineering of The Bell Telephone Laboratories, Inc., taught a senior elective entitled "Case Studies in Electrical Engineering Practice." Student response was excellent to this subject, in which the class conducted a study and prepared a report on "Technical and Economic Considerations Involved in the Establishment and Operation of a Transatlantic Radio Television Link."

Professor Carlton E. Tucker suffered a heart attack in November, and the duties which he normally performs had to be distributed among six other men. By April, Professor Tucker was able to return on a part-time basis, and by July he was back nearly full time. On January 1, 1950, Mr. Robert A. Plachta was appointed to the staff as Administrative Assistant to help carry some of the administrative load.

The practice of holding staff-student colloquia was revived this spring with a series of three meetings arranged by Professor Ivan A. Getting. Graduate students as well as a visiting speaker from the Radio Corporation of America delivered talks on technical subjects of interest to the group. These were preceded by department teas during which staff and students had a chance to get together.

Professor Theodore H. Morgan of Worcester Polytechnic Institute visited the Department in the Spring as the representative of the Visiting Committee of the Engineer's Council for Professional Development, whose purpose is to accredit curricula in the engineering schools.

The Vail Library of Electrical Engineering and the Biology Library have now taken over complete occupancy of the space in the dome formerly occupied by the Central Library. This was occasioned by the move of other functions of the Central Library to the new Charles Hayden Memorial Library building.

Promotions, resignations, and additions to the staff during the year were as follows: Eugene W. Boehne and Jerome B. Wiesner were promoted to the grade of full professor, while Richard B. Adler and Alexander Kusko were made assistant professors. Professor Albert C. Hall has resigned from the staff to accept a position as Associate Director of Research for the Bendix Aviation Corporation. Dr. Joseph M. Pestarini



returned to the staff in February as a lecturer and taught a subject, Metadyne Statics.

Research on difficult communications problems during the last war showed beyond question the necessity for considering the characteristics of the human beings in a communications system as well as the characteristics of physical equipment. Realizing that the whole problem of communications ultimately involves psychological as well as mere physical phenomena, the Department appointed Dr. Joseph C. R. Licklider to the staff as an Associate Professor of Psychology of Communications, to work with communications groups including the Acoustics Laboratory. Professor Licklider came to the Institute from Harvard, where he was a Lecturer in Psychology.

Again this year the Department had visitors from many countries of the world. In addition, the following were appointed as Guests of the Department of Electrical Engineering: Professor Ulf E. Aberg of Sweden, Professor Jorgen Rybner of Denmark, Dr. Edward W. Webster of England, Dr. Renato Malvano of Italy, Mr. Charles A. Gregoire of Belgium, and Professor Charles Huffer of the University of Wisconsin. These men worked with different groups in the Acoustics Laboratory, the Research Laboratory of Electronics, the High-Voltage Laboratory, the Computation Laboratory, and the Machinery Laboratory.

The former punched-card section of the Center of Analysis has been reorganized and is now called "Statistical Services," under the direction of Mr. Frank M. Verzuh. One of its big jobs will be the mechanization of records of various administrative offices at the Institute.

A beautiful conference room designed by Anderson & Beckwith, Inc., was provided for the Department by the Institute and by Jackson and Moreland, Engineers, and was dedicated on June 11 with appropriate ceremonies as the Dugald Caleb Jackson Room in honor of the former head of the Department. This modern room, a replacement for the former Seminar Room 10-200, is attractively appointed and adds needed and gracious facilities for departmental work.

The student chapter of Eta Kappa Nu, National Honorary Electrical Engineering fraternity, has been actively sponsoring contacts among students and staff by holding informal evening

social gatherings and by arranging for students and staff to lunch together. In addition, the Chapter compiled a list of the technical interests of Department faculty members and also was active in the formation and installation of new chapters at Worcester Polytechnic Institute and Northeastern University.

Under personal notes and accomplishments may be mentioned the following: On the invitation of the Swedish Institute of Electrical Engineering, Professor Donald P. Campbell gave a one-month lecture series on automatic control in Sweden and three shorter series in Norway, Denmark, and Holland. Professor Joseph C. R. Licklider received the Biennial Award of the Acoustical Society of America for outstanding contributions in the field of acoustics. John Wiley & Sons published Professor Leo J. Beranek's new book *Acoustic Measurement* (Oct., 1949, 914 pages). In addition to being Chairman of the Electronics Committee of the Research and Development Board, Professor Ivan A. Getting is Chairman of an Ad Hoc Committee reporting to the Chairman of RDB on the adequacy of our national defense program in regard to fighter aircraft. Professor Albert C. Hall is serving on the Guidance and Control Panel of the Guided Missiles Committee of RDB. Professor Truman S. Gray continues as Chairman of the Subcommittee on Organization of the AIEE Committee on Instruments and Measurements. Professor Harold E. Edgerton was appointed Vice-Chairman of the Committee on High-Speed Photography of the Society of Motion Picture Engineers. Professor Leo L. Beranek served as Vice-President of the Acoustical Society of America. Professor Arthur R. von Hippel is Chairman of the Solid State Section of the American Physical Society. Professor Gordon S. Brown has been Chairman of the AIEE Committee on Feedback Control Systems, which under his Chairmanship was raised from a subcommittee to a full committee. Professor Samuel H. Caldwell is a member of the National Research Council Committee on High-Speed Calculating Machines and the AIEE Committee on Computing Devices. Professor Jerome B. Wiesner is a member of the Education Committee of the Institute of Radio Engineers. Professor John G. Trump is serving on the AIEE Committee on Nucleonics. Professor Lan J. Chu is Chairman of the RDB

Committee on Antennas and Propagation, and a member of the RDB Committee on Electronics.

Professor Lawrence B. Arguimbau and Mr. John Granlund have made a basic advance in the understanding of frequency modulation for the reduction of noise and fading in transatlantic radio broadcast relaying. During the winter, they sailed to England, where they conducted field tests on broadcasts between the two countries. It has long been known that the signal given out by a transmitting station splits into several components which travel by different paths to a receiver. Through the design and use of a special frequency-modulation receiver which listens only for the strongest component, they have been able to minimize the effect of fading.

Staff members of the Department continue to play important roles in the large number of sponsored research projects which are being carried on by the Institute. In addition to the Department's share in three interdepartmental laboratories, the Acoustics Laboratory, Laboratory of Nuclear Science and Engineering, and Research Laboratory of Electronics, which are reported on separately, there are numerous other major research activities of the Department whose highlights are as follows:

In the High-Voltage Laboratory, Dr. Trump continues his active leadership and direction of the work on high-voltage X-ray and cathode-ray Van de Graaff accelerators for medical and biological applications. The encouraging initial results achieved by the rotational method of administration, inaugurated and practiced by Dr. Trump in collaboration with Dr. Haire of the Lahey Clinic and others, show promise of its being one of the best methods known today for the successful treatment of certain types of cancer with high-voltage X-rays. In this method, the patient is revolved about an axis so that the X-ray beam is trained continuously on the malignancy, while normal tissue is treated for only a fraction of the total time. In this way, it is possible to deliver more adequate doses with minimum damage to normal tissue and with better coverage of regions of potential spread than can be achieved with lower voltages and ordinary techniques. In the physical and clinical research program of the laboratory, about twenty patients are being treated daily with two-million-volt X-rays,

using the rotational method of administration. The preliminary results have been excellent. In addition to this, the group is studying the biological effects of high-energy cathode rays produced in a Van de Graaff accelerator, as well as their application to the sterilization of pharmaceuticals and the preservation of foods.

The operations of the Differential Analyzer under the direction of Professor Samuel H. Caldwell have been recently sponsored primarily by the Air Materiel Command, United States Air Force. The contract provided not only for the solution of problems originating in that agency, but also for the support of certain studies originating within the Institute. A broad program of work was undertaken on the solution of boundary value problems and on the improvement of machine techniques for treating such problems. The capacity of the machine was substantially increased by the construction of additional decade gear boxes, and critical studies of the basic servomechanism of the machine were continued. Because of the trend in the nature of the work now being done, the operation of the Differential Analyzer will be turned over during the next academic year to the Instrumentation Laboratory, under Professor C. Stark Draper.

The Servomechanisms Laboratory, under Professor Gordon S. Brown, was occupied with several projects. Under the sponsorship of the Armament Laboratory of Air Materiel Command, fundamental studies in fire-control systems, contactor servomechanisms, characteristics of radar noise, and the magnetic-fluid clutch were conducted. An engineering application of the statistical theory of optimum synthesis in relation to the hit probability problem of fire-control systems has been reported in a doctoral thesis. To implement the radar noise studies, a mechanical type correlation computer has been developed which offers substantial time saving in the reduction of statistical experimental data in a number of different fields. Methods for analyzing and synthesizing discontinuous types of servomechanisms was developed and the work reported in several doctoral theses. Work on the magnetic-fluid clutch has been concerned with dynamic tests of two-disc models to determine the effect of gap, degree of lubrication, and kind of lubricant on the dynamic torque capacity of the clutch. Engineering

study directed toward the development of a system applicable to machine tools for controlling the position of shafts has been completed under the sponsorship of the Parsons Corporation. Construction and test of a working pilot model is now under way.

During the past year, Professor Ivan A. Getting and his staff have achieved operation of the Synchrotron at 350 million volts. This progress is reported elsewhere in the report of the Laboratory of Nuclear Science and Engineering.

Under Professor Truman S. Gray, in collaboration with a Physics Department group in the Laboratory of Nuclear Science and Engineering, the electronic nuclear instrumentation research program continued with the measurement of intensity and energy of neutron and gamma radiation. The research has been directed in four major areas, namely: radiation detectors, pulse circuits for nuclear measurement, direct-current circuits for nuclear measurement, and magnetic-field regulation by proton resonance.

The Dynamic Analysis and Control Laboratory, under Professor Albert C. Hall, for the past year has been engaged in operating and extending the scope of the MIT Flight Simulator. Several integrators and associated computing equipment have been added and are in successful operation, thereby considerably increasing the capacity of the machine. Between 8,000 to 10,000 solutions have been computed by the Simulator during the year. The Laboratory also has been engaged in developing equipment for the control of missile flight. Several useful components have been developed to the point where they are in production. Mention should also be made of the first and second flights by the project of a controlled vehicle. The vehicle was roll controlled, and in the second flight roll transients were introduced. Highly satisfactory flights were secured, and the accuracy of stabilization was beyond the requirements set.

The Stroboscopic Laboratory, under Professor Harold E. Edgerton, continues the active study of the theory of flash lighting equipment, the development of special apparatus, and the application of stroboscopic lighting to technical problems in scientific research and engineering investigation. Thesis projects have shed new light on the spectral distribution of the

radiation as a function of time, the repeating ability at high frequency, and the dimensional analysis of the design of flash tubes. During the year, the National Geographic Society sponsored the design and construction of three sets of flash equipment for nature photography. These equipments were used in the Huachuca Mountains in Arizona to take action photographs in color of different types of humming birds. Several naturalists from the Denver Museum of Natural History collaborated with Professor Edgerton in this effort.

Professor Parry Moon continues his investigations on the analytical and theoretical aspects of illumination. During the year he has been the author of a number of papers on this work.

The Electronic Digital Computer Laboratory, under Mr. Jay W. Forrester, is completing Whirlwind I Computer Assembly for the Office of Naval Research. Operation is scheduled to begin in 1951. Half of the machine time will be available for scientific research and half for military applications. The laboratory supplies a continuous industrial and governmental demand for technical data, particularly on improving vacuum tube life and electronic circuit reliability. A number of research studies have examined the application of digital computation to such problems as: underground petroleum recovery, air traffic control, and several classified subjects.

The Computation Group, under Professor Zdenek Kopal, continues to engage in a variety of sponsored research involving advanced analysis and computational methods. Investigations of various physics and astronomy problems are made for the Navy and the Air Force.

The Laboratory for Insulation Research, under the direction of Professor Arthur von Hippel, continues vigorously its fundamental research program with the long-range aim of synthesizing dielectric materials of prescribed electric and magnetic properties. Ferroelectrics, ferromagnetic semiconductors, the transition stages from insulators to metals, electric breakdown, field emission, and broad range spectroscopy from direct current to  $Z$ -rays are under active investigation. In addition, plans are being formulated to add an application group to the Laboratory. The gap between the securing of new knowledge and its transformation to practice has proved to be still too wide. It seems desirable to carry the

research of the Laboratory through the first stages of application in order to make new advances quickly available to government agencies and industry.

The foregoing are the highlights of department activity for the fiscal year 1949-1950.

HAROLD L. HAZEN

### GRAPHICS

During the past year, the Section of Graphics has continued its effort to bring into an orderly pattern the many isolated graphical methods developed as specific tools in widely separated fields. This is the dominant aim of its research investigations.

The Section was very fortunate in having Associate Professor J. Norman Arnold of Purdue University as an exchange professor for the year. The mutual exchange of viewpoints was very helpful to our staff.

JOHN T. RULE

### MECHANICAL ENGINEERING

*General.* The Visiting Committee of the Department, under the chairmanship of Mr. Frederick S. Blackall, Jr., met on December 13, 1949. The following is a brief outline of the major points of discussion and the conclusions reached.

On the general problem of the undergraduate curriculum it was recommended that

(1) The principal objectives of the curriculum should be to provide a thorough groundwork in basic scientific principles, a well-rounded program in the humanities, and adequate professional training. The latter should offer students the opportunity to deal with relevant professional problems which develop sound methods of reasoning, experience in creative effort, and an understanding of the circumstances in which they will work as professional men.

(2) The greatest possible latitude and flexibility should be afforded to students — and especially to those of superior attainments — in the planning of their programs, in order to take full advantage of their own interests and motivation.

Students should be fully informed of this possibility, and a sympathetic and efficient system of student counseling is of the most vital importance.

(3) The Department should continue its study of the curriculum and attempt to delineate as clearly as possible the basic objectives and the best means for their realization. Any changes in the curriculum should take full advantage of the creative work which is carried out by the staff members of the department. The faculty should exercise a continuing effort to replace dull and irrelevant material with inspiring subjects of maximum relevance to the world in which the future engineer will live.

On the question of engineering education for the liberal arts graduate and the associated question of extending the undergraduate curriculum beyond four years, it was recommended that

(4) The four-year program should be basic for engineering education, but the utmost use should be made of the Combined Plan wherever this is economically feasible.

(5) The maximum flexibility should be permitted for graduate students at the Institute to take advantage of previous training at liberal arts institutions. The significance of a wise system of student counseling is very great in this connection.

(6) Greater publicity should be given to the opportunities which the Institute affords for flexibility in the selection of courses, for engineering training for the liberal arts graduate, and for specialized engineering education at the graduate level.

The Visiting Committee strongly endorsed the strengthening of manufacturing and metallurgy as professional objectives for the mechanical engineer of the future. The Committee also voiced a strong enthusiasm for the Cooperative Training Program, Course II-B, and urged that it be developed to the maximum possible extent. The Committee took a great deal of interest in the efforts being made in the Machine Design Division to foster ingenuity and judgment in the undergraduates.

The general developments in the Department during the year have, in the main, followed the directions outlined in this report.



The study of the undergraduate curriculum has continued, but the results are not yet conclusive enough to put into effect some of the ideas put forward in last year's report. It is considered important to allow this work of curriculum revision to proceed slowly.

Noteworthy steps have been taken during the year in strengthening some of the detailed aspects of the curriculum. The laboratory subjects have been vitalized, and much attention is being given to the problems of creative design. The details of these changes will be enlarged upon in later portions of this report.

In the matter of student counseling, the Department has taken steps to enlarge the senior registration function by an extra assistant. Professor Kenneth R. Wadleigh has been detailed for this service. Subject 2.082, Mechanical Engineering Problems, given by the Head of the Department with the assistance of Professor Wadleigh, has been found to serve a useful purpose in this connection in the fourth year.

Major steps have been taken during the year to encourage manufacturing and mechanical metallurgy as professional objectives. A new Division of Machine Tools and Metal Cutting, under the leadership of Professor Milton C. Shaw, was established, effective July 1, 1950. The new Division will consist of the Metal Cutting Laboratory, directly under Professor Shaw, and the Machine Tool Laboratory, under Professor Prescott A. Smith. All of these activities will be transferred as a unit to the Metals Processing Laboratory when this is completed.

The theoretical and experimental work on various applied phases of the physics of the solid state has been strengthened by the addition to our staff of Professor Egon Orowan, formerly of the Cavendish Laboratory of Cambridge University, who will take up his duties in the Department in September, 1950. Dr. Orowan comes to the Department with a distinguished background of research in physics and metallurgy, as well as practical experience as a mechanical engineer. He will report directly to the Head of the Department. In addition to his own program of teaching and research, he will function as a senior consultant to the members of the staff who are engaged in research in these areas.

The work on friction and wear under Professor John T. Burwell, Jr., has now been under way for several years and represents another significant phase of the same field. Professor Brandon G. Rightmire has initiated further research on surface damage under cavitation, and the Department is cooperating with the Department of Metallurgy in a major project on fretting corrosion, sponsored by the National Advisory Committee for Aeronautics and headed by Professor Herbert H. Uhlig.

The results of the first year of operation of the Cooperative Training Program, Course II-B, involving 20 students, were very satisfactory, both from the point of view of the students and that of the participating companies. Arrangements have been made to expand the program to 37 students, distributed among 13 corporations and one government agency. The program is under the supervision of Professor William M. Murray. In addition to its influence upon the motivation of the students in Mechanical Engineering during the last two years, the Cooperative Training Program, it is hoped, will also tend to stabilize placement in the future through increased contacts with a wide segment of industry.

The Placement Officer of the Department, Professor Arthur L. Townsend, presents the following picture of the placement situation for 1950. During the year the following candidates were graduated:

Sc.D. ....	9
Mech.E. ....	6
S.M. ....	33
S.B. ....	171

According to the information available on September 1, all of the men with advanced degrees had accepted jobs, and less than 25 of this year's graduates of the Department remain unplaced. Placement activity throughout the summer has probably been altered markedly through the influence of the Korean War. It is considered significant that the majority of the men who were not placed on June 30 had cumulative ratings near three. A disturbing element which we hope to correct in the future is that an appreciable number of men have failed

to submit personnel records or to avail themselves of department interviews for placement.

The enrollment of graduate students in Mechanical Engineering continues to be large. During the year there were 130 graduate students registered, and the enrollment for next year is expected to remain the same. The number of applications for admission to the Graduate School in the Department of Mechanical Engineering continues to be about three times the number of available places.

A departmental committee on exhibits, under the chairmanship of Professor William M. Murray, has started to prepare places for several displays throughout the department. Displays on shock waves from the Gas Turbine Laboratory and on stress patterns from the Experimental Stress Laboratory have already been set up.

In accordance with suggestions made by the Alumni Association, a Course Reunion was held at Department Headquarters on Alumni Day. The reception was well attended by many former graduates of Course II, who engaged in a lively discussion of the educational objectives formulated by the Visiting Committee.

The following major changes of personnel took place during the year. Professors Emeriti Lawrence S. Smith and Theodore H. Taft retired after having served five years, half-time, as did Mr. Arthur B. English. Professor Wayland S. Bailey resigned to accept a position at Norwich University. The Department also suffered the loss of Professor Emeritus Addison F. Holmes, who had been serving half-time since 1948. Professor Holmes died in November, 1949, after a brief illness.

During the year two guests of the Institute worked in the Department — Dr. Ezio Camatini of the University of Rome and Dr. D. H. Magiros of the University of Athens.

The exchange arrangement between Mr. Deryck N. deG. Allen of the Imperial College of Science and Technology in London and our Assistant Professor Stephen H. Crandall was completed in February. A similar arrangement will start in September, 1950, between Mr. Robert H. Macmillan of Cambridge University and our Assistant Professor Norman C. Dahl.

Professor Joseph J. Keenan has been awarded a Fulbright grant for a stay of one term at Cambridge University, during which period he will lecture on thermodynamics.

Professor C. Richard Soderberg has continued to serve as Chairman of the Division of Engineering and Industrial Research of the National Research Council, as a member of the Scientific Advisory Board to the Chief of Staff of the United States Air Force, and as a member of the Scientific Advisory Committee on Selective Service.

*Applied Mechanics Division.* No major change was made during the year in the instruction program in Applied Mechanics, but the efforts to broaden the point of view of the instructors by having part of their program in the other divisions has been continued. In particular, several of the instructors with a major part of their teaching load in Applied Mechanics took part in the development of instruction in materials.

*Fluid Mechanics.* A new graduate subject was given during the Spring Term by Professor Ascher H. Shapiro entitled Fluid Machinery. This subject was on a professional level with the design viewpoint in mind and gave a unified treatment of various types of machines used for getting power from a fluid or for putting power into a fluid — including axial and centrifugal fans, pumps, compressors, steam and gas turbines, and water turbines; positive-displacement machines; and jet pumps (injectors and ejectors). A special feature of the subject was that the major assignment of the term was a term project in which each student made a detailed study of a specific type of machine. The term project method, incidentally, has been used successfully in several graduate subjects during the past four years and supplies the important ingredient of creative effort so often lacking in formal subjects.

During the past year Professor Shapiro served on the Subcommittee on Turbines of the National Advisory Committee for Aeronautics and on the Executive Committee of the Boston Section of the American Society of Mechanical Engineers.

A paper entitled "Fluidity of Steel" and dealing with problems basic to the flow of molten metals was prepared by Professor Brandon G. Rightmire in collaboration with Professor Howard F. Taylor of the Department of Metallurgy.

This paper was presented at a meeting of the Steel Founders Society of America in September and has since been published by the Society.

To shed light on the technical problem of damage to metals by hydraulic cavitation, studies have been continued on the impingement on metal surfaces of steep-fronted pressure waves in liquid. An X-ray diffraction apparatus has been acquired for this work. Two graduate theses have contributed to this program, while a considerable part has been carried on by Dr. Ezio Camatini of the University of Rome, a guest of the Institute. The work will be continued during the coming year under Government sponsorship.

*Lubrication Laboratory.* Research on friction and wear under the Chrysler Corporation sponsorship has continued during the past year. The principal effort has been concerned with investigating the empirical laws of mechanical wear which are not very clearly stated in the literature. Simple wear is found to depend linearly on the distance of travel and on the applied load so long as the engineering stress is only a small fraction of the flow pressure. If it is an appreciable fraction of the flow pressure, then the wear increases greatly. This is the case during "running-in."

Investigation of metal transfer from a radio-active piston ring to the cylinder barrel in a CFR engine has continued. The results have been accepted as a paper by the Institution of Mechanical Engineers in London.

The proceedings of the summer conference on mechanical wear, which was held in June, 1948, have finally been published in book form by the American Society for Metals under the title "Mechanical Wear."

In addition to the Chrysler program, two new research projects have been undertaken starting June 1. One is for the Draper Corporation to study the wear of spinning rings. The other is for the Office of Naval Research to investigate friction between metal surfaces at very slow speeds using an original method for measuring the friction.

*Machine Design Division.* The prize competition for our third-year students in Machine Design instituted last year was continued and expanded. Prizes were donated by the Draper Corporation, United Shoe Machinery Corporation, and

Admiral Luis de Florez. The senior elective subject, Product Design, under Professor John E. Arnold, is playing an increasingly important role in our attempt to encourage creative thinking in our students.

Professor Arnold directed a survey to determine what steps should be taken to include education in Industrial Design in our curriculum. As a result of this study we plan to offer a two-term elective program administered by Professor Arnold and staffed by members of the Departments of Architecture, Business and Engineering Administration, and Mechanical Engineering, together with outstanding practicing industrial designers. The objective is to give students the opportunity to follow the development of a product from the original idea to its ultimate production in large quantities. Due consideration will be paid to the design as influenced by function, form, and color, to manufacturing processes and materials, to marketing problems, making this an extremely comprehensive program.

The subject Design of Hydraulic Machinery, discontinued during the war, is again being offered as a senior elective. Mr. Jesse L. Shearer has been instrumental in revitalizing this subject and has taken over the administration of the hydraulics work in the Dynamic Analysis and Control Laboratory. An extensive thesis program is also under way in this field.

The use of electronic analogues in the teaching of dynamics is being continually expanded by Professors John A. Hrones and James B. Reswick.

Several patents are in process of being issued to Professor Reswick as a result of original ideas developed during the past year.

The first part of the Linkage Synthesis Research Program has been completed. Results will be published by the Technology Press under the joint authorship of Professors John A. Hrones and George L. Nelson.

Professor Deane Lent completed a textbook for Machine Drawing, and Professor Alvin Sloane has continued his active direction of the student counseling program.

Professor John A. Hrones was appointed Director of the Dynamic Analysis and Control Laboratory.

*Machine Tool Laboratory.* Considerable effort has been

made to prepare detailed plans for the Sloan Metals Processing Laboratories. In keeping with a long-range point of view, the subjects offered by the Machine Tool Laboratory have been altered to satisfy the need in the fields of manufacturing and processing.

Under the direction of Professor Prescott A. Smith, the research group of the Machine Tool Laboratory, which now includes the services of full-time staff members and graduate assistants, is preparing instrumentation and other research equipment. This work is well under way and will be completed in time to provide facilities in the broad field of metal cutting for a number of undergraduate theses. Several graduate theses have been carried out during the past year.

A basic gear-checking machine has been obtained and is considered to be an important addition to the Gage Laboratory.

Professor Smith is acting as Vice-Chairman of the National Education Committee of the American Society of Tool Engineers, Vice-Chairman of the Boston Chapter of that Society, and as a consultant to the United States Department of Labor.

*Metal Cutting Research Laboratory.* The work in the Metal Cutting Research Laboratory has been extended during the past year. Sponsored and unsponsored studies have been made upon the following general topics: grinding (sponsored by the Timken Roller Bearing Company), the drilling of high temperature alloys (sponsored by the Curtiss-Wright Corporation and the United States Air Force), the fundamental performance characteristics of a single point cutting tool and the cutting of leather and other noncrystalline materials (sponsored by the United Shoe Machinery Corporation). Recently a study of the performance characteristics of metal cutting fluids has been instituted in cooperation with the Ford Motor Company. A total of ten graduate and undergraduate students have received training in this laboratory during the past year, including one candidate for the Doctor of Science degree.

A two-day conference was held, in cooperation with the Industrial Liaison Office, at which the results of metal cutting and grinding research were presented and discussed with representatives of the companies participating in the Development Program. The keen interest displayed by the industrial

representatives in the fundamental aspects of metal cutting was most gratifying, and plans are presently being formulated in cooperation with the President's Office for presenting a special intensive subject next summer concerned with the Fundamentals of Metal Cutting mainly for the benefit of industrial representatives.

During the spring term a subject covering the Principles of Metal Cutting was presented to seniors and graduate students for the first time by Professor Milton C. Shaw. Unlike most highly specialized professional subjects, the emphasis was upon the application of the fundamentals of physics, chemistry, and the engineering sciences to the actions which occur when metal is cut, rather than upon the more usual empirical approach to such problems. The results of this experiment were encouraging, and this subject will be given again next year.

In order to promote closer cooperation between those engaged in Metal Processing in the Department of Metallurgy and those in this Department who are similarly engaged, a weekly seminar was instituted last fall under the direction of Professor Shaw and Professor Amos J. Shaler of the Department of Metallurgy. At these meetings subjects of mutual interest to both groups were discussed. Meetings of this sort are of value not only in the opportunity they offer for the exchange of ideas, but also in the provision of much-needed practice for the graduate students in addressing a professional group on a formal basis.

*Materials Division.* The objectives and content of the Testing Materials Laboratory subjects 2.37 and 2.37I have been considerably changed during the past academic year. Emphasis has been shifted towards the study of the behavior of materials under stress rather than on operational methods, although a desirable portion of the latter is still retained. New laboratory exercises have been devised to give a broader coverage of the field. This is essentially a transition stage for these subjects, and it is possible that further changes will be necessary to strengthen the basic significance of the subject matter. These revisions have been made under the supervision of Professor Charles W. MacGregor by a department committee composed of Professor Maurice E. Shank, Chairman,



Professors Wayland S. Bailey, Norman C. Dahl, Nicholas Grossman, Mr. Robert B. Green, and Mr. Robert P. Palme. Many of the testing machines have been repainted and other minor improvements made. The various laboratories are considerably in need of further modernization, such as the addition of individual motor drives for each machine, fluorescent lights, repainting of the walls and ceilings, and addition of special machines.

The various special research laboratories have been active on important Division of Industrial Cooperation projects under the direction of Professor MacGregor. The research project for the Bureau of Ordnance of the Navy Department, now in its eighth consecutive year, is at present engaged on studies of the effects of strain rate, temperature, and constraint on the energy absorption capacity of various metals. The work is being conducted in the High Speed Impact Laboratory, and valuable information has already been obtained. The Brittle Fracture Laboratory is currently studying the effects of prior cycles of fatigue on the transition properties from ductile to brittle fracture for various aircraft materials under the sponsorship of the National Advisory Committee for Aeronautics. Studies of the effects of pearlite size, plastic flow, and shot-peening on the transition temperature for brittle fracture have been reported recently in the literature. The Creep and Plastic Flow Laboratory is working on two major projects. One is devoted to a study of the utility of the velocity-modified temperature in the creep of metals with the objective of devising a rational short-time creep test. Interesting data are now being obtained which substantiate our belief in the utility of this concept in creep problems. This work is supported by the Office of Naval Research. The second project in this laboratory is a study of the creep-to-rupture problem under torsional stresses for gas turbine alloys. This project is sponsored by the National Advisory Committee for Aeronautics. The effects of combined stresses and stress concentration on the torsional creep-to-rupture properties have been determined, and valuable data on this have already been reported to the NACA.

Department research projects include the Rolling of Metals Project under the auspices of the Special Research

Committee on the Plastic Flow of Metals of the American Society of Mechanical Engineers, the calculation of the state of stress and strain under partial plastic flow conditions for rotating disks and spheres under internal and external pressure, the development of a microplastiscope to reveal plastic flow within the grains of metals, the development of a device to test silver-chloride under polarized light for the study of the stresses within the grains, etc. These studies have been conducted by both staff and graduate students under Professor MacGregor's supervision. The Rolling of Metals Project has proceeded sufficiently so that industry (composed of most of the ferrous and non-ferrous metal fabricators in the country) is currently being supplied with unique and valuable data concerning the effect of various rolling conditions on the distribution of normal stresses in the contact arc between the rolls.

The main work of the Experimental Stress Analysis Laboratory has been in the line of academic instruction with the development of some new class exercises, which have been incorporated in the subjects of instruction. In addition to the regular subjects of instruction, lectures, laboratory exercises and demonstrations have been given in Photoelasticity, Stress Coat, Electric Strain Gages, and the Magnaflux, Zyglo, and Cyclograph methods of inspection to students in the subjects of testing materials and to one subject in metallurgy. Research investigations in progress under Professor Murray's supervision include a study of the effect of grain size on strain observations made with very small strain gages; development of an improved lateral extensometer for the Photoelastic Laboratory; and development of the Mesmer technique for finding isopachic lines in photoelastic models. Professor Murray has acted as Honorary Chairman of the A.S.M.E. student branch, as Secretary-Treasurer of the Society for Experimental Stress Analysis and Editor of their Proceedings, and as Secretary of the Conference on Fatigue and Fracture of Metals held in June at the Institute.

Professor John M. Lessells has been elected to the Management Board of *Applied Mechanics Reviews*, took part in the activities of the Professional Divisions Committee of the A.S.M.E., and has continued to serve as Editor of the *Journal*

*of Applied Mechanics.* He has also been elected to the Dudley Medal Award Committee of the American Society for Testing Materials, took part in the activities of Committee E-9 on Fatigue of Metals, and was responsible for the writing of the Section on Nomenclature for the Fatigue Design Manual published by the A.S.T.M. in 1950.

Professor Charles W. MacGregor served as a consultant to the Research and Development Board of the National Military Establishment and to the Committee on Basic Physical Sciences, as a member of the Special Research Committee on the Plastic Flow of Metals of the A.S.M.E., and presented a paper at the Fatigue and Fracture Conference held at the Institute during June.

*Textile Technology Division.* No changes were made in the Textile Technology curriculum during the year. The first of a series of candidates was awarded the degree of Doctor of Science in the field of fibrous high polymers.

A cooperative arrangement with the Lowell Textile Institute was formalized, permitting the interchange of instructional personnel, library facilities, and laboratory facilities between the two institutions. Two fellowships were added to the six already in existence.

Thesis research in the Division consisted of work in the field of fiber friction, contact areas between fibers, the differential transformer as a transducer in physical testing equipment, heat transmission in textiles, and durability of size applied to warp yarns.

The Division undertook a D.I.C. program on the fundamental mechanism involved in the migration of wool fibers in the fulling process.

Honors to staff members included the election as a Founding Fellow of the Textile Research Institute in November, 1949, to Professor Edward R. Schwarz and the award to him of an honorary Master of Science degree by the Lowell Textile Institute in June, 1950, in recognition of his outstanding achievements in the fields of textile research and education. Professor Rogers B. Finch was elected a Fellow of the British Textile Institute in May, 1950.

*Thermodynamics Division.* No major change was made in the instruction program in thermodynamics during the year.

Professor Frank A. McClintock, a former member of the Honors Course who has spent some time in the aircraft industry and some time as a member of the staff of the California Institute of Technology, has joined our staff. His broad experience in thermodynamics and heat transfer has been supplemented by research on strength of metals. It is expected that he will strengthen the ties between research and educational work in heat and those in materials.

Professor Warren M. Rohsenow is measuring heat transfer coefficients and pressure drop associated with the local boiling process for forced convection of water at pressures up to 2,000 psia. Apparatus is being constructed for determining visually the density fluctuations which accompany boiling. This work is sponsored by the Office of Naval Research.

The O.N.R. project on the transfer of heat to air flowing at supersonic speed in a pipe is being continued under the direction of Professors Joseph H. Keenan, Joseph Kaye, and William H. McAdams. Some of the previous results are being published by the A.S.M.E.

Professor Kaye has completed a research program on the transient temperature distributions in a wing flying at supersonic speeds. Four technical reports were published by the Air Force, the sponsors, summarizing this program.

*Cryogenic Laboratory.* Work continued on the project of the development of a cyclic process for refrigeration below 1° Kelvin, sponsored by the Office of Naval Research. The large helium refrigerator has been completed. Experimental apparatus to be used within it is now under construction.

Investigations related to turboexpanders and specific heats of gases have been undertaken for the United States Air Force.

Production of liquid nitrogen in the Laboratory for other departments of the Institute has been at a high level throughout the year — approximately 40,000 liters, as compared with 8,000 liters during the preceding year.

*Engine Laboratory.* The work of Professor William A. Wilson, assisted by Professor David A. Mooney and others of the Laboratory staff, has now begun to yield results in a program of Laboratory instruction which is alive to the students' needs and interests. A special effort is being made to reorganize

the laboratory instruction so that the students are placed in realistic situations with respect to the role they are expected to play and the proper emphasis of their reports. The principal technical objective is to give the students insight into the making of measurements, but it is equally important that the student be confronted with situations where good judgment and a responsible attitude are developed. With these objectives, the Laboratory program is undergoing a gradual change towards fewer exercises with more clearly developed objectives.

*Sloan Automotive Laboratory.* It has been evident during the past year that a keen interest in reciprocating internal-combustion engines continues among undergraduate students at M. I. T. Forty-six students (about the usual number) registered for the Senior Engine Theory course. Of these, 35 took the laboratory work, and 18 took the undergraduate Engine Design subject. The Elementary Engine Theory subject was given for 55 students, mostly from Courses XV-A and IX-B. The laboratory accommodated 11 undergraduate thesis students and nine graduate thesis students.

About 157 men came to the laboratory for work in connection with the regular Mechanical Engineering laboratory subject. This phase of the work is being conducted in close cooperation with Professor William A. Wilson. Both Professor Wilson and the Sloan staff feel that the internal combustion engine is not only a valuable professional subject, but also is an ideal medium for training engineering students in the application of the fundamental principles of rigid and fluid mechanics, combustion, heat transfer, lubrication, friction, and many other phases of mechanical engineering.

The undergraduate laboratory instruction has been handled by Professor Pei-Moo Ku and Mr. Donald Tsai, who have designed and built a completely transparent carburetor for class use in testing and demonstration. A Li strain-gage type indicator is now standard equipment, making it possible for the students continuously to observe the P-V diagram of the engine during experiments.

The number of graduate students in this division is somewhat disappointing. It is believed that this lack may be partly due to the current high cost of postgraduate education. Students are prone to accept thesis work in some division where

fellowship or other financial aid is available. Much valuable research at the graduate level could be done in the Sloan Laboratory if we could offer "Automotive" fellowships or similar help to qualified men. Funds for such fellowships are the major present need of this division.

The shift which is taking place toward Diesel power on United States railroads, together with a similar trend in heavy highway transportation and marine service, has emphasized the interesting and difficult development problems which this type of engine presents, and consequently many of our students are especially interested in this field. For this reason, increased attention is being given to the special problems of the Diesel engine in both lecture and laboratory courses. The post-graduate subjects in design, given by Professor C. F. Taylor, are now directed largely toward the problems of the Diesel engine.

The largest research project in the Sloan Laboratory during the past year has been the study of the auto-ignition of fuel-air mixtures, sponsored by the Ethyl Corporation. This work is carried out on the M. I. T. Rapid Compression machine developed by the staff and is under the direction of Professor William A. Leary of the staff and Mr. James C. Livengood of the Division of Industrial Cooperation. A paper covering the results of this work through the year 1949, presented at the annual meeting of the Society of Automotive Engineers in January, received much favorable comment and has instigated some very profitable discussion and interchange of ideas with both foreign and domestic workers in this field.

Preliminary studies are under way on the measurement of instantaneous cylinder gas temperatures using high frequency sound technique.

A graduate thesis was conducted this year in which the scavenging efficiency of three widely different types of two-stroke engines was compared. This work, the first of its kind on modern American engines, was greatly facilitated by a simple dynamic sampling valve suggested by Professor Augustus R. Rogowski.

A graduate thesis was conducted using the three geometrically similar engines to determine the effect of cylinder size on the maximum power obtainable without detonation. At

the same time, measurements were made to increase our knowledge of the effect of size on engine friction.

Undergraduate theses were undertaken in the fields of friction, detonation, combustion, and performance.

A study of the effect of engine operating conditions on the fuel-air cycle, begun by Professor C. Fayette Taylor, has been completed by Professor Ku, and the results presented in dimensionless form.

Work of this division published this year includes: "Ignition of Fuels by Rapid Compression," C. F. Taylor, E. S. Taylor, J. C. Livengood, W. A. Russell, W. A. Leary, Transactions, Society of Automotive Engineers, April, 1950, Vol. 4, No. 2; "An Investigation of the Effect of Tetraethyl Lead and Ethyl Nitrite on the Autoignition Characteristics of Isooctane and Triptane," J. V. Jovellanos, E. S. Taylor, C. F. Taylor, W. A. Leary, NACA Technical Note 2127.

Professor C. F. Taylor received the Oil and Gas Power Division Speaker's Award for the presentation of his paper, "The Effect of Size on the Design and Performance of Internal-Combustion Engines," at the Annual Meeting of the A.S.M.E. in New York.

*Gas Turbine Laboratory.* It is now nearly three years since the Gas Turbine Laboratory was dedicated in October, 1947, and about two years since full operation was achieved. It seems appropriate, therefore, to review some of the original objectives of the laboratory and to see how these objectives are being fulfilled.

There were three broad purposes for which the laboratory was built, namely, (1) to train graduate students in techniques and problems in the field of gas turbines and jet propulsion and also to give these students the opportunity to pursue problems on an individual basis through the medium of theses and research projects; (2) to acquaint the academic staff with new problems in the same general field through the medium of thesis supervision and guidance of research projects; (3) to extend the boundaries of knowledge in this field. Furthermore, the laboratory was conceived as a place in which at least three departments, Aeronautical Engineering, Chemical Engineering, and Mechanical Engineering had special interest.

In an effort to obtain some measure of the extent to which

these original objectives have been achieved, the following statistics have been compiled.

During the past year the following faculty members have actually participated in the laboratory activities as thesis supervisors or project directors: Professors Edward S. Taylor and H. Guyford Stever of the Aeronautical Engineering Department; Professors Hoyt C. Hottel, Harold S. Mickley, and Glenn C. Williams of the Chemical Engineering Department; and Professors William R. Hawthorne, Ernest P. Neumann, Warren M. Rohsenow, and Ascher H. Shapiro of the Mechanical Engineering Department.

There have been four Doctor of Science theses, ten Master of Science theses, and two Bachelor of Science theses completed in the laboratory during the past year. Currently during the summer months there are in progress seven Doctor of Science theses and six Master of Science theses, most of which will be completed by early fall.

During the past year the following papers have been published by members of the Gas Turbine Laboratory: Ernest P. Neumann and Harold W. Danser, "Industrial Sonic Agglomeration and Collection Systems," *Industrial and Engineering Chemistry*, Vol. 41, p. 2439, November, 1949; L. A. DeFrate, F. W. Barry, and D. Z. Bailey, "A Portable Mach-Zehnder Interferometer," *Meteor Report No. 51*, February, 1950; F. W. Barry, A. H. Shapiro, and E. P. Neumann, "The Interaction of Shock Waves with Boundary Layers on a Flat Surface," *Meteor Report No. 52*, March, 1950; S. L. Bragg and W. R. Hawthorne, "Some Exact Solutions of the Flow through Annular Cascade Actuator Discs," *Journal of the Aeronautical Sciences*, Vol. 17, No. 4, p. 243, April, 1950; E. P. Neumann and F. Lustwerk, "High Efficiency Supersonic Diffusers," *Meteor Report No. 56*, June, 1950; F. W. Barry, A. H. Shapiro, and E. P. Neumann, "Some Experiments of the Interaction of Shock Waves with Boundary Layers on a Flat Plate," *Journal of Applied Mechanics*, *Transactions of the A.S.M.E.*, Vol. 17, No. 2, June, 1950.

The following is a summary of the major research projects now in progress in the Gas Turbine Laboratory.

*Cascade Study.* (1) A two-dimensional low speed cascade design to study the influence of end effects on cascade per-



formance sponsored by General Electric Company and Westinghouse Corporation. (2) An annular cascade designed to study three-dimensional effects induced by variation in geometry along the blade is being conducted through thesis work. (3) Flow around bends or in single passages of a cascade. This work is being conducted by Professor Hawthorne on the Westinghouse Research Account. He has evolved a theory that permits him to predict what happens when a flow with velocity gradient is caused to turn around a corner. He is currently very enthusiastic about the results he has obtained experimentally. This work might ultimately lead to much better understanding of secondary flows in turbines or compressor passages.

*Turbine Cascade.* A two-dimensional cascade turbine nozzle has been constructed by the General Electric Company and is currently being studied in our variable density tunnel. The object of this project is to determine experimentally the variations in efficiency of a steam turbine nozzle lattice with independent variations of Mach number and Reynolds number. The details of the flow around the blade and in the boundary layer are to be studied by employing the optical interferometer.

*High Efficiency Supersonic Diffusers.* This project has been under way in the Laboratory for several years and has so far yielded some interesting and apparently useful results. A variable geometry diffuser, such as one might employ for a diffuser in a supersonic wind tunnel, has been tested. Preliminary small-scale results indicate that the operating power required by a supersonic wind tunnel might in the limit be reduced by as much as 50 per cent. The results of this study are currently being extended to investigate the efficient design of intakes for high speed aircraft or missiles. A further extension of the knowledge gained might conceivably be applied to the design of passageways for supersonic compressors. Note, for example, that a diffuser with boundary layer at entrance and an entering Mach number of 2.22 yields a diffuser efficiency of 87 per cent (same definition of efficiency which is used for compressors). This gives a pressure ratio across the diffuser of approximately 9. The problem in designing this diffuser has been largely one of control of interaction of shock waves and boundary layer. This project has been sponsored by

Meteor, and sponsorship will be terminated the latter part of this summer. We feel this work should, in some way, be continued, and a reasonable outlet may be to try to apply these results to compressor design. This would possibly entail construction of a radial machine, i.e., a single supersonic stage.

*Interaction Between Shock Wave and Boundary Layer.* In the supersonic flow through passageways conditions in the main stream seriously influence what happens at the boundaries of the stream. Shock waves may be set up which impinge on the boundary layer and cause separation. Considerable data using interferometer and schlieren techniques have been obtained. These same physical data have been of some help and guidance in achieving the high efficiency supersonic diffusers just mentioned.

*Application of Interferometer to Investigate Boundary Layer Phenomena.* We have finally arrived at a point where we can independently employ an interferometer to boundary layer investigation within certain restricted conditions. It has so far been employed in determining density distribution and consequently deducing velocity distribution in laminar boundary layer over a flat blade in supersonic flow. These data obtained on the flat blade are of some interest in that they yield information regarding compressible flow boundary layers. Moreover, the results that have been obtained have greater applicability in that we feel we know how to apply this instrument to other boundary layer problems, such as stall on compressor or foils, heat transfer, mass transfer, et cetera.

*Ejector Research.* The research on ejectors or jet pumps has been under way in the Mechanical Engineering Department and the Gas Turbine Laboratory for several years. This research work has produced a rational means for the design of jet pumps for simple applications such as an air-air ejector. However, the same analytical work has recently been extended to the point where we feel we can predict the performance of a given ejector without actually pumping fluids of a variety of chemical compositions. We are currently undertaking some tests where we vary the molecular weights of the driving and driven stream over a fairly broad range. The performance data to date agrees favorably with the analysis. This development is of interest to the chemical industry, and we hope to

apply our variable geometry supersonic diffuser results to jet pumps. This has not yet been accomplished but has come to the point where we are having the Institute look into the patent ramifications. If we are successful in achieving application of the variable geometry supersonic diffuser to jet pumps, a quite considerable gain in their efficiency might be had with possible important commercial applications.

*Supersonic Vortex.* The purpose of this project is to investigate the possibilities of designing a circular system of blades which would provide a supersonic vortex having a given Mach number and angle at the exit from the blades. Theoretical considerations are complete, and some data have been obtained which on a preliminary basis indicate that the theory may be useful for industrial design of impellers and diffusers for centrifugal compressors.

*Interaction of Heat Mass and Momentum Transfer in Boundary Layers.* Study of heat transfer coefficients from a flat blade to a low velocity air stream with suction or injection of gas through the porous surface of the plate. Theoretical work is complete and construction of apparatus is very nearly finished. This project is being done in cooperation with the Chemical Engineering Department.

*Hypersonic Wind Tunnel with Mach Number of 7.* Under the sponsorship of the NACA and in cooperation with the Aeronautical Engineering Department, a high speed wind tunnel has been designed and is under test. A Mach number of 7 has been achieved. The principal object of this study is to determine the effect of condensation of oxygen as the stream in the tunnel goes to low temperatures.

*Investigation of the Mixing of Gas Streams.* This project is under Meteor sponsorship, largely under the direction of Professor Shapiro. The object of this work is to obtain useful design information for the transfer of mass heat and momentum between two coaxial gas streams and to understand the mechanism of turbulent mixing.

In addition to the above-mentioned topics, the work of Professor Rohsenow on the rate of heat transfer for boiling liquids, and of Professors Hottel and Williams on flame stabilization are also being carried out in the Gas Turbine Laboratory.

C. RICHARD SODERBERG

## METALLURGY

*General.* The outstanding development of the year was a gift of a new Metals Processing Laboratory from Alfred P. Sloan, Jr., of the General Motors Corporation. This building will house all activities in connection with foundry, metal working, welding and other metal processing operations. The gift is an indication of the recognition by industry of the necessity for instruction and research in this field on a plane with other branches of science and engineering. The program in metal processing is under the able direction of Professor John Wulff who, during the past four years, has instituted a number of changes designed to raise the instruction to a high level of scientific standard.

Both undergraduate and graduate enrollment in Metallurgy are at an all-time high. The three undergraduate classes had approximately 42 students each, which is twice the prewar number. Graduate enrollment was 96, or about three times the prewar number. The demand is even greater and many good students could not be accepted because of inadequate facilities for larger groups.

The placement situation in Metallurgy is particularly good and all of the seniors obtained good jobs before the end of the term. In the Graduate School the demand has been so great that most men have a choice of several opportunities. There has also been an unusual number of requests for former graduates with some experience.

Research continues to be a very important part of the Department's activities and important contributions are being made in all branches of Metallurgy. Much of the research is sponsored by government and industry, the former totaling for the year \$2,022,318 and the latter \$195,074. Quarterly reports of research were published, beginning in January, which are circulated to a restricted mailing list. In this way results are available much sooner than is possible through normal publication channels. Contributors to the research program in Metallurgy include:

*Government Sponsors* — Air Force; Army Office of Air Research; Army Ordnance; Atomic Energy Commission; National Advisory Committee on Aeronautics; Navy Bureau

of Aeronautics; Navy Bureau of Ships; NEPA; Office of Naval Research.

*Industrial Sponsors* — Aluminum Company of America; American Brake Shoe Company; American Foundrymen's Society; American Iron and Steel Institute; American Smelting and Refining Company; Armour and Company; Engineering Foundation; Foundry Educational Foundation; Godfrey Cabot Solar Energy Fund; International Nickel Company; Republic Steel Corporation; Research Corporation; Revere Copper and Brass Company; Timken Roller Bearing Company; Titanium Alloy Manufacturing Company; Union Carbide and Carbon Corporation; Vanadium-Alloys Steel Company; Welding Research Council of Engineering Foundation; S. K. Wellman Company.

*Mineral Engineering Laboratories.* Two research programs of a restricted nature continue to be carried out by the M. I. T. Mineral Engineering Laboratory at Watertown Arsenal. Progress continues in the devising of ore treatment methods for low-grade uranium ores. Pilot plants and one full-scale plant are now in operation in connection with these programs.

A new process for the concentration of beryllium ores was devised during 1948 and 1949. This process is the first to use induced nuclear radioactivity for mineral engineering purposes. The research program on the use of flotation agents labelled with carbon 14 has continued. This program has been in course for four years and continues to yield fruitful results. It has the use, as tracers, of radioactive carbon, sulfur, silver, copper, calcium, barium, sodium and phosphorus. These tracers have been employed experimentally in equilibrium and kinetic studies in flotation, ion exchange, comminution and geochemical experiments.

A new phase of the unclassified Atomic Energy research has been aimed at utilizing nuclear properties for controlling mineral separations. This nontracer phase of the work is an outgrowth of the beryllium concentration process referred to above and promises the development of one or more new concentrating processes. In this connection it is especially gratifying to acknowledge the cooperation given us by the cyclotron and Van de Graaff generator groups.

Other problems occupying the attention of staff members have been the development of beryl deposits, of a new process for making electrolytic iron from waste pyrrhotite concentrates, of new flotation reagents from pine-tar distillation, and of the fundamentals of comminution. New processes for extracting metals from ores through the use of organic solvents are being explored. These look promising for certain metals. This new field has been christened Lyometallurgy.

During February a two-day conference in mineral engineering was held at the Institute. Over 100 guests attended.

*Process Metallurgy Laboratories.* Modernization of the undergraduate process metallurgy laboratory has been completed and many new experiments were developed during the year.

A broad study of the thermodynamic properties of solid and liquid metallic solutions is being undertaken. One phase of this work has been the measurement of the electrode potentials of liquid ternary alloys. This is the first systematic study of activities in ternary metallic systems.

Progress in the physical chemistry of steelmaking has included a broad study of rate and equilibrium in the transfer of sulfur from molten pig iron to slags. Thermodynamic properties of sulfur in liquid steel have been determined including the effects of various alloying elements on the activity coefficient. An improved method for analysis of hydrogen in steel has been developed as well as a new method of sampling by means of which the hydrogen contained in molten metal can be retained in the sample for analysis. Equilibrium in the deoxidation of steel by silicon has been studied in detail and progress has been made on the similar reactions of aluminum. The reactions of open-hearth-type slags with gases are under study. A method has been devised and preliminary experiments completed to measure the rate of diffusion of hydrogen through molten metals. The general study of reactions between slags and liquid metals is being extended to higher temperatures (about 3500° F.) in order to gain more knowledge of the arc welding process.

A general research program on the physical chemistry of the copper smelting process is underway. The oxygen activities in the iron silicate slags used in this process have been studied

by gas-liquid-slag equilibrium measurements in the temperature range from 1150–1400° C. From these measurements the activities of iron oxide and silica can be determined. Other studies include equilibrium measurements for the reactions of hydrogen with copper mattes and with sulfur dissolved in copper from which the sulfur activities and other chemical properties of interest in copper smelting and refining can be determined.

*Physical Metallurgy Laboratories.* The undergraduate physical metallurgy laboratories are extremely crowded because of the large number of students enrolled. The demand for research in physical metallurgy is also taxing the available facilities heavily.

The research program in physical metallurgy covers a wide variety of subjects. A study is being made of the surface hardening of low carbon steel by the controlled introduction of carbon and nitrogen simultaneously. This is a new method of surface hardening which is of particular interest to the mass production industries such as automobiles and farm equipment primarily because excellent properties can be obtained with the use of the lower-cost steels. The iron-nitrogen phase diagram has been redetermined and studies of the decomposition of nitrogen-austenite, nitrogen-ferrite, and nitrogen-martensite are in progress.

Research in the heat treatment of steel includes a study of the effect of strain on the martensite reaction. A theoretical treatment of the shear reaction has been developed, and it has been shown experimentally that this type of reaction can proceed even at liquid helium temperatures. Other research in this field has been on the effects of retained austenite and tempering phenomena on the physical properties of structural steels and the kinetics of tempering reactions.

A program on the dimensional stability of metals has been in progress for several years. This was originally concerned primarily with the stability problems encountered by industry in hardened tool steel gages. However, because of the increasingly greater industrial importance of the problem, particularly in applications involving close dimensional tolerances, the program has been extended to a study of the kinetics of phase transformations and the relief of residual stresses in a large

variety of ferrous and nonferrous materials. For example, the dimensional effects in invar have been studied and these have been correlated with the coefficient of expansion and with the solubility of carbon in invar austenite. As a result of this work it has been possible to develop modifications of the usual invar that have a zero expansion coefficient and high dimensional stability in the same alloy.

Other fundamental research problems included self-diffusion in pure iron, the fundamentals of recovery, cold work and recrystallization of metals and the nature of solid solutions and grain boundaries. A study is also being made of the application of radioactive tracers to problems in the metallurgy of aluminum and its alloys. Currently the solidification of aluminum alloys and the distribution of typical impurities are being investigated.

A special project under the direction of Professor A. R. Kaufmann is concerned with the process and physical metallurgy of special materials such as beryllium, zirconium and uranium. Much of this activity is of a developmental nature, but there is also some fundamental research. Some examples of the latter are investigations of the properties of beryllium single crystals, the recrystallization behavior of zirconium, the phase transformation mechanism of zirconium, and the phase diagram of uranium-zirconium alloys. The effect of pile exposure on the properties of metals is also being studied. Other research in this program includes such diverse subjects as the extrusion behavior of metals, the internal friction of metals at low temperatures, and the measurement of the magnetic susceptibility of all the pure metals. During the past year there were two Doctor's theses and three Bachelor's theses carried out under the auspices of this project. Summer jobs have been made available to a number of Metallurgy juniors and this arrangement has increased the contact with students. Five papers were published during the year.

The Department has for a number of years made important contributions to the development of alloys for high temperature service, particularly for jet engines and turbines. These include determination of the ternary phase diagrams for the chromium-molybdenum-iron and chromium-molybdenum-nickel systems, controlled grain size in turbine blades, the mode of deformation



of metals at elevated temperatures, and the mechanism of accelerated oxidation in certain stainless steels.

The Henry Marion Howe Medal of the American Society for Metals was awarded to Professors Averbach and Cohen, and to Dr. S. G. Fletcher for a paper on the dimensional stability of steel. Professor Cohen and Dr. W. J. Harris also received the Institute of Metals award of the American Institute of Mining and Metallurgical Engineers for a paper on stabilization of the austenite-martensite transformation.

*X-ray Laboratory.* The facilities of the X-ray laboratory continue to be used at an increasing rate both for formal course instruction and for graduate thesis work. The laboratory is well equipped as far as basic X-ray units are concerned, but there is need for additional accessory equipment such as cameras, film-measuring devices, etc. The undergraduate course in X-ray metallography is undergoing a complete revision for the coming year which will permit the student to obtain a better appreciation of the application and possibilities of X-ray methods as a basic metallurgical tool.

A broad program on a study of the refractory carbides and related refractory substances is underway which has as its objective a better understanding of their structure and properties. The development of a comprehensive and fundamental knowledge of these interesting materials should lead to wider application in the fields of cutting tools and parts for high temperature service.

The field of residual stresses in metals is also being investigated actively. While the immediate emphasis is on the development of X-ray methods for measuring residual stress, the availability of such a method in which the accuracy and reliability are well established will permit a better understanding of the nature and causes of residual stresses as well as a determination of their influence on the behavior of metal parts and structures. In this connection Professor J. T. Norton has recently been appointed chairman of the National Research Council Committee on Residual Stresses whose task is to investigate the influences of residual stresses on the performance of structures such as pressure vessels and welded ships. He is also the United States representative for the Commission on Residual Stresses of the International Institute of Welding.

*Metal Processing Laboratories.* These laboratories carry the heaviest teaching loads in the Department. During the year instruction was given to a total of 810 undergraduate students; and 28 graduate students were working toward advanced degrees. The latter include students in Mechanical Engineering as well as Metallurgy. In the foundry, due largely to the efforts of Professor Howard Taylor, considerable industrial support has been obtained for modernization of equipment and for research and fellowships. However, equipment for the antiquated welding and metal working laboratories is still badly needed.

Foundry research has included studies of molding sands, particularly flowability, wetability of clays, mold-metal interface reactions and the relative heat conductivities of molding materials. The fluidity of metals and alloys and the structure and physical properties of nodular iron have also been investigated. Nodular or ductile cast iron is probably the most important recent development in the foundry field, and it is expected to result in the use of castings for many applications where forgings must now be used.

In the welding laboratories a study has been made of the effects of welding speed, energy input and current wave form on energy efficiency in aluminum welding. The influence of these variables on joint strength is being investigated. Other work included the spot welding of steel, joint design for furnace brazing, and tear cracks in heavy-section austenitic welds.

In the metal working laboratories the surface tension and creep of solid metals has been investigated, particularly the flow characteristics of solid silver under small loads at high temperatures. A program on the true tensile behavior of metals at elevated temperatures is intended to provide true stress-strain data on pure metals and alloys over a range of temperatures. The results of this work may be applied to the mechanical behavior of metals and alloys for high temperature fabrication and use.

In the field of fracture of ductile metals, a study has been made of the origin of defects which lead to a reversible change in the tensile fracture of copper prestrained in torsion, in restricted pressing, and in other ways. Apparatus has been

constructed for tensile tests of ductile metals at constant true strain rates and under hydraulic pressure.

In cooperation with the Mechanical Engineering Department, studies are being made of the mechanics of the process of fine surface grinding of metals, including stress, temperature and metallurgical effects. Another program has to do with the development of metal-ceramic bodies which will have adequate resistance to high temperature oxidation and thermal shock. Ceramic surfaces are coated with metal by deposition from vapor mixtures of metallic chlorides and hydrogen. Metals are also being coated with refractory alloys by co-deposition of two or more metals from volatile compounds in the vapor state.

*Ceramics Laboratories.* During the past year research work has been carried out in the field of thermal conductivity measurements on pure oxides, and values for alumina and magnesia have been obtained up to 1300° C. with a high degree of accuracy. Work has also been carried out on the fundamental problem of thermal shock resistance of refractories and on the measurement of surface tension and wetting properties of liquid metals in contact with refractories.

The laboratory has continued to produce small refractory articles such as crucibles and tubing, and methods have been developed for fabricating a number of new materials. The number of graduate students in ceramics has been sufficient to fill the quota, and the demand for men is even greater than it has been in the past, as there still seems to be a great lack of well-trained men in this field.

Some of the new equipment developed in the laboratory during the year consists of an instrument for measuring the damping capacity of refractories at high temperatures, an instrument for measuring the hot modulus of rupture of refractories, and a furnace for measuring the surface tension of molten metals.

A third edition of the book *Refractories* by F. H. Norton was published during the year and contains much new and recently declassified information on the newer types of refractory materials.

*Corrosion Laboratory.* Two broad basic programs are

underway in the Corrosion Laboratory—corrosion mechanisms and the relation of metallic bonding to passivity and other chemical properties. Corrosion inhibitors are being investigated with the overall objective of knowing how they function and how they may be improved. Work centers on protection of iron and steel, with one project including inhibitors for titanium in hydrochloric and sulfuric acids.

Test equipment has been completed for studying the mechanism of fretting corrosion, a type of damage occurring at metal surfaces in contact, subject to vibration. The mitigation of fretting corrosion and resultant failure of metal parts by cracking is vitally important to the aircraft, automotive and other industries. Attention is also being paid to the chemical reaction occurring when aluminum is corroded by chlorinated solvents, such as are used in metal-cleaning operations.

The effect of metallic bonding in alloys on chemical properties is better understood through continuing studies of the intermetallic compounds of magnesium with tin, lead, germanium and silicon. Along the same lines, advance in knowledge of the corrosion resistance or so-called passivity in stainless steels and similar alloys is being made by electrochemical potential, radioactive tracer and contact potential studies, including measurements of the amount of corrosion inhibitor and oxygen take-up by a clean metal surface.

JOHN CHIPMAN

### METEOROLOGY

The number of students in Meteorology decreased somewhat from the previous year but the teaching load remained about the same. As in the past, the larger part of our educational facilities were devoted to graduate instruction. A number of new graduate students without previous training in meteorology required undergraduate professional subjects which would therefore have to be offered even if there were no undergraduate curriculum. A substantial fraction of the graduating seniors regularly enters the graduate school, reflecting the current demand for meteorologists with advanced training.

During the year, the staff of the Department undertook a study of the undergraduate curriculum with a view to substantial modifications. The present curriculum was designed primarily to provide a sound scientific background for, and training in, weather forecasting. The curriculum has been a success for this purpose but a steadily decreasing number of our graduates is entering this field. Employment opportunities are becoming more diversified and many of them require training in some other area in addition to meteorology. In designing the new curriculum it is planned to broaden the scientific base and to provide considerable elective time by reducing the number of required professional subjects. With the wealth of subject matter available throughout the Institute, this should make possible the selection of the course of study best suited to the needs and interests of the individual student. This curriculum study is continuing and it is anticipated that the revised curriculum will be submitted to the Faculty in the fall of 1950.

Through the courtesy of the Geophysical Research Directorate, Air Force Cambridge Research Laboratories, Dr. Heinz H. Lettau joined our staff as Lecturer. Dr. Lettau who has an international reputation in the field at atmospheric turbulence gave a graduate subject in his specialty during the spring term and also lectured during the second summer term of 1950. It is our good fortune that Dr. Lettau will continue with us on the same basis during the coming year.

The Department sponsored a Special Summer Program in Climatology during the summer of 1950. This program was made up of regular subjects offered during both summer terms and arranged so that students could profitably attend either or both terms. Several new subjects were offered, and our staff was supplemented by two outstanding visiting climatologists, Dr. Woodrow C. Jacobs of the Air Weather Service, U. S. Air Force, and Dr. Helmut E. Landsberg of the Research and Development Board. Applications were substantially in excess of the quota of 45, thus confirming our belief that there was a need for such a program. Almost all of the students were professional meteorologists who came from all sections of the country. Some of the subjects introduced for this summer program will now be offered during the regular academic year.

The research program of the Department is closely integrated with the educational activities. This is accomplished in part by the active participation of most of the graduate students and some of the undergraduates. In addition, the results of the researches are included in the regular subjects of instruction as they become available. A new graduate subject, Radar Meteorology, is based in large part on the results of the Weather Radar Research Project. The sponsored research programs continued at the same level as last year and negotiations for an additional project were initiated. Several smaller unsponsored studies were undertaken by individual staff members. A brief description of the sponsored research projects is given below.

The Weather Radar Project operates under a contract with the Signal Corps, Department of the Army, and is under the supervision of Mr. Alan C. Bemis. The object of the research is the exploration of atmospheric phenomena by means of radar. Several ground radars are operated and the Air Force has supplied an airplane which has been equipped with special instrumentation. Most of the observations and instrument developments envisaged when the project was started in 1946 have been accomplished, but the analysis of the data is far from complete. Earlier results emphasized the need for more accurate and complete measurements. Substantial progress has been made in these directions. Quantitative measures of the fluctuations of radar echoes from precipitation may provide a means for measuring turbulence by radar. Information from the radar systems has occasionally been of use to the Weather Bureau, Airways Traffic Control, and others. Because of widespread interest in the application of radar to weather, members of the project staff have given numerous informal lectures and demonstrations.

A project sponsored by the Department of the Air Force is continuing its studies of the general circulation of the atmosphere under the supervision of Professor Victor P. Starr. Empirical and theoretical results have indicated that the energy and angular momentum exchanges between low and high latitudes are accomplished mainly by quasi-horizontal, large-scale eddy processes. This represents a fundamental departure from

conventional concepts which ascribe the energy transport to closed meridional circulation cells. Additional empirical and theoretical work is required to confirm these findings which may well lead to a complete revision of present ideas concerning the global circulation mechanism of the atmosphere.

In a project sponsored by the Office of Naval Research, a group under the direction of Professor James M. Austin has continued to study the atmospheric processes which accompany changes in atmospheric pressure. Empirical studies of vertical accelerations, horizontal wind divergence, and the vertical distribution of air density have done much to clarify and extend our knowledge of the changes in atmospheric structure which accompany the motion and intensification of storms. It has been found that most of the changes accompanying a fast-moving storm, which does not intensify, occur in the lower portion of the atmosphere. On the other hand, intensifying but stagnant storms show changes of structure primarily within the stratosphere. This striking difference between the processes of translation and intensification should permit more rapid progress in our understanding of the causative mechanisms. Immediate application of these findings will also be made to the forecasting problem.

In cooperation with the Weather Bureau a research group under the direction of Professor Hurd C. Willett has continued to study the variations in the general circulation of the atmosphere with the aim of developing improved methods of forecasting the weather for periods of several days to a month or more in advance. Previous work, which was based on data from the northern hemisphere alone, indicated that there were important interactions with the southern hemisphere. As reported last year, the Weather Bureau supplied additional funds to permit us to attempt the preparation of daily weather maps of the southern hemisphere. With the active cooperation of the Weather Bureau and the meteorological and maritime agencies of the southern hemisphere we have been able, for the first time in meteorological history, to prepare southern hemisphere weather maps comparable in completeness to those for the northern hemisphere. These maps will permit, for the first time, an integrated study of the circulation of the atmosphere over the entire globe. Further studies have provided

new evidence of the influence of irregular solar activity on the weather patterns of the northern hemisphere.

The research project on low level turbulence and diffusion sponsored by the Department of the Air Force continued to progress at the Round Hill Field Station under the direction of Dr. E. Wendell Hewson. Special instrumentation has been developed for measuring atmospheric parameters related to turbulence, and useful data have been collected. A novel and promising theoretical approach to turbulence has been developed and plans are being made to collect the data required to test the theory.

Members of the staff participated in numerous outside professional activities. Professor Hurd C. Willett was invited to lecture for a month in Sweden and attended the Centenary Meeting of the Royal Meteorological Society in England. He has also served as a consultant to several industries and municipalities in connection with the problem of atmospheric pollution. Professor Thomas F. Malone was granted a leave of absence for the entire year to permit him to serve as Editor of the Compendium of Meteorology for the American Meteorological Society. Professors Henry G. Houghton and Hurd C. Willett served on the Committee charged with the planning of the Compendium of Meteorology and also on a Panel of the Research and Development Board. Professor Willett was Chairman of the Nominating Committee of the American Meteorological Society. Professor Houghton was a member of the Council of the American Meteorological Society, of the Scientific Advisory Board of the Department of the Air Force and of a subcommittee of the National Advisory Committee for Aeronautics.

HENRY G. HOUGHTON

#### ROUND HILL FIELD STATION

The principal activities at Round Hill continue to be a research project of the Meteorology Department and the Tech House which is operated by the Technology Christian Association. The four members of the research staff and their families are housed in small dwellings on the estate. The Tech House is occupied by student groups during week ends and



by staff members and their families during week days in the summer. The excellent beach has been made available to the alumni of the New Bedford area and their families.

As funds permit, the ravages of time and weather are being repaired. One of the smaller rooms on the ground floor of the mansion has been redecorated and equipped as a conference room. It is hoped that it will be possible to make more effective use of the mansion in the future but this will require substantial expenditure.

HENRY G. HOUGHTON

### MILITARY SCIENCE AND TACTICS

With the establishment of a separate Department of the Air Force in the federal government, there was established at the Institute a separate Department of Air Science under Major Thomas U. Lineham, Jr., Professor of Air Science and Tactics. The Institute appointed the Dean of Humanities, Dean John E. Burchard, as the Coordinator of R.O.T.C. Affairs.

The year 1949-1950 saw a new R.O.T.C. program inaugurated at the Institute as well as at other colleges throughout the nation. The major change in the program provides for instruction pertaining to the different branches of the services in the sophomore year whereas previously all sophomores had taken the same subjects. Thus at the beginning of the sophomore year at the Institute the sophomores have the opportunity of selecting the branch of the Army or Air Force with which they desire to associate themselves during the year. Seven choices are available at M. I. T. — six in the Army and one in the Air Force. The Army choices are the Corps of Engineers, Signal Corps, Ordnance Corps, Chemical Corps, Army Security Agency and Quartermaster Corps. The new freshman program continues to provide common instruction for all freshmen, both Army and Air Force. The academic year 1949-1950 constituted a transition year in the academic programs of the sophomore, junior and senior years from the old curriculum to the new. The new freshman program was initiated without change from the curriculum furnished by the Department of the Army and the Department of the Air Force.

The comparatively peaceful era in which the nation found

itself at the beginning of the school year caused a considerable decrease in enrollment in the junior year of the elective advanced course (junior and senior years). A tabulation of the R.O.T.C. enrollment by units is given below.

	<i>Freshman</i>	<i>Sophomore</i>	<i>Junior</i>	<i>Senior</i>
<i>Army</i>				
Corps of Engineers.....	125	66	13	32
Signal Corps.....	95	61	5	22
Ordnance Corps.....	22	47	8	34
Chemical Corps.....	80	65	16	22
Army Security Agency.....	46	60	12	21
Quartermaster Corps.....	19	38	6	15
<i>Air Force</i> .....				
	157	143	34	53
Totals.....	544	480	94	199

For the first time since World War II commissions were presented at the graduation ceremonies to those students entitled to them. There were 132 students who received commissions as second lieutenants in the Army of the United States and similarly 49 students received commissions as second lieutenants in the United States Air Force Reserve.

During the school year freshmen were given the opportunity to sign a draft deferment agreement in which they promised among other things to continue their R.O.T.C. course for the four years at the Institute during which time the federal government promised not to induct them into the active military service. Thirty-two availed themselves of the opportunity of signing this agreement.

Colonel Harold R. Jackson, Coast Artillery Corps, completed his fourth year as Professor of Military Science and Tactics at the Institute. He has been replaced by Colonel Charles F. Baish, Corps of Engineers. Colonel Curtis L. Varner, Officer in Charge of the Quartermaster Unit, Lieutenant Colonel Herrick F. Bearce, Officer in Charge of the Army Security Agency Unit, and Lieutenant Colonel R. Stuart Crossman, Officer in Charge of the Ordnance Unit completed their tours at the Institute and have been replaced by Captain Augustine M. Fragala, Major Finis G. Johnson and Lieutenant Colonel Samuel L. Hall, respectively.

The Military Science Department has continued to sponsor the activities of the Massachusetts Institute of Technology Chapters of Pershing Rifles and Scabbard and Blade. These national honorary military societies have served to promote the mutual interests of the Department and the Reserve Officers' Training Corps students in the basic and advanced courses.

CHARLES F. BAISH

NAVAL ARCHITECTURE AND MARINE ENGINEERING

The most striking fact to report is the increased interest in graduate instruction. This has been evidenced by several facts. In the first place, for the first time the quota of graduate students has been completely filled, and it was necessary to refuse admission to several qualified applicants. The Navy has held over one of the recipients of the Naval Engineer degree to permit him to qualify for the doctorate, something that has not been done during the past 50 years at the Institute. The Department has two civilian candidates for the advanced engineering degree. This increased interest in graduate instruction has not resulted in any diminution of demand for undergraduate work.

Both the recipients of the scholarships granted by the Society of Naval Architects and Marine Engineers for graduate work in naval architecture and marine engineering elected to study in this Department.

Stimulated by the report of the Lewis Committee, the Department has two committees making a complete study of its curricula. This study has already brought substantial academic benefits but has not yet been completed.

The academic facilities of the Department have been substantially improved. The Hydrodynamics Laboratory with the ship model towing tank has been completed. We are at present engaged in the installation of the dynamometer and the towing gear, which will shortly be completed. Our plans contemplate the use of this facility for instructional purposes during the current year. We have also recently received as a gift from Mr. William S. Newell a tank for use in statics and wave studies. We expect to put this tank in use during the fall.

The requirement of sea service in Course XIII-C, Marine Transportation, has been changed. Students now have an option of one year or six months practical sea experience. The year at sea will continue to be offered at the end of the third year, and the six months' requirement will be met by spending at sea the summers following the second and third years of the course.

Rearrangement and enlargement of the drawing facilities have been completed. Rooms 5-307, 5-311 (formerly the Dard Hunter Paper Museum), 5-310 and 5-320 are now available for the use of student naval officers enrolled in Course XIII-A. Alterations to the fourth floor drawing room, 5-420, have also been completed.

The Department has also received several objects suitable for display. Some of these will be exhibited in the Francis Rusell Hart Nautical Museum and others in other suitable locations, such as the Engineering Library. We have adopted a policy of rotating exhibits in the Nautical Museum in view of the fact that we have more interesting exhibits than space to display them.

Several important changes in the composition of the staff have occurred. Vice-Admiral Edward L. Cochrane, U. S. Navy (Retired), Professor of Naval Construction, and in charge of the Department, was granted leave of absence to permit his acceptance of appointment as Chairman of the Federal Maritime Board and Administrator, Federal Maritime Administration. Captain James M. Farrin, U. S. Navy, Professor of Naval Construction, and in charge of Course XIII-A, was granted a leave of absence upon his being ordered by the Navy Department to other duty.

Professor George C. Manning has been designated to serve as Head of Department ad interim. Captain Horatio C. Sexton, U. S. Navy (Retired) has been given a temporary appointment for one year as Associate Professor of Naval Architecture. Mr. Norman C. Ficken has been appointed an Instructor, and Messrs. Charles A. Gern and Alexander J. Tachmindji have been appointed half-time teaching assistants in the Department.

GEORGE C. MANNING

## SCHOOL OF SCIENCE

### BIOLOGY

During the year several changes in the undergraduate curriculum were adopted. Comparative vertebrate anatomy, traditionally a junior subject, will be included in abbreviated form in elementary general biology. A new term subject in cytology and histology will be substituted for comparative anatomy. This, together with embryology, will form the basis for all advanced subjects in the Department. Professor William F. Loomis, previously in charge of instruction in embryology, resigned to join the Rockefeller Foundation as Assistant Director for Natural Sciences. During 1950 embryology was taught by Professor Viktor Hamburger, on leave from Washington University, serving as Visiting Professor. Dr. James D. Ebert, who has been appointed Instructor of Embryology, will teach the junior and advanced subjects in this field.

Another important curriculum change was approved by the faculty, namely the offering of a new Course VII-B, Chemical Biology. Like Course VII-A, Physical Biology, this is a five-year course leading simultaneously to the degrees of Master of Science in Chemical Biology and Bachelor of Science in Quantitative Biology. In the course the emphasis will be on chemistry rather than on physics, as is the case with Course VII-A. The new course has been greeted with enthusiasm by the students and will meet a need long felt by the Department.

A new requirement of all candidates for the doctorate, before completion of qualifying examinations, is participation in a seminar course on recent advances in biology. Other new advanced subjects given during the year include a Seminar on Neurology and a Seminar on Respiratory Enzymes.

Fourteen medical postdoctoral fellows are in residence. Of these six are candidates for the Ph.D. in biophysics or biochemistry. Six others have staff appointments at nearby hospitals, including the Massachusetts General, Peter Bent Brigham, and Children's Hospitals. This liaison between the Biology Department and the research programs of teaching

hospitals has proven most valuable to the medical fellows and to the institutions concerned.

Research on the structure of biological materials continues to increase in scope and intensity. Professor Richard S. Bear and associates have completed a detailed X-ray analysis of the structure of the fibrous protein, collagen, and have made important contributions to the study of the keratins and the molecular nets of muscle fiber proteins. Noteworthy advances in low-angle X-ray diffraction technique were required before these results could be obtained.

Electron microscope studies reveal a higher level of structure. Professor Cecil E. Hall has developed a technique by which he has succeeded in photographing the molecular aggregates of edestin, catalase and several other crystalline proteins. The group working under the direction of Professor Francis O. Schmitt have developed the technique of thin sectioning for the examination of tissues with the electron microscope. The technique has been applied chiefly to a study of nerve fibers. It is hoped that a combination of physical and chemical characterization of nerve proteins with electron microscope studies will contribute to our understanding of nerve function. Electron microscope techniques as employed in this laboratory have been studied by many visitors from this country and abroad.

At a still higher level of structure, Professor John R. Loofbourov and associates have brought their development of techniques for ultraviolet microscopy and microabsorption spectroscopy to a point where it is now profitable to apply them to a study of biological and biochemical problems. Also completed is a survey of low-temperature spectra of proteins, amino acids, nucleic acid derivatives and steroids. Progress has also been made with the isolation and identification of substances released from radiation-damaged cells.

Protein physical chemistry has become a major field of research since the necessary equipment was assembled. Professor David F. Waugh is continuing his studies of the fibrous aggregation of insulin molecules and has extended the scope of the work to include serum albumin, egg albumin and the kinetics of blood coagulation. Most recently, with the aid of

a grant from the National Dairy Association, he has begun a study of the coagulation of casein. His group is also investigating the physical properties and the ultracentrifugal isolation of the adrenocorticotrophic hormone (ACTH) under the auspices of Armour and Company.

In enzymology lies the key to most intracellular chemical reactions. Professor Irwin W. Sizer's group, augmented by a number of postdoctoral fellows, is investigating a variety of enzyme systems in addition to Professor Sizer's chief concern, the action of oxidative enzymes on proteins, enzymes and hormones. The results of the latter research were summarized by him at an International Congress of Biochemistry in Cambridge, England. Because absorption spectroscopy is an important tool in enzymology, a close integration has developed between the laboratories of Professors Irwin W. Sizer and John R. Loofbouroow.

Professor Bernard S. Gould continues his studies of anti-scorbutic substances and the role of proline in wound healing. Microbiological studies include the distribution of phosphatases in *Neurospora* and the mechanism of mold pigment formation. The latter is in collaboration with Professor George T. Johnson, who is also working on the characterization of various types of protoplasmic particulates, including mitochondria and chloroplasts.

Professor Charles H. Blake has concerned himself with ornithological field studies.

From Professor Kurt S. Lion's instrumentation laboratory have come successfully developed methods for measurement of blood pressure by means of a transducer operating on the principle of a high frequency gas discharge, and for recording of the electrical activity of the brain at frequencies above 200 cps. His present major effort is devoted to the development of a new type of radiation detector.

Several members of the staff serve on advisory committees of the American Cancer Society, U. S. Public Health Service and National Research Council. Special lectures and symposium talks were given by many members of the staff during the year.

Perhaps the most significant event during the year was

the authorization by the Institute to proceed with the planning and erection of the new building to house the Departments of Biology and Food Technology. The designing is in an advanced stage, and ground will be broken before Christmas, 1950.

FRANCIS O. SCHMITT

### CHEMISTRY

Changes in curriculum in the Department of Chemistry include the introduction of a new subject (5.60, Physical Chemistry) to replace qualitative analysis as the terminal subject in Chemistry for Course VIII (Physics) majors in the sophomore year. This new one-semester subject in chemical principles is taught by Professor James A. Beattie. During the 1950 summer term three short, intensive subjects intended primarily for practicing chemists in industry were offered by members of Chemistry Department staff, and attracted larger-than-capacity groups of registrants. The subjects were Optical and Electrical Methods of Instrumental Analysis, offered by Professors David N. Hume and L. B. Rogers, and the Techniques and Applications of Infrared Spectroscopy, offered by Professor R. C. Lord.

In the graduate program in Chemistry efforts have continued to encourage and develop in the students the capacity for original, creative thinking. In analytical and organic chemistry the oral major examination has been directed toward this end by requiring the students to present and defend so-called "propositions," which are original ideas suitable for experimental research devised by the students. Training in speaking and writing on scientific subjects has continued through the media of oral seminars, written seminar abstracts and term research reports, and in some research groups through written monthly research reports prepared by the students.

Placement of June and September graduates (S.B., S.M. and Ph.D.) was practically complete in May, 1950. The numbers of degrees granted were: 40 doctoral degrees, making 412 the total number awarded in Chemistry since 1907, 5 master's degrees, and 34 bachelor's degrees. Of the bachelors candidates 18 are continuing with graduate work, 4 at the Institute and 14 elsewhere, and 16 have entered the chemical industry.



Research in the Department has continued at a high level of productivity in many fields, as is illustrated by the publications of members of the staff which are listed separately in the President's Report.

ARTHUR C. COPE

### FOOD TECHNOLOGY

Two developments within the Department have been significant. First, with the help of the Chemical Engineering Department, a two-term subject in the Chemical Engineering Applications in Food Processing under Professor William C. Bauer was instituted. Secondly, junior members of the staff were assigned as laboratory assistants in three of our laboratory subjects with marked improvement in this instruction.

During the year, the Institute of Nutrition of Central America and Panama was opened in Guatemala City. This Institute was conceived by Professor Robert S. Harris and he is playing an active role in the planning of its biochemical and clinical research program. This Institute is an outgrowth of the four-year food analysis survey of the edible plants of Central America which was undertaken by the Department under the sponsorship of United Fruit Company. A monograph summarizing this program will be ready for publication shortly. The Nutritional Biochemistry group presented papers at eight scientific meetings during the year.

Professor Bernard E. Proctor has been active in the research program of the Department relating to the sterilization of foods by cathode rays. Numerous publications in this field have been made on the effect of such irradiation on foods, vitamins and amino acids in recent months, with Dr. Samuel Goldblith and Dr. John T. R. Nickerson as co-authors. Professor Proctor has also participated actively in the affairs of the Institute of Food Technologists, The Refrigeration Research Foundation and is Chairman-elect of the Division of Agricultural and Food Chemistry of the American Chemical Society. He is also serving as Chairman of a National Research Council sub-committee relating to Army emergency rations.

Professor Ernest E. Lockhart has established a calibrated test panel for acceptance evaluation in food flavors and has

presented several papers relating to the chemistry of the compounds involved in flavors. He is also revising the textbook on Food Chemistry originally written by Emeritus Professor A. G. Woodman.

During the year Professor Cecil G. Dunn has completed revision of his book on "Industrial Microbiology," written with Dean Prescott; written and had published comprehensive reviews on (1) The Quaternary Ammonium Compounds, and (2) Sanitation in the Food Industries; presented papers at scientific meetings; been active as Deputy Commander and Chief of Staff of the 1050th Research and Development Training Group (Army), as Vice-President of the Northeast Branch, Society of American Bacteriologists.

At the suggestion of the Department Visiting Committee, active efforts are being made to offer an option in Biochemical Engineering in the Department curriculum which should be of particular interest to the pharmaceutical industry.

For the first time since the war, a short summer course in Food Technology was given and it was so successful that it was repeated again in 1950.

Mention should be made of the magnificent gift by the Campbell Soup Company of the new Dorrance Laboratory for the two Departments of Biology and Food Technology. Acknowledgment should be made for the participation of the United Fruit Company in the Development Program, and the National Dairy Company should be added to our list of sponsors.

WILLIAM L. CAMPBELL

### GEOLOGY

For the first time since the war, the Department has had a full quota of undergraduates in each of the three classes and a near quota enrollment of graduate students. Consequently a major part of staff time has had to be devoted to undergraduate teaching and to direction and supervision of graduate instruction and research. The undergraduate program of instruction now includes at least one lecture subject by every member of the regular staff.

The second summer operation of our field camp near

Antigonish, Nova Scotia, was again outstandingly successful, with 25 students in residence, and at its conclusion the Board of Governors voted to exercise the option to purchase the Crystal Cliffs property where camp headquarters are located. Later in the year the property was purchased by the Province of Nova Scotia and during the winter and spring months, new facilities were added in anticipation of future expansion. Nineteen undergraduates received field instruction and six others carried on S.B. thesis work; five graduate students worked on field theses. As in the previous summer, Professor Walter L. Whitehead served as Director of the Camp and was assisted by Professor Roland D. Parks, who instructed in Geological Surveying.

Research in the Department maintained a healthy balance between field investigations and experimental and instrumental laboratory work and continued at a high level much as last year. Professor Martin J. Buerger continued his research in X-ray Crystallography and developed a widely publicized instrument for photographing the geometric position of atoms in crystals. He also investigated the properties of the Patterson function and has been able to show that it is mathematically possible to derive from this function very important information about crystal structure. The investigation of the origin of gas and petroleum sponsored by the American Petroleum Institute and supervised by Professor Whitehead continued for the eighth year. Dr. Irving A. Breger, Research Associate, who has been associated with this project since its inception, was granted a Fulbright Fellowship and left in July to carry on geochemical research at the University of Utrecht, Utrecht, Holland. Professor P. M. Hurley continued his investigation of age determination of ores, rocks and sedimentary materials by the helium method and further expanded his research in the general field of geophysics. The program of spectrographic research on both major and minor rock constituents supported by a grant from the Office of Naval Research to Professor Harold W. Fairbairn continued for the second year under the supervision of Dr. Louis H. Ahrens, Research Associate.

The quota of graduate students for the school year 1950-1951 has been completely filled and our research facilities will

be taxed to the limit in meeting the requirements of what promises to be the largest graduate enrollment in Geology that the Institute has ever had. In anticipation of these requirements, a few additional bays of space in Building 24 will be equipped as special laboratories and are expected to be ready for use at the beginning of the fall term. These laboratories will add appreciably to the departmental facilities for quantitative research and are in line with our policy of expanding this kind of geological work. A record enrollment of undergraduates also seems in prospect and limited thesis facilities are being temporarily set up in Building 20.

Instructional changes planned for the 1950-1951 academic year include the addition of a senior subject and a graduate seminar in Geochemistry, both to be taught by Dr. Louis H. Ahrens, recently appointed an Assistant Professor of Geology. Plans have also been made to resume undergraduate and graduate laboratory work in Geophysics which, during the leave of absence of Professor John N. Adkins, has been temporarily suspended for the most part. Professor Adkins was on leave during the entire year while serving as Director of the Earth Sciences Division of the Office of Naval Research in Washington. He resigned at the close of the school year, and instructional work in Geophysics during the 1950-1951 academic year will be conducted jointly by Professor Patrick M. Hurley and Dr. Norman A. Haskell, who will serve as a Research Associate.

Several important staff changes were made during the year. Professor Warren J. Mead retired at the end of the school year 1949-1950, but was appointed a Lecturer for the past year and continued to give the two special subjects in Engineering Geology which he has offered for many years. Professor Mead assumed the Chairmanship of the Department in 1934 after the retirement of Professor Waldemar Lindgren and during his Chairmanship the staff not only expanded but underwent almost complete change of personnel. Professor Robert R. Shrock, Executive Officer from 1947 to 1950, served as Acting Head of Department and was appointed Head of Department late in the year, and Professor Hurley was at the same time appointed Executive Officer of the Department. Professor Frederick K. Morris, for 20 years a member of the

Department, reached retirement age during the year and became Professor Emeritus. He has accepted a position on the staff of the Commanding General of Maxwell Air Field, Montgomery, Alabama, and plans to continue geological research with his usual vigor and enthusiasm. As stated previously, Professor Adkins resigned his position as Assistant Professor of Geology and Dr. Ahrens, who has been a Research Associate in the Department since 1947, was appointed an Assistant Professor of Geology. Dr. Donald J. MacNeil, Professor of Geology and Chairman of the Geology Department, St. Francis Xavier University, Antigonish, Nova Scotia, was appointed Lecturer for the school year 1950-1951. He will participate in the instruction at the Summer Field Camp and will deliver a series of special lectures on coal geology during the spring term of 1951.

In the course of the year, several members of the Department gave invited lectures or participated in special symposia. In particular, Professor Buerger spoke to numerous groups interested in Crystallography; Professor Hurley participated in several symposia on the origin and age of the earth; and Dr. Ahrens met several times with Washington groups interested in geochemical problems. Certain members of the Department also continued to serve on various governmental and professional committees.

ROBERT R. SHROCK

#### MATHEMATICS

During the year the Department reviewed the content of the subjects offered in the first two years. With a view to making improvements in these subjects, revised curricula were tried in selected sections. Professor Francis B. Hildebrand continued his work for an integrated program of graduate mathematics for engineers. His textbook, "Advanced Calculus for Engineers," appeared in September, 1949, and found favorable reception here and at other institutions. Since then he has prepared a new subject on Methods of Applied Mathematics which will follow the present two-term subject on Advanced Calculus for Engineers, and will be offered in the fall term.

Professor Carl B. Allendoerfer of Haverford College served as Visiting Professor in the Department during the spring semester. Lecturers in the Departmental Lecture Series were Professors Richard Brauer of the University of Michigan, Claude Chevalley of Columbia University, Lars Garding of Lund University, Sweden and the Institute for Advanced Study, Kunihiko Kodaira of the University of Tokyo and the Institute for Advanced Study, and Tracy Y. Thomas, of Indiana University. Professor Mark Kac and Dr. Monroe D. Donsker, both of Cornell University, gave a series of six lectures in a special seminar on Applications of Statistical Methods to Differential and Integral Equations. The lecture series and seminar were attended by students and staff, both from the Institute and from neighboring institutions.

During the fall semester, Professor Norbert Wiener was on leave at the National Institute of Cardiology in Mexico City where he and Dr. Arturo Rosenblueth continued their joint research, which is supported in part by the Rockefeller Foundation.

During the summer of 1949 three members of the Department served as Visiting Professors in the summer schools of other universities, Professor Witold Hurewicz at the University of California, Berkeley, Professor William T. Martin at the University of California, Los Angeles, and Professor Eric Reissner at the University of Michigan.

Professor Henry Wallman, who has been spending the past two years on leave as Visiting Professor in the Electrical Engineering Department at the Chalmers Institute of Technology in Gothenburg, Sweden, resigned his position here and accepted an appointment as Professor at Chalmers beginning in the Fall of 1950. In December 1949, while Visiting Professor at Gothenburg, Professor Wallman was elected a foreign member of the Royal Swedish Academy.

Professor Philip Franklin continued to serve as consultant for Project Whirlwind. Professor Chia-Chiao Lin carried on his work on research sponsored by the National Advisory Committee for Aeronautics. Professor George P. Wadsworth again conducted a research project on Weather for the Army, and also continued as Project Director for the Operations Evaluation Group. Professor Eric Reissner was in charge of

a project sponsored by the Office of Naval Research. In January he became a member of the editorial board of the Journal of Applied Physics.

In May Professors Witold Hurewicz and George W. Whitehead were invited speakers at a special conference on Topology held at the University of Chicago. Professor Lin gave an invited address at the annual meeting of the Fluid Mechanics Division of the American Physical Society in January. In December Professor Wiener gave the annual Josiah Willard Gibbs lecture at the meeting of the American Mathematical Society held in New York City.

Professor Henry B. Phillips was elected secretary of the American Academy of Arts and Sciences.

Professor Raymond D. Douglass assumed the duties as Chairman of the Staff-Administration Committee.

Professor George P. Wadsworth served on the Faculty Committee on the Special Summer Program for high school teachers, and arranged lectures by several members of the Department for this program.

The Visiting Committee for the Department held a well attended meeting at the Institute in March under the chairmanship of Dr. Alfred L. Loomis. The interest shown by the Committee in the work of the Department and the suggestions made by the members of the Committee proved most helpful to the Department.

In February, Professor G. B. Thomas, Jr. became Executive Officer of the Department. In his new work he will pay particular attention to the problem of coordinating more closely the studies and teaching duties of those members of the staff who are also graduate students.

WILLIAM T. MARTIN

## PHYSICS

The Physics Department during the year has carried out the projects mentioned in last year's report with few unexpected changes. Perhaps the most interesting feature of the year was the graduation of the largest group of seniors we have ever had in Course VIII, and the administration of senior theses for this large and unusually able group. This has meant that

almost every research project in the Department has concerned itself with undergraduate research. There have been many small, informal seminars at which the seniors consulted their professors about their own research problems, and about research in general. Many results of these senior theses form publishable work.

The result of this activity among the seniors has been that a very large fraction of them have decided to go on with graduate work, either at the Institute or elsewhere. The need of graduate training, as a preparation for a career in physics, becomes stronger all the time, and increasing numbers of our students are realizing this. The pressure for admissions to the graduate school in physics, both from our own graduates and from those from other schools, continues very strong. In our admissions for the year 1950-1951, we have had to turn away many well-qualified applicants, and even so, the admissions will carry the size of the graduate school well over the quota allowed by the Stabilization Committee.

Notwithstanding these large numbers, the problem of placement does not seem severe. No particular trouble was encountered in placing our students, either undergraduate or graduate, during the year. Professor Clark Goodman undertook the difficult job of graduate placement officer, organizing the relations between graduate students and employers in a very effective manner.

A new arrangement was put into effect for undergraduate registration officers and placement officers, made necessary by the large number of undergraduates. In the future, a registration officer will be appointed for a sophomore class, and will follow along with that class, acting as placement officer when they become seniors. Following this scheme, Professor Hans Mueller, who had been junior registration officer for the class of 1950, became senior registration officer and placement officer for that class. Professor Donald C. Stockbarger, who had been sophomore registration officer for the class of 1951, became junior registration officer, and will be senior registration officer in 1950-1951. Professor Bertram E. Warren became sophomore registration officer for the class of 1952.

The changes in graduate curriculum, mentioned in the preceding report, were put into effect, and operated smoothly. The research program made many notable advances. The



synchrotron was put into operation, and produced mesons. The linear accelerator was completed. The cyclotron and Van de Graaff generators yielded valuable nuclear information. The microwave gas discharge and physical electronics groups were very active, and the low temperature group acquired a group of capable students. Significant new developments in the ruling of diffraction gratings were made in the spectroscopy laboratory. The X-ray laboratory devised a new method for investigating distortions in metals. Most of these results, and many more, are taken up in more detail in the reports of the interdepartmental laboratories, in which most of the Department's research is carried out.

The Department served as host to an International Conference on the Physics of Very Low Temperatures in September 1949, and to one of the annual conferences on Physical Electronics in March 1950. In the summer of 1950, a Symposium on Modern Physics was organized, running for a six weeks' period, intended not only for our own students, but for students from outside the Institute. Visiting lecturers were Professor P. Scherrer, of the Eidgenossische Technische Hochschule, Zurich, who gave one of his famous series of experimental lectures on modern physics, and Professor E. Amaldi of the University of Rome, a well-known expert on nuclear physics; several members of our own staff, including Professors Weisskopf and Morse, also took part. This was the first teaching undertaken by Professor Morse since his return from his various government duties, which lasted until June 1.

Professor Sears conducted highly successful summer sessions for high school teachers, sponsored by the Westinghouse Educational Foundation, during the summers of 1949 and 1950; these form the first two of a five-year series for which financial support has been secured. A selected group of physics teachers were given an opportunity to bring their training up to date not only in physics but in many other branches of modern science as well.

Professor Morse, as mentioned, was away until June, and Professor Van de Graaff's health required his absence during most of the year, but he was able to resume some research during the summer of 1950.

JOHN C. SLATER

## SCHOOL OF ARCHITECTURE AND PLANNING

### ARCHITECTURE

The academic year has seen a continuation of high enrollment, virtually every desk having been in continuous use, with full quotas in both undergraduate and graduate design classes. Since almost all graduate students complete their thesis requirements in September, the summer term has also used all available staff. The sustained quality of the Department's program since resumption of full enrollment is now bringing a higher standard of competence in graduating students, to judge by the merit of current thesis work.

In the design work, a series of sketch problems in which students of all classes participate equally has been introduced with the purpose of improving skill in visual and graphic aspects of the work, and the effect has been rewarding. In the graduate program Professors Carl Koch and Ralph Rapson initiated a study of the Industrialized House, an effort to arrive at architectural solutions in this field in the light of the fullest possible understanding of the conditions of market, industrial process, distribution, financing, and social organization of mass housing. It is expected that this study will be followed in future with other groups of students. It is an area needing the combined assistance of the Bemis Foundation, the Departments of Building Engineering and Construction and Business Engineering and Administration, and external agencies.

The Department has been able to carry out its first exchange program with the Royal Academy of Fine Arts in Copenhagen. Mr. Thomas F. McNulty, an instructor in the Department, went to Copenhagen for the Second Term and was replaced by Mr. Viggo Møller-Jensen, and these temporary transplantations have been successful in both schools. Both students and staff have much to gain by substantial contact on a professional basis with representatives of a different national outlook on the cultural, technical, and artistic basis of contemporary design. Each country emulates some aspects of the other's attainments and wishes to know them at first hand.

This year our students were also influenced by the teaching of Mr. Willem de Moor, who came for one term of teaching.

Mr. de Moor has had ten years' experience in Sweden preceded by education in Italy and France.

Mr. R. Buckminster Fuller made several visits to the Department, and sponsored a student project for more imaginative use of structural technique in the enclosure of space, with the idea that conventional building involves wasteful and redundant methods, and that only a very small fraction of ordinary materials and processes can produce adequate shelter if new forms are exploited. Mr. Fuller's extraordinary development of this thesis had an invigorating effect among the group who worked with him, and stimulated many others as well.

The teaching role of the Acoustics Laboratory for the students of the Department continues to increase in multiplicity of fields of study and in numbers of students who are influenced by it. An increasing number of both graduate and fifth year architects elect to follow the basic subject in acoustics with activity in research projects involving the application of knowledge of physical behavior of sound to its many architectural applications. Some of these applications currently under study are: analysis of sound distribution in rooms by geometrical analogy with observed light reflections; model measurements of transient response in rooms using sound impulses having frequencies in scale with model; and new techniques of measuring response of theater auditoria using ultra-short pulse equipment. It is hoped that the unusual educational opportunities involved in our relations with these facilities may continue their development.

During the year, Professor Henry-Russell Hitchcock resigned. His work in Architectural History has been taken over by Professor John McAndrew. Early in the year Professor Vernon DeMars resigned.

The list of distinguished persons who came to give extra-curricular lectures includes Mr. Jose Luis Sert, M. Auguste Perret, Mrs. Sybil Moholy-Nagy, and Mr. Richard Neutra.

LAWRENCE B. ANDERSON

#### BEMIS FOUNDATION

A major activity of the Foundation during the year was the handling of liaison between the Institute and the newly established Research Division of the Housing and Home

Finance Agency. Meetings were held to discuss possible Institute projects, several projects were discussed with the Agency, and contract details on the accepted project were worked out with the help of the Division of Industrial Cooperation. The Agency has found it convenient to use the Foundation as a central liaison point within the Institute and has since approached us with suggestions for further work which are now under discussion.

The investigations of Westgate by the Research Center for Group Dynamics, sponsored by the Foundation, were published by Harper & Brothers as a book entitled *Social Pressures in Informal Groups, A Study of Human Factors in Housing*, by Leon Festinger, Stanley Schachter, and Kurt Back. The Foundation's study of the prefabricated housing industry was in the hands of the printer, expected to come out in book form before the end of 1950.

The Director served on the first Advisory Committee to the Housing and Home Finance Agency Research Division at the time of the organization of that Division, and on the Advisory Committee to the Building Research Advisory Board, National Research Council, regarding the survey of Housing Research to be conducted by that Board. He assisted the Executive Director of the Special Commission on the Structure of the State Government, Commonwealth of Massachusetts, in organizing the Study Unit on Construction, and is serving that unit as a consultant. Further, he attended meetings of the Housing Research Council, an informal organization of the heads of university and industry housing research agencies, and of other housing groups, and prepared a paper on prefabrication for the Twentieth International Congress for Housing and Town Planning, to be held in Amsterdam under the auspices of the International Federation for Housing and Town Planning.

The Foundation as usual gave guidance on specialized points in the field of housing to students and to visitors, including several from foreign countries. It assisted the School of Architecture in making available during the year the services of Buckminster Fuller, noted housing pioneer, and in undertaking the preparation and editing of the report on a conference on the Industrialized House held in connection with a special

course on the subject offered by Professors Carl Koch and Ralph Rapson during the year. The Director took part in the planning of this course and conducted seminars in it and in the Housing Seminar.

Research Assistant to the Foundation during the year was Gordon C. McCutchan, Graduate Student in Architecture. The regular meeting of the Foundation Advisory Committee was held in May, 1950.

BURNHAM KELLY

### CITY AND REGIONAL PLANNING

The past year saw no major changes in curriculum or enrollment in the Department. Graduate enrollment remained at a maximum and indications are that this will continue at least through the coming year. Placement opportunities are even more extensive and more diversified than they were in 1949 and all students have found positions immediately upon graduation.

The Department has collaborated with the Department of Architecture in sponsoring a series of lectures by visiting experts in various professional fields of interest to both groups of students. It also continued its series of annual conferences on City and Regional Planning. The eleventh conference was held from September 6 to 16, 1949, and was participated in by a small but representative group from many parts of the United States and Canada.

A number of leading authorities in the field of housing participated as lecturers in the Housing Seminar conducted each week by Professor Lloyd Rodwin. These included Carl Feiss, Chief of Urban Planning for the Urban Redevelopment Administration; Catherine Bauer, Vice-President of the National Public Housing Conference; Professor Leo Grebler, of Columbia University; and Professor Charles Abrams, of the New School for Social Research.

A reorientation of the material in the second half of the subject in Theory and Practice of City Planning was undertaken this year by the inclusion of a series of lectures by Professor Rodwin on research techniques and methods of analysis; while Professor Roland B. Greeley offered for the first time

a lecture subject in Regional Planning to seniors who were registered in the Planning and Administration option of Course I.

At the Annual Meeting of the American Institute of Planners, held last March, Professor John T. Howard was elected Secretary-Treasurer, and Professor Greeley to a three-year term on the Board of Governors. At the same meeting, Professor Burnham Kelly presented a paper on Housing Research, and other members of the teaching staff participated in the discussion sessions.

FREDERICK J. ADAMS

## DIVISION OF HUMANITIES

### ECONOMICS AND SOCIAL SCIENCE

The teaching program of the department has received only a few minor amendments during the year, though I should like to call attention to the revisions made in connection with the adoption of a new numbering system for subjects offered by this Department. The enrollments in Course XIV and in our graduate division are almost the same as last year. Efforts have been made to form closer relations with our students through the formation of student-staff committees to hear grievances and discuss methods of improving the various subjects.

The Industrial Relations Section last spring held a second conference on the Scanlon Plan for union-management cooperation. The size of the conference was held down to about 50 people representing 17 companies and seven unions from all over this country and from Canada. The Section also presented a special program at the University of Toronto which was attended by four members of our staff. Professor George P. Shultz made an especially favorable impression at this meeting. He has also completed for publication a study of the men's shoe industry entitled "Pressure on Wage Decisions."

Professor Charles A. Myers has continued to serve on important national committees in the field of industrial relations and, in conjunction with Professor Shultz, wrote the National Planning Association's Case Study No. 7 on the "Causes of Industrial Peace Under Collective Bargaining." The members of the Section have completed a study on unemployment which is now ready for publication.

Professor W. Rupert Maclaurin has been carrying forward an investigation of innovations in low-cost housing under a grant from the Merrill Foundation. To assist him in the program Dr. Max Millikan has been brought into the Department. The research has received added stimulus by a contract from the Housing and Home Finance Agency in Washington for a study of comparative costs of different types of house-building companies. Attention will be given to methods of construction, uses of new materials, and organization tech-

niques in housing enterprises in different parts of the United States. Since the outbreak of the Korean war, special emphasis is being placed on workers' housing and its relation to current trends in decentralization of industry.

Professor Norman J. Padelford last summer visited England and Sweden on behalf of the Institute to arrange for graduate student foreign study and research. During the year he published a series of strategic maps and prepared two volumes of notes for our course in International Relations. Professor Charles P. Kindleberger's book on "The Dollar Shortage" is scheduled for December publication. He also served as visiting lecturer at Columbia University and during the past summer at the School for Advanced International Studies at Peterborough, New Hampshire.

Professors Robert L. Bishop and Morris A. Adelman have been part of a small group working at Harvard University engaged in mapping out studies of monopoly, bigness and appropriate changes in our antitrust laws. Professor Adelman has also been serving as consultant to the Economic Cooperation Administration and the Department of Commerce. His doctor's thesis was awarded the Wells Prize. Professor Adelman has received much favorable comment for various articles dealing with anti-trust policy, and, in particular, the A. and P. case.

Professor H. A. Freeman has been busy with the affairs of the American Statistical Association of which he is vice-president. Professor E. Cary Brown has continued his study of the effect of taxes on business decisions conducted through the Harvard Business School under a grant from the Merrill Foundation. Professor Samuelson continues to add to his impressive list of publications in the field of economic theory and has revised his extraordinarily successful textbook. Both he and Professor Alex Bavelas have been acting as consultants to the Rand Corporation.

RALPH E. FREEMAN

#### ENGLISH AND HISTORY

In August, 1949, the Department moved into its very pleasant new quarters on the fourth floor of the Charles Hayden Memorial Library. For many years the books needed in our



English and history subjects have been housed partly in the old library under the dome and partly in Walker Memorial. The inconvenience of this arrangement has been eliminated by the new building, and our collections are now consolidated and near at hand on the first floor of the north wing. Both students and staff find it convenient and pleasant to work in the light, attractive, comfortable reading rooms.

The music lounge and the listening rooms in the new library have greatly increased and improved the facilities for students in the music subjects. If full use is made of the ear-phones, the rooms provide 804 listening hours a week; without any use of the earphones, 536 listening hours. The maximum that could be provided under the old arrangement in Walker Memorial was 335 hours.

Space is available for displaying material pertinent to the assignments in music; books and scores are easily available; and the new phonographs reproduce music in a manner infinitely nearer the ideal of an actual performance than any previous equipment we have had.

New material on some of the basic problems of American development has been introduced in the sophomore options, *The United States in World History* and *The Growth of Democratic Thought*. A book of materials for a case study of an early American industrial community has been prepared for use next fall. Both of these options, one of which every student must take, are designed to develop a mature understanding of American society. In the history option it is done chiefly by a study of political and economic forces responsible for the growth of the United States as a member of a world society; in the *Democratic Thought* option by a study of the ideas which have contributed to our concept of democracy.

The experimental freshman program, which is a synthesis of the various disciplines in the humanities and social sciences, has been undergoing continuous organization and refinement. Two booklets, *Man in Society* and *Athens in the Fifth Century B.C.*, have been prepared by the staff and will be published by the Technology Press in time for use in the fall term. Plans have also been made with the Museum Committee for exhibits which will illustrate the different periods being studied in the subjects.

Since effective training in the communication of ideas is one of the most important objectives of the experimental program, much thought is being given to methods of achieving that objective. Carefully devised written problems are an integral part of the subjects. For students seriously deficient in the fundamentals of English usage, small remedial groups have been organized on a voluntary basis.

This year the Theodore Roosevelt Project, under the direction of Professor Elting E. Morison, completed and sent to the press the first four of eight projected volumes of *The Letters of Theodore Roosevelt*. Volumes I and II, covering the period 1870-1900, now in galley proof, will be published by the Harvard University Press about February, 1951. Volumes III and IV, covering the period 1901-August 1905, will be published about October, 1951. The manuscript of Volume V is well under way.

Dr. Robert K. Lamb, aided by a grant from the Committee for Research in Economic History, has continued his study of the group of leaders who laid the foundations for the American economy within the framework of the new Constitution. This study focuses, colony by colony, on the interrelationship of the mercantile and landed families whose members and chosen representatives played the leading role in the chief colonies, later served as organizers of the commercial and financial committees of the Continental Congress, and became the founders of the principal economic and political institutions, public and private, in the new nation. A grant from the American Philosophical Society has assured the continuance of this study for the coming year.

Mr. E. Neal Hartley's studies this year for the American Iron and Steel Institute have provided sufficient data on the seventeenth century iron industry in both New England and Europe to warrant the directors of the project to proceed with the physical reconstruction of the first blast furnace in America at Saugus, Massachusetts. Research on the other elements of the iron works will continue.

The Department was very fortunate in having two visiting professors during the year. Dr. Siegfried Giedion, the distinguished art historian of the Federal Institute of Technology at Zurich, was at M. I. T. during the second term. He gave

a seminar, Civic Centers and Social Life, for seniors and graduate students, and a series of five public lectures on "The Role of Art in Contemporary Life." Professor Russell L. Caldwell of the University of California at Los Angeles came as an exchange professor of history for the first term of the 1950 Summer Session. Professor Thomas H. D. Mahoney took Professor Caldwell's classes at the University of California during the same period.

Mr. David Hoggan was granted leave of absence to serve as Assistant Director of the *Amerika Institut* at the University of Munich. Professor Karl W. Deutsch presented papers at the Twelfth Conference on Science, Philosophy, and Religion and at the Tercentenary Celebration in Honor of Descartes held at Bryn Mawr College. Mr. John Blum gave a paper at the Boston meeting of the American Historical Association. Professor Elting E. Morison gave two lectures in the Athenaeum Lecture Series at the California Institute of Technology.

As Chairman of the Humanistic-Social Division of the American Society for Engineering Education, Professor Howard R. Bartlett, with the assistance of Professor Stuart W. Chapman of the University of Washington, organized a three-day conference on The Humanities and Social Sciences in Engineering Schools. It was held immediately following the Society's meeting in Seattle.

The Department suffered the loss of one of its oldest members through the death of Professor Dean M. Fuller on November 23, 1949. Professor Fuller had served M. I. T. with loyalty and distinction since he joined the staff as an instructor in 1920.

HOWARD R. BARTLETT

### MODERN LANGUAGES

There has been increased concern with research in several fields in the Department of Modern Languages during the last year. James W. Perry, an unusual combination of chemist, linguist, and specialist in documentation, became Associate Professor of Modern Languages and spent full time under the Carnegie Grant for Scientific Aids to Learning on problems related to a new organization of information independent of

the constraints of alphabetization. He is exploring the possibilities of these more flexible reference systems in connection with high speed selectors. Chemical literature is being used for a pilot study. Working with Professor Perry is Miss Madeline M. Berry, Research Assistant, who came to us from the Peter Bent Brigham Hospital.

In quite a different direction is the work being done by Rudolf F. Schreitmueller, Research Assistant. He is also working under the Carnegie Grant for Scientific Aids to Learning. His problem is to break down the complex waves produced by speech sounds and to find components in the wave forms which can be identified as the features by which the ear recognizes individual speech sounds. Recently developed devices may make possible this analysis which has been attempted without success for 100 years.

Two conferences on speech, its production, natural and synthetic, its analysis, and its perception were held at the Institute with the participation of Department members. Professor William N. Locke, Head of the Department, was chairman of the first, held on December 2 in cooperation with the Acoustics Laboratory and the Research Laboratory of Electronics; he also directed the organization of the second, on May 31 and June 1, 2, and 3, held under the joint sponsorship of the Acoustical Society of America, the Harvard Psycho-Acoustic Laboratory and the Carnegie Grant for Scientific Aids to Learning at M. I. T. These conferences brought together leaders in more than a dozen fields interested in various aspects of speech. Papers and discussions were generally felt to have benefited the participants through a broader appreciation of the work being done by workers in the different areas.

At the beginning of the fall term a new, specialized subject in reading Chemical German for Chemical Engineers was introduced. The Chemical Engineering Department had been interested in a one-term subject for its sophomores similar to the reading knowledge subject offered for graduate students in the various Institute courses, and for several years special sections of Elementary German had been formed for Course X men, but it proved more satisfactory to give a special subject for them, since the other students who are required to study a foreign language are allowed two terms. The reactions of

students and teacher to the new subject have been favorable.

During the year Professor Pierre C. Delattre of the University of Pennsylvania served as Consultant on phonetics and John G. King, who had worked on the analysis of speech in the previous year, resigned to devote his full time to his studies. At the end of the year the Department regretfully accepted the resignation of Professor Fritjof A. Raven, who went to the University of Alabama.

WILLIAM N. LOCKE

### MUSEUMS AND EXHIBITIONS

Fifteen exhibits were arranged this year, 11 in the Lobby of Building 7 and four in the New Gallery of the Charles Hayden Memorial Library, which was opened to the public in February, 1950.

Two of the exhibitions in the New Gallery, "The Paintings of Georges Braque" and "The Painter and the City," were important museum events in the greater Boston community. The collection of Braques was probably the most substantial one ever brought together in this area.

The Dard Hunter Paper Museum was moved and installed in its new quarters in the Charles Hayden Memorial Library.

At the request of the Stabilization Committee, the "Course Exhibit" was expanded in scope. Formerly it has been limited to seven courses; this year every course was invited to participate and all but two were represented in the exhibit. The Museum Committee would like to present more exhibits which grow out of the work of different departments and laboratories, because it believes they are important and interesting to the M. I. T. community.

The Museum Committee was invited to become a member of the Museums Council of Boston and Cambridge.

Two exhibitions originating at the Institute, "Edgerton Stroboscopic Photography" and "Visual Education for Architects" are being circulated to other museums in the United States by the American Federation of Arts.

H. R. BARTLETT

H. L. BECKWITH

## INTERDEPARTMENTAL LABORATORIES

### ACOUSTICS LABORATORY

The research programs of the Acoustics Laboratory during its fifth year illustrated in increasing degree the integrated educational approach that is characteristic of the Institute and its interdepartmental laboratories. These programs involved a high measure of specialization coupled with a broad coordination among several branches of knowledge. Most of the work lay in the four general areas described in following paragraphs.

*Architectural Acoustics.* Work in architectural acoustics was directed toward two ultimate objectives: the provision of satisfactory hearing conditions in rooms and the control of noise to provide a satisfactory environment. The problem of hearing conditions in rooms includes as essential ingredients the physics of sound waves in enclosures, the electro-acoustic instrumentation of measuring techniques, and the architectural design and construction of rooms. These phases must be coordinated to achieve a result that is evaluated in terms of musical taste and psychological response of human beings.

During the year a broad program of field measurements was initiated with tests in a motion picture theater and in a concert hall. These tests involved physical measurements in the empty rooms and with audiences. A new method was employed for testing transient response to sharp sounds generated electronically and by pistol shots. Subjective reactions to music and speech hearing conditions were examined by use of questionnaires formulated in collaboration with psychologists and with European acoustics specialists. The objective of these field investigations is the establishment of more rational criteria for architectural acoustic design.

Some of the physical problems can also be studied in small models, and to this end a group of graduate students in architecture developed a flexible system for building small models of auditoriums for scale measurements of sound pulse response. Electronic techniques were refined for generating, recording, and analyzing short transient sounds. This equipment was used both in field measurements and in model studies.

Work related to noise control was concerned mainly with the completion of a new method for measuring sound transmission through wall structures. On a doctor's thesis in Electrical Engineering, instrumentation was completed for generating a controlled sound field of adjustable properties and for measuring and plotting automatically a sound field over an eight-foot-square area. Other studies in noise environment included a survey of office noise influences, and the construction of a facility for measuring the transmission of impact noises on floors. A general analysis of sound transmission through single and multiple structures was completed in a doctor's thesis in physics.

*Communication Acoustics.* Work in communication acoustics was characterized by increased emphasis on psychological factors and on mathematical techniques such as autocorrelational analysis. Much of this work has been carried on in close collaboration with the Research Laboratory of Electronics and with other groups interested in similar problems. Thus, in this area also, one sees the increased interaction among several disciplines: in this case, psychology, mathematics, electronics, and acoustics.

Studies were conducted on the randomness of errors of speech perception and on autocorrelation functions as representative of speech sounds. Development of a duplex theory of pitch perception and a study of transmission properties of the vocal tract contributed to basic knowledge of speech and hearing.

Work was continued on problems of intelligibility of processed speech. The effects of amplitude and time quantization on intelligibility were investigated, and the effects of frequency modulation and of time delay distortion were measured. A thesis was completed on the effect of distortion on musical quality as judged by listeners.

*Medical Acoustics.* Ultrasonic techniques offer promising new possibilities for diagnostic methods in medicine. A general program initiated in this area at the close of the previous year made rapid progress towards its first specific objective, the detection and localization of intracranial tumors. One part of the investigation was directed to the establishment of thresholds of pain and damage by ultrasonic energy. Although a definitive conclusion has not yet been reached, it appears

highly probable that there is a safe margin between intensities required for intracranial detection and those that cause pain or damage. This possibility offers a significant advance over operative techniques employed today for tumor location. Carefully controlled experimentation is continuing on the effects of ultrasound on biological tissue.

During the year, precise one-dimensional scans were obtained both on fixed brain samples and on human beings. Preliminary results were obtained on two-dimensional pictures with shadow-graph type of presentation. Future work will be directed to the refinement of this picture. To this end considerable emphasis was put on the development of new types of multiple array transducers for sending and receiving ultrasound. This investigation in turn led to a physics thesis on properties of barium titanate, a new piezoelectric transducer material.

*Physical Acoustics.* Underlying all applications of acoustics are the basic physical phenomena associated with sound waves and their interactions with matter. Several of the applications reported above grew directly out of physics studies conducted in the laboratory in previous years. During the current year major emphasis developed along two lines: the analysis of transient behavior, and investigations of large amplitude nonlinear acoustic effects.

Calculations were carried out on reflection of transients from boundaries of nonsimple shape and impedance. A doctor's thesis in physics incorporated a comprehensive study of the behavior of acoustical resonators and orifices. Theoretical and experimental methods were coordinated to give, for the first time, a comprehensive understanding of the general behavior of resonators in the presence of high intensity sound. Work was continued on the study of dynamic properties of visco-elastic materials, and work was started on ultrasonic propagation in glass.

*Administration.* The space and general facilities of the laboratory remained essentially unchanged during the year. Some internal construction was done to increase the amount of usable research and office space.

The financial support by the Bureau of Ships, the Office of Naval Research, and the U. S. Air Force continued at



approximately the same level. Funds from the Raytheon Manufacturing Company and the Massachusetts General Hospital made it possible to initiate the medical acoustics program and to ensure its continuance until a recent grant was received from the United States Public Health Service. Two fellowships, one from Armstrong Cork Company and one from the Acoustical Materials Association, supported research by two graduate students. The Pittsburgh Plate Glass Company arranged to sponsor an ultrasonic study of properties of glass.

The work of the laboratory was reported in 19 journal articles and in 25 papers delivered at meetings of professional societies. Papers were presented before the American Neurological Association, the American Institute of Architects, the Institute of Radio Engineers, and the Acoustical Society of America. The laboratory was actively represented at the Conference on Speech Communication held at the Massachusetts Institute of Technology in May, 1950.

Ten student theses were submitted during the past year, four doctor's, five master's, and one bachelor's. The thesis work was approximately evenly divided between the Physics and the Electrical Engineering Departments. For the first time, work for a graduate thesis in Naval Architecture and Marine Engineering was done at the Acoustics Laboratory.

The book, *Acoustic Measurements*, by Professor Leo L. Beranek was published during the year. This is the first comprehensive treatment of contemporary experimental techniques in acoustics. Professor Richard H. Bolt and Mr. Robert B. Newman, Instructor in Architecture, collaborated in writing chapters for two books: one on acoustics in *Music Rooms and Equipment*, published by the Music Education Research Council; and one on control of noise in *Standards for Healthful Housing*, to be published by the American Public Health Association.

The number of research students increased somewhat, and the effect on the quality and diversity of the research accomplished was gratifying. The scope of research was further enriched by the work of several visitors. Dr. Wilson Nolle from the University of Texas made some measurements on the dynamic properties of rubber-like materials in collaboration

with the Bureau of Standards. Dr. George D. Ludwig of the Massachusetts General Hospital contributed to research on the medical applications of ultrasound. Mr. C. G. M. Fant from the Royal Institute of Technology, Stockholm, worked with the group studying the intelligibility of processed speech. Mr. U. Aberg, also of Sweden, spent some time in the laboratory, and Dr. Glen Camp, of the Operations Evaluations Group, Department of Navy, worked both with us and with the Department of Mathematics for two months. Dr. T. F. Hueter arrived from Germany in December to join the project on brain tumor location.

We were particularly pleased to welcome Dr. J. C. R. Licklider, Associate Professor of the Psychology of Communications, as a new staff member of the laboratory. At its June meeting, the Acoustical Society of America presented to Dr. Licklider the Biennial Award for Noteworthy Contributions to Acoustics.

RICHARD H. BOLT

#### RESEARCH LABORATORY OF ELECTRONICS

The general framework of the research of the Laboratory remains unchanged, but the scope has been increased with the addition of two new projects, both of which fit quite naturally into our communications research program. The first of these is a study of the Airplane Traffic Control problem under the direction of Professors Lan Jen Chu, Samuel J. Mason and Richard B. Adler. This project receives support directly from the Air Navigation Development Board of the Department of Commerce. The second project is a study of Group Communications, with special emphasis on their psychological aspects, under the direction of Professor Alex Bavelas of the Department of Economics. This latter project has been active in the Department of Economics for some time but was brought into the Laboratory in the past year because of its relationship to the rest of our communications research. The project receives support from the Rand Corporation. The basic research program of the Laboratory continues to receive the major portion of its support from the Signal Corps, the Office of Naval

Research and the Air Materiel Command jointly, through a contract administered by the Signal Corps. Research applied to radar guidance systems and telemetering systems for missiles continues under the sponsorship of the Bureau of Ordnance, and the leadership of Professors Henry J. Zimmermann and William H. Radford.

Five industrial firms for some time past have generously aided graduate students in the Laboratory with fellowship support. The firms are the General Radio Company, the International Telephone and Telegraph Corporation, the Radio Corporation of America, the Socony-Vacuum Oil Company and the Sperry Gyroscope Company.

The total complement of the Laboratory remains nearly constant, but the addition to the senior staff of Professor Bavelas and Dr. Oliver H. Straus, also working on the human side of communications, are noteworthy. Professor George G. Harvey, who has been invaluable to the administration of the Laboratory since its inception, has been appointed Assistant Director.

The research program of the Laboratory, except for additions noted above, continues at about the level of a year ago and shows normal progress. Professor Wayne B. Nottingham's group has made excellent contributions to the understanding of basic electronic phenomena, especially in the fields of cathode aging, high field emission and direct current gaseous conduction. The group working on high frequency gaseous electronics under Professors William P. Allis and Sanborn C. Brown are rapidly tying up loose ends in the general theory.

Professor John C. Slater has been very active in several phases of solid state physics and has developed a new method which simplifies the calculation of energy bands. Professor Arthur F. Kip and his collaborators, after several years of preparatory work, are now getting excellent results in the important field of magnetic resonance in solids. The soft X-ray spectrograph, constructed under the direction of Professor Harvey, is now ready to begin experiments to determine the energy distribution of electrons in metals. Professor Laszlo Tisza has made outstanding contributions to the theory of superconductivity and the theory of antiferromagnetism.

Professor Melvin A. Herlin and his collaborators have established a first-rate low temperature laboratory and are investigating many interesting problems in this field.

Professors Francis Bitter, Bernard T. Feld, Malcolm W. P. Strandberg, and Jerrold R. Zacharias are continuing work in the study of atoms, molecules and solids by means of radio frequency techniques. Results of special significance have been made in the development of optical-radio techniques for the determination of hyperfine structure, and the measurement and explanation of quadrupole interactions in diatomic molecules and in antisymmetric molecules.

Applied research on vacuum tube problems continues under the direction of Professor Stuart T. Martin and Mr. Louis D. Smullin. The high power magnetron is now almost ready for industrial development, and many results of practical significance have been obtained on traveling wave tubes. Basic research on the interaction of electromagnetic fields with electrons continues to influence the development of high frequency devices.

An enhanced group on general communication problems now includes Professors Wilbur B. Davenport, Jr., Robert M. Fano, Yuk-Wing Lee, J. Francis Reintjes and Jerome B. Wiesner. During the past year significant progress was made in the application of Professor Norbert Wiener's statistical theories to problems in the fields of communication, presentation techniques, psychology, and medicine. The newly developed correlation techniques were employed as research tools in the fields of communication, acoustics and medicine; and electronic correlators, first developed at M. I. T., were employed for improving detection and presentation devices. The correlator provides a means of detecting signals masked by noise, and it is this property which is employed.

The new statistical concepts are also being employed in a study of human communication problems by Professor Bavelas and his group to obtain an understanding of the behavior of social groups as their communication facilities are altered. This work may provide a key to the problem of placing studies of group behavior on an analytical basis. As a result of interest stimulated by communication theory, the Laboratory is now carrying out research on sensory replacement devices for handicapped persons. At the present time

a hearing device for totally deaf persons and a Braille map for use in guidance of the blind are under development. Both of these devices are in a preliminary state but initial tests have given encouraging results.

In the late winter of this year transatlantic tests were made of the frequency-modulation receiver developed by the group under Professor Lawrence B. Arguimbau. The results far exceeded expectations with reception being of studio quality 20 per cent of the time and superior to average amplitude-modulated reception 70 per cent of the time. Further laboratory work is being carried out to investigate the reasons for poor reception during the remainder of the time.

The work of Professor Ernst A. Guillemin and Dr. Manuel V. Cerrillo is directed toward the mathematical synthesis of a host of practical design problems including active electrical networks, servomechanisms and the time domain approach to transient problems. All of these problems are intricate, but good progress is being made. The electronic differential analyzer first developed in the Laboratory has been put to extensive use by our staff and other members of the Institute. Noteworthy problems during the past year include a study of the parallel operation of microwave oscillators and the analysis of the motion of an hydrofoil boat. Work on other analog devices for the solution of electrical network problems continues.

During the past year the Laboratory has been host to the following scientists for extended periods: Professor Hans Kopfermann of the University of Gottingen, Professor J. C. F. Rybner of the Royal Technical University, Copenhagen, Dr. E. H. Sondheimer of Cambridge University, and Dr. R. Malvano of the Polctnic Institute of Turin. Many visitors and guests have been with us for shorter periods. The Laboratory was host to approximately 120 officers and scientists of the National Military Establishment for two days in November at which time the work of the Laboratory was reviewed. In March, the Laboratory, jointly with the Physics Department, sponsored the tenth annual conference on Physical Electronics, and in June, jointly with the Carnegie Project on Scientific Aids to Learning and the Acoustical Society, sponsored a four-day conference on speech analysis.

ALBERT G. HILL

## LABORATORY FOR NUCLEAR SCIENCE AND ENGINEERING

During the past year the most important result in the Laboratory for Nuclear Science and Engineering has been the successful operation of the 350 Mev synchrotron. This machine, which was designed by Professor I. A. Getting of the Department of Electrical Engineering, has been under construction since 1947. In December, 1949, a satisfactory beam of high energy electrons was obtained and all the preparations for experimental use of this equipment were immediately put into effect. Within six weeks, seven active programs of research were under way, using the X-ray beam, initially with energies of approximately 300 million volts. It was found, as had been hoped, that satisfactory quantities of mesons were produced and an important result was obtained, as mentioned elsewhere in this report, in the measurement of the decay lifetime of the  $\pi$ -meson. Many experiments were performed by members of our Cosmic Ray Group whose techniques with natural high energy particles are directly applicable to this laboratory source of high energy electrons.

In addition to work with the synchrotron, the Cosmic Ray Group conducted researches at Lexington and in Colorado, with cloud chamber and ionization chamber experiments at the Echo Lake Laboratory of the Inter-University High Altitude Station. During the year the Research Corporation purchased the former Doolittle ranch on Mt. Evans and has made it available for housing to the families of research workers on Mt. Evans. This has assisted us in the difficult problem of quarters for the staff and has insured the availability of such housing in the future.

The Cyclotron Group under the direction of Professor M. Stanley Livingston of the Department of Physics has produced much valuable data on a number of nuclear reactions, utilizing the automatic data-taking equipment designed and constructed in 1948. The group has poured out results at a rate that has proven difficult to absorb. Our Theoretical Group now has a wealth of data to assist them in understanding nuclear reactions among the lighter elements. Some tentative interpretations have already been made. Research has also been conducted by the Theoretical Group in meson theory with application to the synchrotron results reported above.

In the spring of 1950, the large pressure tank for our proposed 12 million volt electrostatic generator was completed by the Boston Naval Shipyard and delivered to the site in April. This permitted construction to resume upon the new building at the eastern end of the campus. The generator, under the direction of Professor John G. Trump of the Department of Electrical Engineering, is going forward rapidly. We hope to achieve electrostatic tests by the end of the year.

Professor Trump's group has also been employed in a promising program of therapy using electrostatic generators in conjunction with hospitals and clinics of the Boston area.

The group under the direction of Professors Robert J. Van de Graaff and William T. Buechner has continued to improve the precision of the measurement of energy levels in the light elements. This has resulted in a much better understanding of the light elements. This also has given much material to the theoreticians.

The work on radioactive processes under Professor Martin Deutsch, besides continuing the study of angular correlations, was extended to investigations of very short-lived nuclear states. The research on the behavior of positrons in matter has yielded the first significant quantitative results on the annihilation of swiftly moving positrons.

In the Applied Radioactivity Group under Professor Robley D. Evans during the past year there has been a strong revived interest in the radium poisoning cases which were studied several years ago. The renewed interest is due to the fact that it now appears that much of the bone damage which was noted in the old dial painter cases may have been due to mesothorium, since the luminous paints used were in many cases a mixture of the two. Since many of the present tolerance values for alpha emitters are based on these old radium poisoning cases which did not consider the dosage received from the mesothorium, these new studies may have a very important bearing on the tolerance values for alpha emitters in the various atomic energy installations. A long-range program has also been instituted to study the radium content of normal humans in various geographical locations. These data will be reviewed in the light of their possible correlation to the incidence of osteogenic sarcoma. Our collaborative studies on the

metabolism of iron, zinc, and other heavy metals with particular reference to the blood dyscrasias have been continued, and much new information has been obtained. Radioactive isotopes of these elements have been used as tracers in these studies. Behind all the research programs has been the continued effort to develop new and more precise methods and techniques for radioactive measurements.

JERROLD R. ZACHARIAS

#### SPECTROSCOPY LABORATORY

The research program of the Spectroscopy Laboratory consists of studies on atomic and molecular structure by staff and students from the Physics, Chemistry and Biology Departments, and of investigations by members of various other departments on problems in which spectroscopy is a useful tool. The program has been aided by grants from industrial concerns and by a contract with the Office of Naval Research.

During the past year work on the large Michelson Engine for ruling diffraction gratings has brought the engine to the critical point of being ready to rule. Preliminary trials indicate a high probability of success when the first complete grating is ruled. The ruling is controlled with the help of high-precision calibration of the engine's master screw. Professor George R. Harrison and Dr. James Archer have developed a device called a "commensurator" that carries out with great rapidity the calibration in terms of interference fringes (giving an accuracy of a millionth of an inch). Professor Harrison has written an interesting article "The Challenge of the Ruled Grating" (*Physics Today*, September, 1950) in which his work in this field is discussed in nontechnical language. The new type of grating invented by him — the echelle — has now been produced in collaboration with the Bausch and Lomb Optical Co. and has shown a resolution approaching the theoretical.

In the field of atomic structure, investigation has centered on the spectra of the rare-earth atoms. Analysis of these spectra with the help of the Zeeman effect has been greatly aided by the discovery of a technique for exciting the spectra of nonionized atoms in the high magnetic fields of the Bitter magnet. Professor Francis Bitter and Mr. Jean Brossel, here



from the University of Paris, have proved experimentally the existence of resonant absorption of microwaves by mercury atoms in a magnetic field.

The Laboratory's program of studies on molecular structure has been continued under the direction of Professor Richard C. Lord. Ultraviolet, infrared and Raman spectra have led during the past year to direct conclusions concerning the structures of the molecules of iodine penta- and hepta-fluoride, pyridine, diborane, cyclopropane, methyl acetylene and allene. All except the fluorides have been investigated in the form in which all hydrogen atoms have been replaced by the heavy isotope deuterium. Apparatus for the study of molecular spectra at low temperatures in the vacuum ultraviolet region is approaching completion. It is anticipated that this hitherto unexplored field will yield valuable information concerning the electronic structure of molecules that fail to absorb the longer wave ultraviolet and give uninterpretable short-wave absorption at elevated temperatures.

The Laboratory sponsored an intensive course in infrared spectroscopy for industrial research workers during the summer. About 60 people of advanced research experience outside the infrared field attended the course, which was aimed at preparing them to use infrared spectroscopy as a research tool. The infrared equipment of the Laboratory was augmented by loan of instruments and personnel from all the leading producers of infrared spectrometers, so that each student was able to learn by actual practice about the characteristics of the most recent American instruments in this field. The response to the course was favorable and it will probably be repeated.

Dr. Bert L. Vallee and his associates of the Department of Biology have continued their program of studies on the distribution of trace elements, chiefly metals, in biological substances. These investigators, supported mainly by the *John Lee Pratt Fund* of the Sloan-Kettering Foundation have found the high-dispersion spectrographic equipment of the Laboratory well suited to their purposes. They have carried out a general survey of the methods of quantitative spectrochemical analysis for trace elements and have standardized upon a null-method. In order to increase the sensitivity of detection of traces, investigation of the conditions of operation

of the direct-current arc as a source has been made and the use of an inert atmosphere of helium or argon has been found to improve sensitivity considerably.

The publications of the Spectroscopy Laboratory are in the form of journal articles by staff and students and are listed under the publications of their respective departments. The following scholars from other institutions made use of the Laboratory's facilities during the year: Professor Richard A. Ogg, Jr., Stanford University; Dr. M. Kent Wilson, Harvard University; Dr. E. R. Lippincott, University of Connecticut; Dr. Frederick L. Hoch, Harvard Medical School; Professor Dorothy Weeks, Guggenheim Fellow on leave from Wilson College.

RICHARD C. LORD

## REPORT OF THE TREASURER

## REPORT OF THE TREASURER

### AUDITORS' CERTIFICATE

*To the Auditing Committee of the Massachusetts Institute of Technology:*

We have examined the balance sheet of Massachusetts Institute of Technology as at June 30, 1950 (pages 236 and 237) and the related statements of income and expense (page 238), and deficit from operations (page 239) for the year ended June 30, 1950. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the accompanying financial statements present fairly the position of Massachusetts Institute of Technology at June 30, 1950, and the results of its operations for the year then ended.

LYBRAND, ROSS BROS. & MONTGOMERY

Boston, Massachusetts  
August 25, 1950

### REPORT OF THE AUDITING COMMITTEE

*To the Corporation of the Massachusetts Institute of Technology:*

The Auditing Committee reports that the firm of Lybrand, Ross Bros. & Montgomery was employed to make an audit of the books and accounts of the Institute for the fiscal year ended June 30, 1950 and their certificate is submitted herewith.

Respectfully,

REDFIELD PROCTOR  
HAROLD BUGBEE  
HENRY E. WORCESTER, *Chairman*

September 1, 1950.

## FINANCIAL REVIEW

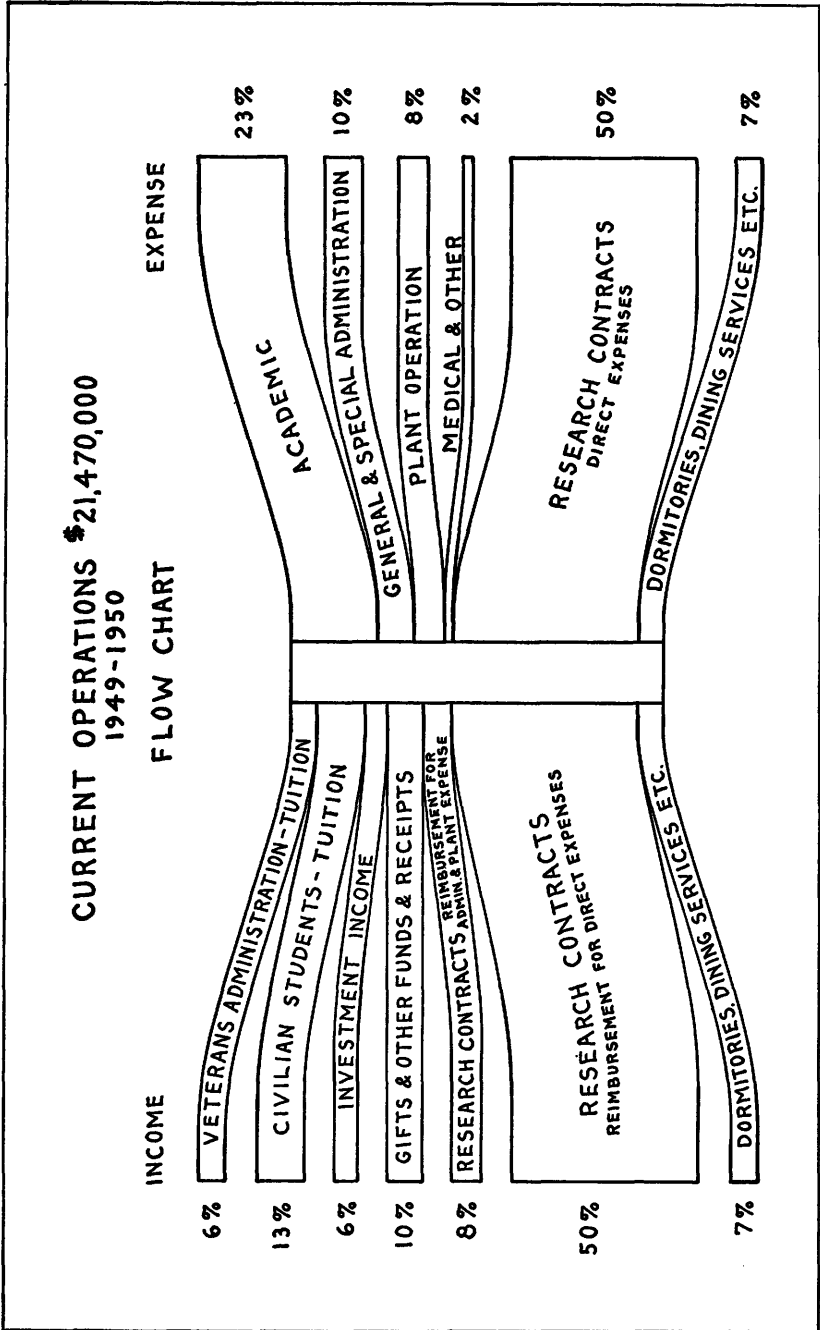
*To the Corporation:*

The statements and schedules submitted herewith show the financial condition of the Institute as at June 30, 1950 and the transactions during the year ended on that date. The principal exhibits summarizing the financial position of the Institute and the operations for the year are (A) the BALANCE SHEET, (B) the STATEMENT OF INCOME AND EXPENSE and (C) the DEFICIT FROM OPERATIONS included at the close of the Financial Review, which is the first section of this report. The Balance Sheet and the Statement of Income and Expense are supported by detailed schedules which are designated A-1 through A-20 and B-1 through B-13, and these schedules comprise the second section. The third and final section is devoted to a brief description of the funds of the Institute.

## OPERATIONS FOR THE YEAR

The total volume of operations in 1949-50 declined from the high level of recent years, established in 1948-49. The total income decreased from \$23,353,000 to \$21,470,000 due mainly to a reduction in research contract revenues. Income from students increased from \$3,636,000 to \$4,134,000 and represented a higher proportion of total income than in the previous year. Investment income of \$1,332,000 and gifts and other receipts at \$2,147,000 changed very little, but income allowances for administration and plant operations under research contracts were significantly higher at \$1,702,000.

The higher tuition rate effective in the 1949-50 period increased the income from students. Investment operations produced income of \$1,977,000 compared with \$1,867,000 in the preceding twelve months. \$1,332,000 or over two-thirds of the income was applied directly to operating expenses and the balance, for the most part, was transferred to funds for redistribution against expenses chargeable to the funds or accumulated as unexpended income. Gifts and other receipts of \$2,147,000 included \$770,000 as grants in-aid under the Industrial Liaison Program and in the previous year this type of support from business corporations amounted to \$267,000.



Income allowances for overhead under research contracts rose from \$2,448,000 to \$2,614,000 or \$166,000 while the balance after deductions for reserves and other charges, which was made available directly for expenses of the year, increased from \$1,489,000 to \$1,702,000 or \$213,000. The increase then, in overhead allowances, was fully carried through for immediate application to expenses for administration, plant operations and other charges.

The greater part of the year to year change in academic expenses from \$5,040,000 to \$4,979,000 was attributable to a reduction in departmental research expenses. Although several components of General Expense increased to make up the overall increase from \$1,941,000 to \$2,245,000, this class of expense reflected the high rate of Development Program activity during the year. Heretofore, the cost of Development operations have been offset by charges against funds but in 1949-50 these costs were borne by general income. Further participation by the staff and others in retirement plans substantially increased Pensions and Insurance costs included within General Expenses. The rise in plant operation expenses from \$1,405,000 last year to \$1,800,000 was brought about by special charges for substantial alterations, extensive moving expenses and heavy charges for repair and replacement of facilities. Total expenses exceeded income by \$65,000.

The following exhibit is a summary of the operations of the Division of Industrial Cooperation during the past three years, showing that the decrease in revenues in 1949-50 was accounted for primarily by the completion of Major Facilities in 1948-49 and also by a decrease in Subcontracts and Materials and Services.

	1949-50	1948-49	1947-48
Reimbursement for direct expenses:			
Salaries and Wages.....	\$6,457,813	\$6,328,577	\$5,212,788
Materials and Services.....	2,294,591	3,039,469	5,611,638*
Subcontracts.....	748,522	1,576,078	.....
Construction of Major Facilities.....	391,460	1,746,179	.....
Other, including travel.....	351,944	334,489	281,381
	<u>\$10,244,330</u>	<u>\$13,024,792</u>	<u>\$11,105,807</u>
Allowances for:			
Expenses of Division of Industrial Cooperation.....	\$430,382	\$398,112	\$348,581
Institute's overhead expenses.....	1,702,147	1,489,029	1,255,131
Use of facilities and funds.....	481,752	561,253	591,628
	<u>\$2,614,281</u>	<u>\$2,448,394</u>	<u>\$2,195,340</u>
Total contract revenues.....	<u>\$12,858,611</u>	<u>\$15,473,186</u>	<u>\$13,301,147</u>

\* Includes Subcontracts and Construction of Major Facilities not segregated.

REPORT OF THE TREASURER

SUMMARY OF FUNDS

	Balance, June 30, 1940	Gifts and Other Receipts	Investment Income	Net Transfers	Expenses	Other Charges	Balance, June 30, 1950
<b>Endowment Funds — Income Available:</b>							
(A-3) For General Purposes	\$26,967,189	\$1,030,644	\$1,084,705	.....	\$1,083,909	\$500	\$27,998,129
(A-4) For Designated Purposes	8,126,060	381,211	.....	\$622,093	.....	.....	9,129,364
(A-5) Student Loan Funds	2,136,376	13,435	67,535	12,414	.....	1,510	2,203,422
(A-6) Building Funds	850,154	1,268,267	45,884	179,229	.....	691,289	1,632,245
<b>for Current Expenses:</b>							
(A-7) For General Purposes	913,743	2,066,967	38,660	751,440	156,663	991,310	1,119,948
(A-8) For Designated Purposes	3,801,820	861,405	120,184	565,401	346,823	334,146	3,536,979
(A-4) Unexpended Balances of Endowment Fund Income for Designated Purposes	960,824	10,624	403,922	12,636	223,790	223,675	915,269
(A-9) Deposits and Advances held for Investment	463,195	21,612	17,068	33,623	.....	11,751	486,101
(A-10) Conditional Gifts — not yet available	432,231	51,687	24,143	.....	.....	19,550	486,511
(A-11) Accumulated Net Gain on General Investments	2,523,090	969,946	.....	.....	.....	.....	3,493,036
(A-18) Uninvested Funds	\$47,174,682	\$6,675,798	\$1,802,101	\$573,661	\$1,811,185	\$2,273,731	\$50,994,004
	1,119,241	1,657,522	.....	903,756	2,049,930	184,756	1,445,833
Deduct Activity of Balances of Unexpended Appropriations included with the Uninvested Funds. (See Schedule C.)	\$48,293,923	\$8,333,320	\$1,802,101	\$330,095	\$3,861,115	\$2,458,487	\$52,439,837
	159,793	.....	.....	330,095	381,401	51,555	56,842
	\$48,134,220	\$8,333,320	\$1,802,101	.....	\$3,479,714	\$2,406,932	\$52,382,995
Per Schedule B-2a — Investment income distributed to funds	.....	.....	\$1,802,101	.....	.....	.....	.....
Per Schedule B-2	.....	.....	.....	.....	\$3,479,714	.....	.....
Gifts per the Gift List	.....	\$6,528,090	.....	.....	.....	.....	.....
Other Receipts	.....	1,805,230	.....	.....	.....	.....	.....
	.....	\$8,333,320	.....	.....	.....	.....	.....



### ENDOWMENT AND OTHER FUNDS

The exhibit opposite sets out the resources of the Institute available in the form of funds on June 30, 1950, along with the changes in the several classes of funds during the fiscal year. The Endowment Funds and funds functioning as Endowment increased by \$2,034,000 and building funds were higher at the end of the year by \$802,000. Through realized gains on sales of securities of \$970,000 the accumulated net gain on General Investments increased to \$3,493,000. The funds of the Institute during the year under review had a net increase of \$4,249,000. Gifts, grants and other receipts, including additions to current funds, were \$8,333,000 as compared with \$3,293,000 last year, an increase of 153 per cent.

Invested funds, unrestricted as to principal and income, were \$1,119,000 on June 30, 1950, and \$913,000 on June 30, 1949. The Industrial Fund increased from \$594,000 to \$615,000 during the year and the Use of Facilities reserve was \$518,000 at the close of the year, having increased \$128,000 in the twelve-month interval.

Gifts, Grants and Bequests of \$6,528,000 received during the year included a total of \$3,778,000 of gifts expendable as to principal and \$1,914,000 in gifts of this type were received last year. Those gifts actually expended within the year for operating expenses are a part of the Gifts and Other Receipts of \$2,147,000, shown as such on the Statement of Income and Expense. The additional resources in the form of funds available for support of the Institute's program in education and research reflect in large measure the activities of the Committee on Financing Development.

### EDUCATIONAL PLANT

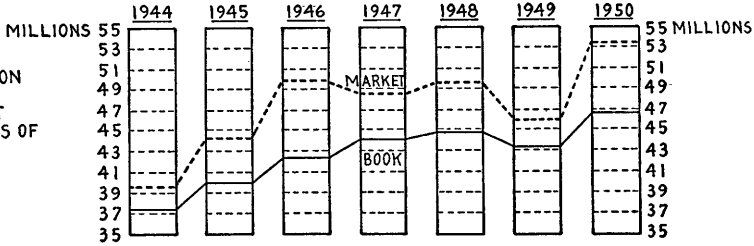
Total plant resources had a book value of \$24,213,000 on June 30, 1950 and increased \$1,970,000 during the year. The larger additions to the buildings of the Institute were \$1,440,000 for the completion of the Hayden Library and \$460,000 for the additional cost of construction of the Hydrodynamics Laboratory. Expenditures for new power plant facilities were included as deferred charges in current assets on June 30, 1950.

## SUMMARY OF INVESTMENTS AS AT JUNE 30, 1950

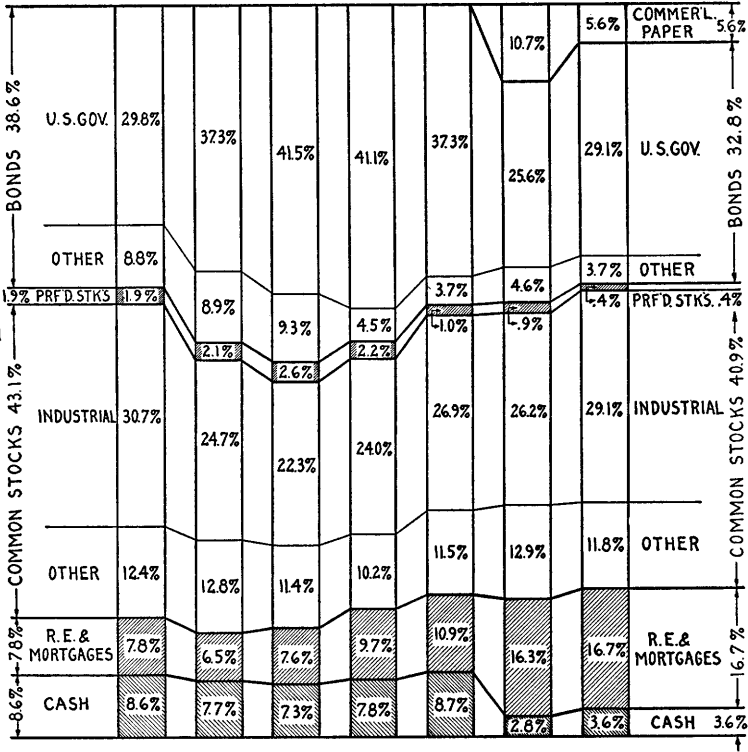
<i>General Investments</i>	<i>Book</i>	<i>Market</i>	<i>Per Cent at Market</i>
<i>Bonds —</i>			
United States Government . . .	\$15,450,244	\$15,509,794	29.1
Public Utility . . . . .	423,647	416,963	0.8
Railroad . . . . .	392,645	376,422	0.7
Other . . . . .	1,152,656	1,155,550	2.2
<b>Total . . . . .</b>	<b>\$17,419,192</b>	<b>\$17,458,729</b>	<b>32.8</b>
<i>Commercial Paper —</i>	\$2,977,333	\$2,977,333	5.6
<i>Preferred Stocks —</i>			
Public Utility . . . . .	\$154,500	\$150,000	0.3
Other . . . . .	21,000	21,000	0.1
<b>Total . . . . .</b>	<b>\$175,500</b>	<b>\$171,000</b>	<b>0.4</b>
<i>Common Stocks —</i>			
Industrial . . . . .	\$9,932,834	\$15,479,706	29.1
Public Utility . . . . .	1,378,480	1,485,396	2.7
Railroad . . . . .	322,475	347,767	0.7
Bank and Finance . . . . .	2,326,767	2,270,281	4.3
Insurance . . . . .	1,047,738	1,582,915	3.0
Other . . . . .	572,947	565,223	1.1
<b>Total . . . . .</b>	<b>\$15,581,241</b>	<b>\$21,731,288</b>	<b>40.9</b>
Real Estate . . . . .	8,699,532	8,699,532	16.4
Mortgages . . . . .	147,277	147,277	0.3
Cash — Advanced (Schedule A)	1,944,434	1,944,434	3.6
<b>Total General Investments . . . .</b>	<b>\$46,944,509</b>	<b>\$53,129,593</b>	<b>100.0</b>
Students' Notes . . . . .	442,215	442,215	
<b>Total General Investments including Students' Notes . . . .</b>	<b>\$47,386,724</b>	<b>\$53,571,808</b>	
<i>Special Investments . . . . .</i>	<i>3,607,279</i>	<i>3,960,445</i>	
<b>ALL INVESTMENTS . . . . .</b>	<b>\$50,994,003</b>	<b>\$57,532,253</b>	

MASSACHUSETTS INSTITUTE OF TECHNOLOGY  
GENERAL INVESTMENTS

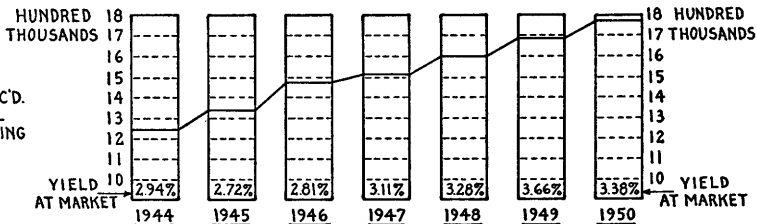
1  
COMPARISON  
OF BOOK  
& MARKET  
VALUES AS OF  
JUNE 30



2  
PERCENTAGE  
DISTRIBUTION  
OF  
SECURITIES  
AT MARKET  
AS OF  
JUNE 30



3  
ACTUAL  
INCOME REC'D.  
FOR FISCAL  
YEAR ENDING  
JUNE 30



### INVESTMENTS

The investments in bonds increased from 30.2 per cent to 32.8 per cent of total General Investments at market during the year while United States Government securities increased from 25.6 per cent to 29.1 per cent. Commercial paper held on June 30, 1950, was 5.6 per cent compared with 10.7 per cent at the end of the preceding year. Common stocks at market were up moderately to 40.9 per cent from 39.1 per cent. The proportion of total investments in real estate was 16.4 per cent, and important additions to this class of investment were the Riverside Apartments and the Tech Block, both properties adjoining the campus. The book value of all investments increased from \$47,174,000 to \$50,994,000 during the year and at market value all investments were \$57,532,000 at the year end.

### INVESTMENT INCOME

For the third successive year the income allocation to funds sharing the general investments was at 4.0 per cent of book value. Unallocated investment income in the amount of \$175,000 was added to the balance of undistributed investment income bringing the total to \$243,000.

### GENERAL

The record of the gifts, grants and bequests received during the year immediately follows, and thereafter a report of the Technology Loan Fund Committee and a report of the trustees of the M. I. T. Pension Association. This review is concluded with (A) the Balance Sheet, (B) the Statement of Income and Expense and (C) the Deficit from Operations.

Respectfully submitted,

JOSEPH J. SNYDER  
*Treasurer*

August 30, 1950

GIFTS, GRANTS AND BEQUESTS RECEIVED DURING THE YEAR  
ENDED JUNE 30, 1950

## GIFTS FOR ENDOWMENT

*Funds for General Purposes*

Class of 1909 for Scholarships (additional) . . . . .	\$2,676.48
John W. Foster for John W. Foster Fund (additional) . . . . .	276.01
Caroline French Estate for Jonathan French Fund (additional) . . . . .	146.67
Benjamin Munch for Samuel Munch Fund . . . . .	1,200.00
Harriette Nevins Estate for George Blackburn Memorial (additional) . . . . .	113.18
John D. Rockefeller, Jr. for John D. Rockefeller, Jr. Fund . . . . .	1,021,475.00
Homer E. Sargent for Homer E. Sargent Fund . . . . .	2,415.63
Henry P. Talbot Estate for Henry P. Talbot Fund (additional) . . . . .	32.04
Marion Westcott Estate for Marion Westcott Fund (additional) . . . . .	1,375.88
Everett Westcott Estate for Everett Westcott Fund (additional) . . . . .	800.00
	<u>\$1,030,510.89</u>

*Funds for Designated Purposes*

## Contributions to

Class of 1922 . . . . .	\$5.00
Class of 1938 . . . . .	461.51
Karl T. Compton Prize Fund . . . . .	5,959.50
Margaret Compton Fund . . . . .	10.00
Julian M. Avery for Julian M. Avery Fund (additional) . . . . .	5,145.67
Godfrey L. Cabot Charitable Foundation for Godfrey L. Cabot Fund . . . . .	10,000.00
Eunice M. Cruft Estate for Scholarship . . . . .	1,250.00
Mrs. Harry M. Goodwin for Harry M. Goodwin Fund . . . . .	9,824.00
Marie Holm for Loren Holm Scholarship . . . . .	5,955.89
Eleanor Martin for Waldo A. Martin Fund . . . . .	10,000.00
Alexander Mercer Estate for Hall-Mercer Fund (additional) . . . . .	242.37
William E. Nickerson Estate for Scholarship . . . . .	26,066.77
Anne C. Norris Estate for James F. Norris Fellowship (additional) . . . . .	34,365.22
Odette S. Price for Raymond Price Fund (additional) . . . . .	3,000.00
Willis W. Reeves for Willis W. Reeves, Jr. Scholarship (additional) . . . . .	150.00
Julia H. S. Smith Estate for Elias Howe, Jr. Scholarship . . . . .	17,600.36
E. R. Stevens Estate for Albert Boyden Fund (additional) . . . . .	30.14
Katherine R. Thomas Estate for W. B. S. Thomas Fund (additional) . . . . .	2,002.50
United Fruit Company for United Fruit Fund . . . . .	250,000.00
	<u>\$382,068.93</u>

TOTAL GIFTS FOR ENDOWMENT . . . . . \$1,412,579.82

## GIFTS FOR STUDENT LOAN FUNDS

S. Prince for Tech Loan Fund . . . . .	<u>\$10.00</u>
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## GIFTS FOR BUILDING FUNDS

Campbell Soup Company for Biology and Food Technology . . . . .	\$1,000,000.00
Arthur J. Conner Trust for A. J. Conner Dormitory Fund . . . . .	8,166.49
Ingersoll Rand Company for Hydrodynamics Laboratory . . . . .	10,000.00
A. P. Sloan Foundation for Sloan Metals Processing Laboratory . . . . .	250,000.00
Robert A. Waters for Electronics Laboratory Building Fund . . . . .	100.00
	<u>\$1,268,266.46</u>

## OTHER GIFTS (Principal available for expenses)

*Unexpended Balance of Endowment Fund Income  
for Designated Purposes*

Charles Hayden Foundation for Hayden Memorial Fund Special (additional) . . . . .	\$2,500.00
John Volpe for William Ware Fund . . . . .	25.00
	\$2,525.00

*Funds for General Purposes — Invested*

## Contributions to

Class of 1899 . . . . .	\$1,000.00
Class of 1924 . . . . .	1,005.00
Class of 1925 . . . . .	22,792.14
Development Fund . . . . .	1,730,713.08
Anonymous J. . . . .	600.00
Anonymous LE. . . . .	10,000.00
Anonymous R. . . . .	10,000.00
Stephen L. Bartlett Estate for Stephen L. Bartlett Fund (additional)	2.10
Arthur J. Conner Trust for Arthur J. Conner Fund . . . . .	101,245.54
Charles H. Eames Estate for Charles H. Eames Fund . . . . .	20,000.00
William T. Henry Estate for William T. Henry Fund (additional)	19,720.00
Edwin J. Lewis, Jr. Estate for Edwin J. Lewis Fund . . . . .	24,303.54
Alice G. Martin Estate for Augustus P. Martin Fund . . . . .	61,000.00
Alice Metcalf Trust for Leonard Metcalf Memorial Fund . . . . .	2,573.48
William E. Nickerson Estate for William E. Nickerson Fund (add'l)	26,066.78
Edward A. Sumner Estate for Edward A. Sumner Fund . . . . .	10,694.44
Edwin S. Webster for Edwin S. Webster Fund . . . . .	25,217.50
	\$2,066,933.60

*Funds for Designated Purposes — Invested*

## Contributions to

M.I.T. Alumni 1949-1950 . . . . .	\$61,051.37
M.I.T. Alumni 1950-1951 . . . . .	998.50
Boston Stein Club (additional) . . . . .	215.00
Class of 1898 . . . . .	600.00
Industrial Relations Fund . . . . .	26,250.00
Tubby Rogers Fund . . . . .	225.00
American Can Company for Food Technology Fund (additional)	10,000.00
Anonymous for Athletics Field Special . . . . .	3,500.00
Carnegie Corporation for Carnegie S.A.L. Center (additional) . . .	40,000.00
Dow Chemical Company for Food Technology Fund (additional) . .	10,000.00
Goodyear Tire & Rubber Company for Ind. Econ. Graduate Fellowship . . . . .	2,500.00
Oscar Horovitz for Horovitz Fund (additional) . . . . .	500.00
International Business Machine Co. for Ind. Econ. Fellowship (add'l)	1,000.00
International Tel. & Tel. for Industrial Fellowship in Economics (additional) . . . . .	10,000.00
Sigmund Kunstadter for Nuclear Science Fund (additional) . . . . .	1,000.00
Arthur D. Little, Inc. for Arthur D. Little Lecture Fund (add'l) . . .	2,500.00

GIFTS, GRANTS AND BEQUESTS

229

OTHER GIFTS — continued

*Funds for Designated Purposes — Invested*

John R. Macomber for John R. Macomber Fund (additional) . . . . .	\$500.00
C. Lillian Moore Estate for John A. Grimmons Fund (additional) . .	3,113.86
John L. Pratt for Pratt Spectroscopy Research . . . . .	42,000.00
Radio Corporation of America for Research Laboratory of Elec- tronics Fellowship (additional) . . . . .	10,000.00
Socony Vacuum Oil Company for Industrial Fellowship in Elec- tronics (additional) . . . . .	5,000.00
Standard Brands, Inc. for Food Technology (additional) . . . . .	10,000.00
U. S. Smelting & Refining Company for Ind. Econ. Fellowship (add'l)	1,000.00
Westinghouse Educational Foundation for Ind. Econ. Grad. Fellowship (additional) . . . . .	2,500.00
Albert and Jessie Wiggin Foundation for Ind. Econ. Grad. Fellowship (additional) . . . . .	1,000.00

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\$245,453.73

*Funds for Designated Purposes — Not Invested*

Contributions to

Faculty Flower Fund . . . . .	\$15.26
Foreign Student Project . . . . .	28,151.21
Mechanical Design Prize Fund . . . . .	75.00
Mechanical Engineering Flower Fund . . . . .	88.00
Structural Laboratory . . . . .	75.00
Undergraduate Scholarship Special . . . . .	500.00
Acoustics Material Association for Fellowship . . . . .	3,000.00
Allied Chemical & Dye Corporation for Fellowship (additional) . . .	3,350.00
Aluminum Company of America for Research (additional) . . . . .	25,000.00
American Brake Shoe Company for Fellowship (additional) . . . . .	700.00
American Cancer Society for Research (additional) . . . . .	50,369.00
American Chemical Society for Merck Fund . . . . .	2,500.00
American Chiclé Company for Fellowship (additional) . . . . .	6,000.00
American Cyanamid Company for Fellowship (additional) . . . . .	2,000.00
American Foundryman's Society for Research . . . . .	3,750.00
American Petroleum Institute for Research (additional) . . . . .	19,900.00
American Philosophical Society for Research . . . . .	2,000.00
American Smelting & Refining Company for Scholarship (additional)	1,500.00
American Society of Mechanical Engineers for Research (additional)	12,861.20
American Society of Tool Engineers for Research (additional) . . . . .	300.00
Anonymous for Anonymous L . . . . .	1,900.00
Anonymous for President's Fund "L" . . . . .	10,000.00
Armour & Company for Research — Waugh (additional) . . . . .	26,100.00
Edwin H. Armstrong for Cosmic Terrestrial Research (additional)	2,500.00
Atlantic Refining Company for Research . . . . .	20,000.00
Aviation Week for Fellowship . . . . .	1,800.00
Baird Associates for Spectroscopy Research (additional) . . . . .	1,000.00
Bituminous Coal Research, Inc. for Research (additional) . . . . .	7,000.00
Charles B. Breed for Medical X-Ray Fund . . . . .	100.00
Bristol Laboratories for Research (additional) . . . . .	6,000.00
Godfrey L. Cabot, Inc. for Research (additional) . . . . .	25,000.00

## OTHER GIFTS — continued

*Funds for Designated Purposes — Not Invested*

Godfrey L. Cabot, Inc for Carbon Black Fund . . . . .	\$6,000.00
California Research Corporation for Research . . . . .	50,000.00
Chicopee Manufacturing Company for Fellowship (additional) . . . . .	2,600.00
H. W. Christopher for H. W. Christopher Fund . . . . .	200.00
Cities Service Research & Development Company for Research (add'l)	50,000.00
E. L. Cochrane for Naval Architecture Anonymous Fund . . . . .	170.00
Conservation Foundation for Research . . . . .	3,600.00
Continental Can Company for Spectroscopy Research (additional)	10,000.00
Continental Oil Company for Research . . . . .	25,000.00
Thomas C. Desmond for Photogrammetry Laboratory (additional)	4,150.00
Detroit Alumni Club for Scholarship . . . . .	750.00
Dewey & Almy Chemical Company for Research (additional) . . . . .	11,041.49
Draper Corporation for Draper Fund . . . . .	50,000.00
E. I. DuPont deNemours for Fellowship (additional) . . . . .	7,800.00
Marcy Eager for Eager Student Aid . . . . .	250.00
Eastman Kodak Company for Fellowships (additional) . . . . .	3,750.00
Homer D. Eckhardt for Sperry Gyroscope Fund . . . . .	500.00
Elastic Colloid Research Corporation for Research (additional) . . . . .	2,000.00
Samuel Eliot for Low Temperature Research . . . . .	300.00
Engineering Foundation for Research (additional) . . . . .	4,800.00
Tech Christian Association for Foreign Student Project . . . . .	500.00
Foundry Educational Foundation for Scholarship (additional) . . . . .	15,000.00
R. E. Gillmor for Gillmor Fund (additional) . . . . .	600.00
Goodyear Tire & Rubber Company for Fellowship (additional) . . . . .	6,000.00
Gottesman Foundation for Fellowship (additional) . . . . .	2,600.00
Graduate House Committee for Crafts Library Fund . . . . .	250.00
M. M. Greer for Greer Rowing Equipment . . . . .	600.00
Paul B. Guilden for Dean's Fund Special . . . . .	1,000.00
Gulf Oil Corporation for Fellowship (additional) . . . . .	1,350.00
Harshaw Chemical Company for Research (additional) . . . . .	8,000.00
Charles Hayden Foundation for Medical X-Ray (additional) . . . . .	5,000.00
W. C. Hotchkin for Dard Hunter Fund . . . . .	4,400.00
Houston Endowment, Inc. for William Knudsen Fellowship (add'l)	2,500.00
Humble Oil & Refining Company for Research (additional) . . . . .	25,000.00
Professor Jerome C. Hunsaker for Aeronautical Special (additional)	1,000.00
Godfrey M. Hyams Trust for Radiation Research (additional) . . . . .	7,500.00
Illuminating Engineering Society for Research (additional) . . . . .	5,000.00
Jackson & Moreland for Jackson Memorial Room . . . . .	2,500.00
Charles F. Kettering Foundation for Research . . . . .	10,000.00
Kimberly Clark Corporation for Fellowship (additional) . . . . .	4,000.00
Charles A. and Marjorie King Estate for King Fund (additional) . . . . .	10,000.00
Liquid Carbonic Corporation for Research . . . . .	10,000.00
Newman Marsillius for Marsillius Fund (additional) . . . . .	1,000.00
Trustees of Melvin Trust for Melvin Trust Scholarship (additional)	11,787.00
Memorial Hospital for Spectroscopy Research (additional) . . . . .	8,000.00
Floyd Naramore for Floyd Naramore Fund . . . . .	1,000.00
National Academy of Sciences for Research . . . . .	4,622.50
National Geographic Society for Edgerton Film Research . . . . .	3,600.00
National Lime Association for Research (additional) . . . . .	7,500.00
National Public Health for Research . . . . .	2,660.00



## OTHER GIFTS — continued

*Funds for Designated Purposes — Not Invested*

Nova Scotia Research Foundation for Research (additional) . . . . .	\$1,250.00
Nutrition Research Foundation for Research (additional) . . . . .	4,000.00
Pan American Refining Company for Fellowship (additional) . . . . .	2,500.00
Pepsodent for Research (additional) . . . . .	5,000.00
Pittsburgh Consolidation Coal Company for Research (additional)	3,100.00
Plastic Materials Manufacturing Association for Research (add'l) . .	33,537.68
Procter & Gamble for Fellowship (additional) . . . . .	7,300.00
The Quaker Oats Company for Nutrition Research (additional) . . .	3,900.00
Research Corporation for Research (additional) . . . . .	22,715.00
Revere Copper & Brass, Inc. for Research (additional) . . . . .	3,500.00
Riker Laboratories, Inc. for Research . . . . .	2,300.00
Rockefeller Foundation for Research (additional) . . . . .	57,995.13
S. K. F. Industries for Fatigue & Fracture of Metals Research . . .	500.00
Saco Lowell Shops for Research . . . . .	20,000.00
Sharp & Dohme, Inc. for Research (additional) . . . . .	3,600.00
Shell Fellowship Committee for Fellowship (additional) . . . . .	2,300.00
A. P. Sloan Foundation for Fellowship (additional) . . . . .	50,000.00
A. O. Smith Corporation for Research . . . . .	10,000.00
Socony Vacuum Oil Company for Research (additional) . . . . .	50,000.00
Sperry Gyroscope Company for Sperry Gyroscope Fund (additional)	15,000.00
Spool Cotton Company for Clark Thread Fellowship (additional) . .	5,400.00
Standard Brands, Inc. for Fellowship (additional) . . . . .	2,200.00
Standard Oil Company of California for Fellowship (additional) . .	3,025.00
Standard Oil Company of Indiana for Research (additional) . . . . .	50,000.00
Standard Oil Company of New Jersey for Research (additional) . .	50,000.00
Sugar Research Foundation for Research (additional) . . . . .	4,950.00
Texas Company for Research (additional) . . . . .	150,000.00
Timken Roller Bearing Company for Research (additional) . . . . .	10,000.00
Titanium Alloy Manufacturing Company for Research (additional)	1,500.00
Union Carbide & Carbon Corporation for U.C.&C. Fund (additional)	20,000.00
Union Carbide & Carbon Corporation for Fellowship (additional) . .	2,100.00
U. S. Rubber Company for Fellowship (additional) . . . . .	2,800.00
U. S. Steel Corporation for Research . . . . .	150,000.00
Upjohn Company for Research . . . . .	6,000.00
Vanadium Alloy Steel Company for Research (additional) . . . . .	1,875.00
Ralph Walker for Ralph Walker Fund (additional) . . . . .	300.00
S. K. Wellman for S. K. Wellman Fund (additional) . . . . .	2,500.00
Westinghouse Educational Foundation for George Westinghouse Professorship (additional) . . . . .	30,000.00
Westinghouse Educational Foundation for Science Teachers Fellowship (additional) . . . . .	12,500.00
Julia Whitney for Granger Whitney Fund (additional) . . . . .	200.00
Howard D. Williams for H. D. Williams Fund (additional) . . . . .	500.00

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 \$1,463,763.47

 TOTAL OTHER GIFTS . . . . . \$3,778,675.80

## MISCELLANEOUS GIFTS

*Deposits and Advances Held for Investment*

Class of 1900 .....	\$4,995.00
Class of 1901 .....	369.50
Class of 1903 .....	950.00
Class of 1917 .....	2,433.15
Class of 1917 Reunion Fund .....	1,850.00
Class of 1921 .....	1,865.00
Class of 1926 .....	3,860.22
Class of 1927 Joseph W. Hammond Memorial .....	30.00
Class of 1928 .....	50.00
Class of 1929 .....	4.20
Class of 1933 .....	164.44
Class of 1934 .....	36.94
Class of 1935 .....	90.23
Class of 1936 .....	71.58
Class of 1937 .....	559.02
Class of 1944 .....	553.32
Class of 1948 Reunion .....	100.00
Class of 1949 .....	264.85
	<u>\$18,247.45</u>

*Conditional Gifts*

Anonymous for Anonymous Q .....	\$3,010.00
Anonymous for Anonymous X .....	24,900.00
Knight W. Wheeler for Wheeler Fund .....	20,000.00
George Witmer for Witmer Fund (additional) .....	2,400.00
	<u>\$50,310.00</u>
TOTAL MISCELLANEOUS GIFTS .....	<u>\$68,557.45</u>

## SUMMARY

Gifts for Endowment		
Funds for General Purposes .....	\$1,030,510.89	
Funds for Designated Purposes .....	<u>382,068.93</u>	\$1,412,579.82
Gifts for Student Loans .....		10.00
Gifts for Building Funds .....		1,268,266.49
Other Gifts (principal available for expenses)		
Unexpended Balances of Endowment Fund Income	\$2,525.00	
Funds for General Purposes — Invested .....	2,066,933.60	
Funds for Designated Purposes — Invested .....	245,453.73	
Funds for Designated Purposes — Not Invested ..	<u>1,463,763.47</u>	3,778,675.80
Miscellaneous Gifts		
Deposits and Advances held for Investment .....	\$18,247.45	
Conditional Gifts .....	<u>50,310.00</u>	68,557.45
		<u>\$6,528,089.56</u>

REPORT OF THE TECHNOLOGY LOAN FUND COMMITTEE

COMPARATIVE BALANCE SHEET

		ASSETS			
		June 30, 1949		June 30, 1950	
Cash.....	\$ 57,478.63		\$ 86,934.05		
Investments (Schedule A-2).....	1,598,218.20	\$1,655,696.83	1,570,416.29	\$1,657,350.34	
Student Notes Receivable:					
Loans 1930 to date.....	\$2,041,659.75		\$2,179,510.75		
Less Repayments (including \$8,734.70 charged off).....	1,688,316.09	353,343.66	1,751,623.28	427,887.47	
<b>TOTAL ASSETS.....</b>		<u>\$2,009,040.49</u>		<u>\$2,085,237.81</u>	
		LIABILITIES			
Technology Loan Fund:					
Total Subscriptions.....		\$1,451,285.18		\$1,451,295.18	
Add:					
Investment Income (net).....	\$ 558,576.97		\$ 621,955.91		
Interest from Loans.....	225,796.03		229,623.48		
Class of 1895 Memorial Fund.....	3,824.00	788,197.00	4,824.00	856,403.39	
		\$2,239,482.18		\$2,307,698.57	
Deduct:					
Net Loss on Sales of Securities.....	\$190,978.28		\$181,486.97		
Written Off, Deceased Borrowers.....	3,810.95		5,125.32		
Legal Settlements.....	3,413.37		3,609.38		
Life Insurance Premiums.....	32,239.09	230,441.69	32,239.09	222,460.76	
<b>TOTAL LIABILITIES.....</b>		<u>\$2,009,040.49</u>		<u>\$2,085,237.81</u>	

RECEIPTS AND EXPENDITURES FOR 1949-1950

		RECEIPTS	
Income (Investments).....			\$63,378.94
Interest (Loans).....			3,827.45
Net Gains on Sales of Securities.....			9,491.31
Gift.....			10.00
Class of 1895 Memorial Fund.....			1,000.00
			<u>\$77,707.70</u>
		EXPENDITURES	
Loans made during year.....		\$137,851.00	
Less: Repayments (plus charge-offs).....		63,307.19	
		\$74,543.81	
Deceased Borrowers.....		1,314.37	
Legal Settlements.....		196.01	76,054.19
<b>NET INCREASE IN CASH AND INVESTMENTS.....</b>			<u>\$1,653.51</u>

TECHNOLOGY LOAN FUND COMMITTEE

Karl T. Compton, *Chairman*

Gerard Swope  
Pierre S. du Pont

William C. Potter  
Joseph J. Snyder

## REPORT OF THE TREASURER

REPORT OF THE TRUSTEES OF THE  
M. I. T. PENSION ASSOCIATION  
COMPARATIVE BALANCE SHEET

ASSETS		
	<i>June 30, 1949</i>	<i>June 30, 1950</i>
Cash .....	\$16,565.07	\$100,658.84
Investments (page 235).....	2,453,614.48	2,712,411.70 <sup>1</sup>
<b>Total</b> .....	<b>\$2,470,179.55</b>	<b>\$2,813,070.54</b>
<sup>1</sup> Market Value June 30, 1950, \$3,025,726.98.		
LIABILITIES		
Teachers' Annuity Fund (5% salary deduction, plus interest).....	\$1,436,342.40	\$1,594,651.63
*M.I.T. Pension Fund (3% appropriation, plus interest).....	959,196.19	1,073,233.06
Special Reserves for Annuity Payments....	67,018.15	123,698.30
<b>Total Liabilities</b> .....	<b>\$2,462,556.74</b>	<b>\$2,791,582.99</b>
Reserve Fund (including undistributed income).....	7,622.81	21,487.55
<b>Total</b> .....	<b>\$2,470,179.55</b>	<b>\$2,813,070.54</b>

\* The Institute appropriates annually the equivalent of the 5% salary deduction, using 2% for payment of group insurance premiums.

RECEIPTS AND EXPENDITURES FOR 1949-1950

RECEIPTS	
5% salary deductions added to Teachers' Annuity Fund . . .	\$195,445.68
3% appropriations added to M.I.T. Pension Fund . . . . .	117,413.64
Income from investments (Net).....	98,845.11
Gain on sale of securities .....	7,007.37
<b>Total Receipts</b> .....	<b>\$418,711.80</b>
EXPENDITURES	
Paid on account of withdrawal or decease of members . . . . .	\$63,722.86
Pension paid directly to retired former members.....	12,097.95
<b>Total Expenditures</b> .....	<b>\$75,820.81</b>
<b>Net Increase of Ledger Assets</b> .....	<b>\$342,890.99</b>

TRUSTEES OF THE M.I.T. PENSION ASSOCIATION

Karl T. Compton	Joseph J. Snyder	John R. Macomber
Ralph E. Freeman		John R. Loofbourow

A RECORD OF INVESTMENTS HELD FOR ACCOUNT OF THE TRUSTEES OF THE M.I.T. PENSION ASSOCIATION

<i>Par Value or Shares</i>				<i>Book Value</i>	<i>Net Income<sup>1</sup></i>
\$125,000	U. S. Treasury . . . . .	2¾	1959-62	\$127,500.00	\$509.96
125,000	U. S. Treasury . . . . .	2¾s	1968	126,200.00	3,025.00
100,000	U. S. Treasury . . . . .	2¾s	1964-69	100,700.00	2,400.00
100,000	U. S. Treasury . . . . .	2¾s	1965-70	101,431.25	2,400.00
100,000	U. S. Treasury . . . . .	2¾s	1967-72	101,935.00	1,891.32
910,000	U. S. Savings, "G". . . . .	2¾s	1954-62	910,000.00	20,250.00
35,000	Alabama Power . . . . .	3¾s	1972	35,000.00	1,225.00
50,000	Am. Tel. & Tel. . . . .	2¾s	1961	54,000.00	975.00
50,000	Am. Tel. & Tel. . . . .	2¾s	1980	50,100.00	1,325.00
50,000	Comm. Edison . . . . .	3s	1977	52,400.00	1,400.00
46,000	Louisiana Pr. & Lt. . . . .	3s	1974	47,173.40	1,330.00
50,000	Pac. Gas & Elec. . . . .	3s	1974	51,500.00	1,400.00
50,000	Philadelphia Electric . . . . .	2¾s	1974	50,300.00	1,325.00
35,000	So. California Edison . . . . .	3s	1965	36,600.00	950.00
25,000	Balt. & Ohio . . . . .	4s	1975	24,987.50	1,000.00
800	du Pont . . . . .			29,504.20	3,000.00
1,102 1/8	Eastman Kodak . . . . .			28,500.00	1,805.80
1,500	General Electric . . . . .			63,519.71	3,900.00
600	General Motors . . . . .			29,332.24	5,100.00
450	Gulf Oil . . . . .			28,174.29	675.00
501 1/8	Int. Business Machines . . . . .			26,441.93	1,958.00
1,600	Sears Roebuck . . . . .			29,391.89	3,600.00
1,000	Standard Oil, Ind. . . . .			42,892.95	2,707.00
868	Standard Oil, N. J. . . . .			40,551.16	3,881.00
1,500	Union Carbide and Carbon . . . . .			41,575.54	3,000.00
1,500	United Fruit . . . . .			38,575.21	6,000.00
800	United Shoe . . . . .			49,713.79	1,437.50
200	Am. Telephone & Telegraph . . . . .			33,252.59	1,800.00
1,200	Cleveland Electric Illuminating . . . . .			44,110.95	2,760.00
600	Houston Lighting & Power . . . . .			26,132.53	1,320.00
1,000	Public Service of Indiana . . . . .			29,496.30	450.00
1,500	Virginia Electric & Power . . . . .			30,000.00	900.00
560	Bankers Trust, N. Y. . . . .			26,737.50	1,028.00
625	Chemical Bank and Trust, N. Y. . . . .			25,187.50	1,125.00
500	First National Bank, Boston . . . . .			27,500.00	1,125.00
100	Guaranty Trust, N. Y. . . . .			23,989.50	1,400.00
720	Fireman's Fund Insurance . . . . .			40,950.00	1,872.00
267	Hartford Fire . . . . .			18,338.67	600.50
300	Insurance Co. of North America . . . . .			16,000.00	975.00
	Real Estate, Albany, N. Y. . . . .			52,716.10	2,410.28
	Income from stocks and bonds sold . . . . .				2,608.75
	<b>Total Pension Association . . . . .</b>			<b>\$2,712,411.70</b>	<b>\$98,845.11</b>

<sup>1</sup> Net after premium amortization.

*SCHEDULE A*

## BALANCE SHEET

JUNE 30, 1950

## INVESTMENTS

## General Investments:

U.S. Government Bonds .....	\$15,450,243.76
Other Bonds .....	1,968,948.52
Commercial Paper .....	2,977,333.33
Preferred Stocks .....	175,500.00
Common Stocks .....	15,581,241.34
Real Estate (including \$4,188,678.26 devoted to Institute use) and Mortgages .....	8,846,808.11
Advances for Current Operations (per contra) .....	1,944,433.92

Total General Investments..... (A-1) \$46,944,508.98

Investments of Funds Separately Invested..... (A-2)	3,607,279.38
Students' Notes Receivable..... (A-12)	442,215.29

\$50,994,003.65

## CURRENT AND DEFERRED ASSETS

## Cash:

General Purposes .....	\$2,211,014.93
Segregated for Certain U.S. Government Research Contracts .....	724,934.57
Students' Safe-Keeping Deposits .....	83,974.48

Accounts Receivable, U.S. Government and Other.. (A-13)	1,237,440.48
Contracts in Progress, U.S. Government and Other.. (A-14)	1,932,992.87
Inventories, Prepaid Expenses and Deferred Charges. (A-15)	907,780.75

\$7,098,138.08

## EDUCATIONAL PLANT

Land, Buildings and Equipment..... (A-19)	\$24,213,962.58
	<u>\$82,306,104.31</u>

## BALANCE SHEET

237

## SCHEDULE A

## BALANCE SHEET

JUNE 30, 1950

## INVESTED FUNDS

Endowment Funds — Income Available:		
For General Purposes . . . . . (A-3)	\$27,998,128.94	
For Designated Purposes . . . . . (A-4)	9,129,364.52	
Student Loan Funds . . . . . (A-5)	2,203,421.35	
Building Funds — Principal and Income Available . . . (A-6)	1,652,243.99	
Other Invested Funds — Principal and Income Available:		
For General Purposes . . . . . (A-7)	1,119,947.84	
For Designated Purposes . . . . . (A-8)	3,536,979.06	
Unexpended Balances of Endowment Fund Income for		
Designated Purposes . . . . . (A-4)	915,269.47	
Deposits and Advances Held for Investment . . . . . (A-9)	457,101.68	
Conditional Gifts, Income not yet Available . . . . . (A-10)	488,510.80	
Accumulated Net Gain on General Investments . . . . . (A-11)	3,493,036.00	
		<u>\$50,994,003.65</u>

## CURRENT LIABILITIES, FUNDS AND SURPLUS

Advances from Invested Funds (per contra) . . . . .	\$1,944,433.92
Accounts Payable and Accrued Wages . . . . .	508,359.39
Students' Advance Fees and Deposits . . . . . (A-16)	240,461.68
Students' Safe-Keeping Deposits . . . . .	83,974.48
Withholdings, Deposits and Other Credits . . . . . (A-17)	303,556.70
Advances by U.S. Government for Certain Research Contracts	2,520,230.32
Total Current Liabilities . . . . .	<u>\$5,601,016.49</u>
Unexpended Balances for Designated Purposes:	
Investment Income not Distributed to Funds . . . . .	242,719.96
Gifts and Other Receipts for Current Expenses—uninvested (including \$56,842.04 unexpended balances of appro- priated income) . . . . . (A-18)	1,445,833.12
Deficit from Operations . . . . . (Schedule C)	191,431.49
	<u>\$7,098,138.08</u>

## EDUCATIONAL PLANT CAPITAL

Endowment for Educational Plant . . . . . (A-20)	\$24,213,962.58
	<u>\$82,306,104.31</u>

## SCHEDULE B

STATEMENT OF INCOME AND EXPENSE FOR YEAR ENDED  
JUNE 30, 1950

## INCOME

## EDUCATIONAL AND GENERAL:

TUITION AND OTHER FEES . . . . . (B-1)	\$4,133,731.59
INVESTMENT INCOME used for current expenses . . . . . (B-2)	1,332,222.35
GIFTS AND OTHER RECEIPTS used for current expenses . . . . . (B-2)	2,147,492.01
REVENUE FROM RESEARCH CONTRACTS (including allowances for expenses of administration and plant operation) . . . . . (B-3)	12,376,859.18
OTHER INCOME . . . . . (B-4)	56,205.02

Total Educational and General . . . . . \$20,046,510.15

AUXILIARY ACTIVITIES — Dormitories, Dining Services and Housing Projects . . . . . (B-13) 1,423,884.18

*Total Operating Income* . . . . . \$21,470,394.33

## EXPENSES

## EDUCATIONAL AND GENERAL:

## ACADEMIC EXPENSES:

Salaries and Wages . . . . . (B-5)	\$3,966,334.47
Departmental Expenses (including research expenses of academic departments) . . . . . (B-6)	780,824.11
Library and Museum . . . . . (B-7)	232,679.82

RESEARCH CONTRACTS (direct expenses) . . . . . (B-3) 10,674,712.11

GENERAL AND ADMINISTRATIVE EXPENSES . . . . . (B-9) 2,244,855.45

PLANT OPERATION . . . . . (B-10) 1,800,413.38

MEDICAL DEPARTMENT . . . . . (B-11) 150,600.03

UNDERGRADUATE BUDGET BOARD . . . . . (B-12) 262,423.33

Total Educational and General . . . . . \$20,112,842.70

AUXILIARY ACTIVITIES — Dormitories, Dining Services and Housing Projects . . . . . (B-13) 1,423,219.12

*Total Operating Expenses* . . . . . \$21,536,061.82

DEFICIENCY OF INCOME FOR YEAR . . . . . \$65,667.49



SCHEDULE C

DEFICIT FROM OPERATIONS

YEAR ENDED JUNE 30, 1950

DEFICIT June 30, 1949 . . . . .		\$228,625.44
Deficiency of income for the year ended June 30, 1950 . . . . .		65,667.49
		<u>\$294,292.93</u>
Unexpended balances of prior years' appropriations from current income restored to surplus:		
By cancellation of appropriations . . . . .	\$51,555.32	
By expenditure charged to current expenses . . . . .	95,988.09	
		<u>\$147,543.41</u>
Unexpended balances of 1949-50 appropriations from income, reserved for future expenditure . . . . .	44,681.97	
Net reduction of unexpended balances of appropriated income . . .		<u>102,861.44</u>
DEFICIT June 30, 1950 . . . . .		<u><u>\$191,431.49</u></u>

## STATEMENT ON ACCOUNTS

*To the Treasurer:*

Supporting schedules for the Balance Sheet as of June 30, 1950, and Statement of Income and Expense for the year have been drawn from the Institute's books of account and are presented herewith. The schedules A-1 through A-20 are keyed to (A) the Balance Sheet and schedules B-1 through B-13 to (B) the Statement of Income and Expense.

D. L. RHIND  
*Bursar*

J. A. LITTLE  
*Accounting Officer*

W. A. HOKANSON  
*Assistant Bursar*

August 15, 1950

INVESTMENTS

241

SCHEDULE A-I  
GENERAL INVESTMENTS

U. S. GOVERNMENT BONDS

<i>Par Value</i>			<i>Book Value</i>	<i>Net Income<sup>1</sup></i>
\$5,000,000	U.S. Treasury . . . . .	2 1/4s 1962-59	\$5,000,000.00	\$112,500.00
1,000,000	U.S. Treasury . . . . .	2 1/2s 1954-52	1,001,400.00	24,300.00
5,100,000	U.S. Treasury . . . . .	2 1/2s 1969-64	5,179,000.00	121,500.00
417,000	U.S. Savings "G" . . . . .	2 1/2s 1953-56	417,000.00	10,425.00
3,750,000	U.S. Treasury . . . . .	2 1/2s 1971-66	3,852,843.76	1,916.04
	Income from bonds sold . . . . .			30.24
<i>Total U.S. Government Bonds . . . . .</i>			<u>\$15,450,243.76</u>	<u>\$270,671.28</u>

PUBLIC UTILITY BONDS

\$250,000	American & For. Pr. . . . .	5s 2030	\$246,478.00	\$12,500.00
173,000	Puget Sound Pr. & Lt. . . . .	4 1/4s 1972	177,168.69	7,524.50
	Income from bonds sold or called . . . . .		.....	3,727.78
<i>Total Public Utility Bonds . . . . .</i>			<u>\$423,646.69</u>	<u>\$23,752.28</u>

RAILROAD BONDS

\$100,000	Baltimore & Ohio . . . . .	4s 1975	\$86,985.00	\$4,000.00
50,000	B.&O.,P.,L.E.&W.Va. . . . .	4s 1980	48,643.75	2,000.00
4,000	Missouri Pacific . . . . .	5s 1978	4,000.00	.....
115,000	Northern Pacific . . . . .	4s 1997	105,228.29	4,600.00
150,000	Southern Pacific . . . . .	4 1/2s 1981	147,787.50	6,750.00
	Income from bonds sold . . . . .		.....	1,535.48
<i>Total Railroad Bonds . . . . .</i>			<u>\$392,644.54</u>	<u>\$18,885.48</u>

OTHER BONDS

<i>Par Value or Shares</i>			<i>Book Value</i>	<i>Net Income</i>
\$250,000	Com'l Credit . . . . .	2 3/4s 1954	\$250,000.00	\$6,875.00
250,000	Com'l Credit . . . . .	2 3/4s 1955	250,000.00	6,875.00
250,000	Com'l Credit . . . . .	2 3/4s 1956	250,000.00	6,875.00
250,000	Com'l Credit . . . . .	2 3/4s 1957	250,000.00	6,875.00
625	Eastern States Exposition . . . . .	4s 1999	1.00	12.50
1,000	Italian Credit Consortium . . . . .	2s 1977	412.50	.....
52,500	Phillips Petroleum . . . . .	2 3/8s 1975	54,243.79	.....
2,000	Power Condenser & Electronics . . . . .	6s 1958	2,000.00	.....
96,000	Railway & Light Sec . . . . .	3 1/4s 1955	96,000.00	3,120.00
	Income from bonds sold . . . . .		.....	11.60
<i>Total Other Bonds . . . . .</i>			<u>\$1,152,657.29</u>	<u>\$30,644.10</u>

<sup>1</sup> Net after premium amortisation.

## REPORT OF THE TREASURER

## SCHEDULE A-1 — (Continued)

<i>Par Value or Shares</i>			<i>Book Value</i>	<i>Net Income</i>
	<b>COMMERCIAL PAPER</b>			
\$1,000,000	Com'l Invest. Trust.	1950	\$992,500.00	.....
1,000,000	Gen. Motors Acceptance Corp. ....	1950	992,375.00	.....
1,000,000	Gen. Motors Acceptance Corp. ....	1950	992,458.33	.....
	Income from notes matured. ....		.....	\$64,622.57
	<i>Total Commercial Paper Notes</i> . . . . .		<u>\$2,977,333.33</u>	<u>\$64,622.57</u>
	<b>PUBLIC UTILITY PREFERRED STOCKS</b>			
1,500	N.E. Gas & Elec. Assoc. ....	4½%	\$154,500.00	\$6,750.00
	Income from stocks sold. ....		.....	1,125.00
	<i>Total Public Utility Preferred Stocks</i> . .		<u>\$154,500.00</u>	<u>\$7,875.00</u>
	<b>OTHER PREFERRED STOCKS</b>			
100	Armstrong Furnace. ....		\$10,000.00	.....
20	Gannett, Fleming, Corddry & Carpenter. ....		1,000.00	.....
100	H. K. Webster. ....		10,000.00	\$250.00
	Income from stocks sold. ....		.....	4,968.75
	<i>Total Other Preferred Stocks</i> . . . . .		<u>\$21,000.00</u>	<u>\$5,218.75</u>
<i>Shares</i>			<i>Book Value</i>	<i>Net Income</i>
	<b>INDUSTRIAL COMMON STOCKS</b>			
1,000	Allied Chemical and Dye. ....		\$169,177.26	\$11,000.00
3,000	American Can. ....		294,888.57	12,000.00
2,024	American Tobacco. ....		154,736.11	8,096.00
100	American Zinc, Lead and Smelting		900.00	.....
2,600	Armstrong Cork. ....		117,427.19	8,710.00
4,000	Caterpillar Tractor. ....		92,194.13	8,000.00
150	Chicago, Wilmington and Franklin Coal. ....		3,450.00	.....
263	Christiana Securities. ....		701,474.35	74,657.80
44,200	Chrysler. ....		144,819.60	23,600.00
200	Cochran Foil. ....		3,000.00	40.00
2,000	Colgate Palmolive Peet. ....		100,920.68	6,000.00
2,500	Consolidated Rendering. ....		169,500.00	13,750.00
35	Continental Oil. ....		2,406.25	.....
5	Dewey and Almy Chemical. ....		128.75	.....
1,501	Dow Chemical. ....		95,055.65	.....

INVESTMENTS

243

SCHEDULE A-1 — (Continued)

Shares		Book Value	Net Income
<b>INDUSTRIAL COMMON STOCKS (Continued)</b>			
2,000	Draper Corporation.....	\$96,132.10	\$12,000.00
30,000	Eastman Kodak.....	478,610.26	51,000.00
8,955	General Electric.....	233,287.47	23,273.00
6,321	General Motors.....	288,597.46	49,363.50
3,100	General Radio.....	70,350.00	5,125.00
200	Greyhound Corporation.....	2,000.00	.....
3,500	Gulf Oil.....	184,894.62	13,125.00
6,000	Hercules Powder.....	264,519.94	12,800.00
250	Heywood-Wakefield.....	4,400.00	425.00
100	Hudson Bay Mining and Smelting	3,750.00	76.67
8,000	Humble Oil and Refining.....	339,294.10	32,000.00
52	Industrial Rayon.....	2,750.00	187.50
6,000	Inland Steel.....	199,974.49	18,000.00
1,050	International Business Machines..	47,116.63	4,200.00
6,000	International Harvester.....	79,912.25	10,800.00
4,850	International Nickel.....	163,067.43	13,174.00
8,006	International Paper.....	180,461.60	22,003.75
6,000	Johns Manville.....	187,886.86	16,800.00
35	Jones & Lamson Machine.....	787.50	17.50
1,800	Kennecott Copper.....	84,911.80	7,200.00
60	Kerite Company.....	1,500.00	.....
2,625	Liggett & Myers Tobacco.....	183,606.14	13,125.00
3,150	Liquid Carbonic.....	53,551.11	3,150.00
400	Lithomat Corporation.....	3,700.00	.....
6,020	Merck & Co.....	110,483.44	9,000.00
1,000	Minnesota Mining and Mfg.....	73,708.40	2,800.00
4,000	Monsanto Chemical.....	89,403.58	8,000.00
4,000	Montgomery Ward.....	261,266.32	12,000.00
250	National Company, Inc.....	1,060.00	.....
4,180	National Cash Register.....	139,047.62	10,450.00
4,200	National Lead.....	118,093.64	10,500.00
6,600	National Steel.....	149,488.34	13,860.00
3,500	Ohio Oil.....	106,531.25	2,100.00
6,000	Owens Illinois Glass.....	342,772.10	18,000.00
5,000	J. C. Penny.....	154,666.05	15,000.00
10	Charles Pfizer.....	740.00	15.00
3,000	Phillips Petroleum.....	168,069.52	9,000.00
50	Pittsburgh-Des Moines Company.	3,300.00	.....
6,000	Pittsburgh Plate Glass.....	83,197.11	10,500.00
7,500	Procter & Gamble.....	261,143.86	24,375.00

## REPORT OF THE TREASURER

## SCHEDULE A-1 — (Continued)

<i>Par Value</i>		<i>Book Value</i>	<i>Net Income</i>
<b>INDUSTRIAL COMMON STOCKS (Continued)</b>			
37	Radio Corp. of America.....	\$735.25	\$4.75
500	Rockwell Mfg.....	10,000.00	400.00
1,000	St. Joseph Lead.....	43,998.04	3,000.00
6,664	Sears Roebuck.....	144,572.79	14,483.50
100	Sheraton Corp. of America.....	850.00	.....
2,000	Sherwin Williams.....	100,988.10	6,000.00
14,700	Socony-Vacuum Oil.....	251,737.50	3,675.00
5,675	Standard Oil, Cal.....	343,751.66	11,120.00
7,000	Standard Oil, Ind.....	282,381.62	11,495.20
9,070	Standard Oil, N. J.....	417,565.93	33,111.00
345	J. P. Stevens.....	10,005.00	776.25
2,126	Texas Company.....	116,981.92	9,035.50
2	Texas Gulf Sulphur.....	146.00	2.50
100	Tilo Roofing.....	800.00	10.00
13,745	Union Carbide and Carbon.....	271,908.10	27,407.50
12,306	United Fruit.....	202,533.18	48,024.00
6,000	United Shoe Machinery.....	352,340.53	9,491.25
400	Warner Bros. Pictures.....	5,600.00	.....
6,000	Westinghouse Electric.....	107,827.11	10,200.00
	Income from stocks sold.....	.....	49,244.80
	<b>Total Industrial Common Stocks...</b>	<b>\$9,932,834.26</b>	<b>\$856,780.97</b>
<b>PUBLIC UTILITY COMMON STOCKS</b>			
8,340	American Gas & Elec.....	\$341,103.21	\$24,390.00
1,000	American Tel. & Tel.....	128,639.76	9,000.00
4,060	Boston Edison.....	146,849.74	11,368.00
8,075	Commonwealth Edison.....	230,222.21	12,718.13
2	Electric Bond & Share.....	40.00	.....
46	Gulf State Utilities.....	1,058.00	13.80
3,500	Illinois Power.....	127,251.83	2,200.00
64	North American.....	1,344.00	.....
5	Northern Natural Gas.....	178.12	2.25
42	Northern States Power.....	504.00	.....
4,000	So. California Edison.....	141,089.14	4,000.00
15	Southwestern Pub. Service.....	525.00	8.25
6,000	Texas Gas Transmission.....	102,750.00	.....
8,058	Virginia Elec. & Power.....	156,924.75	7,160.40
	Income from stocks sold.....	.....	10,624.92
	<b>Total Public Utility Common Stocks</b>	<b>\$1,378,479.76</b>	<b>\$81,485.75</b>
<b>RAILROAD COMMON STOCKS</b>			
2,030	Atch., Top. & Santa Fe.....	\$182,584.31	\$16,240.00
2,000	Great Northern.....	95,877.13	7,500.00
1	N. Y. Chicago & St. Louis.....	107.00	.....
1,200	Norfolk & Western.....	43,907.09	6,100.00
	<b>Total Railroad Common Stocks...</b>	<b>\$322,475.53</b>	<b>\$29,840.00</b>

SCHEDULE A-1 — (Continued)

<i>Shares</i>		<i>Book Value</i>	<i>Net Income<sup>1</sup></i>
<b>BANK STOCKS</b>			
3,750	Bankers Trust, N. Y. . . . .	\$189,613.75	\$7,125.00
2,000	Central Hanover Bk. & Tr., N. Y. . . . .	233,650.00	8,000.00
8,000	Chase National, N. Y. . . . .	372,212.50	8,000.00
3,800	Chemical Bank & Trust, N. Y. . . . .	192,887.50	6,840.00
2,425	Cont. Ill. Nat. Bank, Chicago . . . . .	174,564.00	9,700.00
4,986	First National, Boston . . . . .	300,481.21	11,218.50
1,152	Guaranty Trust, N. Y. . . . .	321,949.04	16,128.00
667	Harris Trust & Savings, Chicago . . . . .	146,587.00	8,004.00
2,200	Lincoln Rochester Trust . . . . .	102,800.00	5,280.00
5,800	National City, N. Y. . . . .	252,022.08	11,020.00
500	New England Trust, Boston . . . . .	40,000.00	3,000.00
	<i>Total Bank Stocks</i> . . . . .	<u>\$2,326,767.08</u>	<u>\$94,315.50</u>
<b>INSURANCE STOCKS</b>			
3,751	Boston Insurance . . . . .	\$197,959.62	\$8,503.20
2,125	Continental Insurance . . . . .	68,383.05	4,462.50
3,590	Fireman's Fund . . . . .	207,774.20	9,334.00
2,308	Hartford Fire . . . . .	112,547.69	4,931.00
3,200	Insurance Co. of North America . . . . .	161,635.55	10,150.00
7,500	National Union . . . . .	248,437.51	10,875.00
1,700	Standard Accident . . . . .	51,000.00	2,592.50
	Income from stocks sold . . . . .	.....	23,350.00
	<i>Total Insurance Stocks</i> . . . . .	<u>\$1,047,737.62</u>	<u>\$74,198.20</u>
<b>OTHER STOCKS</b>			
6,000	American Research & Development . . . . .	\$150,000.00	.....
2,050	Bond Investment Trust of America . . . . .	202,031.50	\$8,200.00
50	Kern County Land . . . . .	2,415.63	50.00
9,315	Railway & Light Securities . . . . .	188,992.31	12,189.00
1,000	Stone & Webster, Inc. . . . .	29,507.65	2,250.00
	Income from stocks sold . . . . .	.....	833.89
	<i>Total Other Stocks</i> . . . . .	<u>\$572,947.09</u>	<u>\$23,522.89</u>
<b>REAL ESTATE</b>			
<i>Property Devoted to Institute Use</i>			
111	Bay State Road, Boston . . . . .	\$17,400.00	\$696.00
120	Bay State Road, Boston . . . . .	30,312.75	649.70
	Graduate House, Cambridge . . . . .	647,951.94	.....
	New Dormitory (see Schedule A-19) . . . . .	2,064,180.53	.....
410-420	Memorial Drive, Cambridge . . . . .	600,705.90 <sup>2</sup>	.....
	Westgate, Veterans' Housing . . . . .	459,492.60	10,642.95
565	Memorial Drive, Cambridge . . . . .	200,560.50	8,022.00
211	Massachusetts Avenue, Cambridge . . . . .	100,000.00	3,867.00
	Lexington, Mass. . . . .	68,074.04	2,723.00
		<u>\$4,188,678.26</u>	<u>\$26,600.65</u>

<sup>1</sup> Net after amortization.

<sup>2</sup> Not including first mortgage of \$426,400.

## SCHEDULE A-1 — (Continued)

REAL ESTATE <i>Continued</i>	Book Value	Net Income <sup>1</sup>
<i>Other Property</i>		
Franklin Street, Boston . . . . .	\$150,000.00	\$10,676.76
80 Memorial Drive, Cambridge . . . . .	908,574.84	44,828.40
100 Memorial Drive, Cambridge . . . . .	153,510.85	3,130.64
333 Memorial Drive, Cambridge . . . . .	40,000.00	1,373.10
500 Memorial Drive, Cambridge (Buildings and Fixtures) . . . . .	59,145.68	783.18
640 Memorial Drive, Cambridge . . . . .	492,377.11 <sup>2</sup>	22,936.08
76-94 Massachusetts Avenue, Cambridge . . . . .	419,656.77	580.74
Bexley Hall, Cambridge . . . . .	155,280.61	7,213.71
Main and Vassar Streets, Cambridge . . . . .	50,335.70	960.00
Gloversville, N. Y. . . . .	225,672.29	11,069.82
New London, Conn. . . . .	239,930.89	11,506.51
Plattsburgh, N. Y. . . . .	187,694.91	8,597.28
Taunton, Mass. . . . .	196,356.45	8,922.57
Waltham, Mass. . . . .	487,334.63 <sup>3</sup>	19,553.04
Willimantic, Conn. . . . .	160,289.93	7,230.41
Worcester, Mass., Main Street . . . . .	194,307.99	8,828.62
Worcester, Mass., Federal Street . . . . .	390,384.75	18,781.51
Income on Real Estate sold . . . . .	.....	3,506.33
<i>Total Real Estate</i> . . . . .	<u>\$8,699,531.66</u>	<u>\$213,171.67</u>

<sup>1</sup>Net after amortization.<sup>2</sup>Not including first mortgage of \$487,500.<sup>3</sup>Not including first mortgage of \$160,000.

## MORTGAGE NOTES

Spear and Wibird Streets, Quincy . . . . .	\$4,100.00	\$205.00
Common Street, Belmont . . . . .	6,250.00	295.31
Park Avenue, Arlington . . . . .	8,808.82	407.70
Pequotett Road, Belmont . . . . .	10,635.57	492.99
Ruby Avenue, Marblehead . . . . .	6,700.00	312.74
Putnam Place, Roxbury . . . . .	4,500.00	.....
Alpha Tau Omega . . . . .	10,700.00	580.00
Beta Theta Pi . . . . .	21,000.00	1,087.50
Delta Kappa Epsilon . . . . .	13,000.00	791.72
Kappa Sigma . . . . .	9,000.00	450.00
Lambda Chi Alpha . . . . .	13,582.06	704.12
Pi Lambda Phi . . . . .	7,000.00	390.14
Phi Gamma Delta . . . . .	4,250.00	243.75
Phi Kappa . . . . .	14,250.00	526.04
Phi Mu Delta . . . . .	8,000.00	456.25
Sigma Chi . . . . .	3,500.00	218.75
Theta Chi . . . . .	2,000.00	293.26
<i>Total Mortgage Notes</i> . . . . .	<u>\$147,276.45</u>	<u>\$7,455.27</u>



SUMMARY OF GENERAL INVESTMENTS

247

SUMMARY OF GENERAL INVESTMENTS

Bonds:	<i>Book Value</i>	<i>Net Income</i>
U. S. Government.....	\$15,450,243.76	\$270,671.28
Public Utility.....	423,646.69	23,752.28
Railroad.....	392,644.54	18,885.48
Other.....	1,152,657.29	30,644.10
<i>Total</i> .....	<u>\$17,419,192.28</u>	<u>\$343,953.14</u>
Commercial Paper.....	<u>\$2,977,333.33</u>	<u>\$64,622.57</u>
Preferred Stocks:		
Public Utilities.....	\$154,500.00	\$7,875.00
Other.....	21,000.00	5,218.75
<i>Total</i> .....	<u>\$175,500.00</u>	<u>\$13,093.75</u>
Common Stocks:		
Industrial.....	\$9,932,834.26	\$856,780.97
Public Utility.....	1,378,479.76	81,485.75
Railroad.....	322,475.53	29,840.00
Bank.....	2,326,767.08	94,315.50
Insurance.....	1,047,737.62	74,198.20
Other.....	572,947.09	23,522.89
<i>Total</i> .....	<u>\$15,581,241.34</u>	<u>\$1,160,143.31</u>
Real Estate.....	<u>\$8,699,531.66</u>	<u>\$213,171.67</u>
Mortgages.....	<u>\$147,276.45</u>	<u>\$7,455.27</u>
Cash Advanced.....	<u>\$45,000,075.06</u>	.....
	1,944,433.92	.....
<i>Total General Investments</i> .....	<u>\$46,944,508.98</u>	<u>\$1,802,439.71</u>

(Schedule A)

Add Interest on Funds Advanced for Research Contracts  
(exclusive of \$14,745.00 credited to Real Estate income).... 23,000.00

Deduct Compensation of Financial Agent..... \$1,825,439.71  
30,000.00

\$1,795,439.71

(Schedule B-2a)

## SCHEDULE A-2

## INVESTMENTS OF FUNDS SEPARATELY INVESTED

<i>Par Value or Shares</i>		<i>Book Value</i>	<i>Net Income</i>
<b>INVESTMENTS, AVOCA FUND</b>			
3,600	General Radio.....	<u>\$76,200.00</u>	<u>\$6,300.00</u>
<b>INVESTMENTS, BABSON FUND</b>			
\$2,000	U. S. Treasury..... 2¼s 1956-59	\$2,000.00	\$45.00
1,000	U. S. Savings "G"..... 2½s 1961	1,000.00	12.50
469	A. P. W. Products.....	126.10	.....
80	United Stores, Cum. Conv. Pfd.....	8,034.54	480.00
80	United Stores, 2d Pfd.....	1,288.56	88.00
30	Standard Oil, Ind.....	1,429.30	81.21
	<i>Total Babson Fund.....</i>	<u>\$13,878.50</u>	<u>\$706.71</u>
<b>INVESTMENTS, ALBERT FARWELL BEMIS FUND</b>			
	Miscellaneous building lots in Wellesley carried at.....	<u>\$2,000.00</u>	.....
<b>INVESTMENTS, MALCOLM COTTON BROWN FUND</b>			
\$2,500	U. S. Savings "G"..... 2½s 1954	\$2,500.00	\$62.50
1,000	U. S. Savings "G"..... 2½s 1961	1,000.00	12.50
30	General Electric.....	1,019.70	78.00
	<i>Total Brown Fund.....</i>	<u>\$4,519.70</u>	<u>\$153.00</u>
<b>INVESTMENTS, CLASS OF 1919 FUND</b>			
\$4,650	United States Savings "F".... 1956-57	<u>\$3,441.00</u>	.....
<b>INVESTMENTS, CLASS OF 1920 FUND</b>			
\$3,150	U. S. Savings "F"..... 1957	\$2,331.00	.....
2,175	U. S. Savings "F"..... 1958	1,609.50	.....
	<i>Total Class 1920 Fund.....</i>	<u>\$3,940.50</u>	.....
<b>INVESTMENTS, DRAPER FUND</b>			
\$29,900	U. S. Savings "G"..... 2½s 1954	\$29,900.00	\$747.50
24,000	U. S. Savings "G"..... 2½s 1955	24,000.00	600.00
10,000	U. S. Savings "G"..... 2½s 1959	10,000.00	250.00
21,000	U. S. Savings "G"..... 2½s 1960	21,000.00	525.00
5,000	Baltimore & Ohio..... 4s 1975	5,000.00	200.00
5,000	Northern Pacific..... 4s 1997	4,598.31	200.00
5,000	Southern Pacific..... 4½s 1981	5,000.00	225.00
100	du Pont de Nemours.....	4,731.05	375.00
30	Standard Oil, N. J.....	2,010.78	135.00
	Income from bonds sold.....	.....	100.00
	<i>Total Draper Fund.....</i>	<u>\$106,240.14</u>	<u>\$3,357.50</u>

INVESTMENTS

249

SCHEDULE A-2 — (Continued)

<i>Par Value or Shares</i>		<i>Book Value</i>	<i>Net Income</i>
<b>INVESTMENTS, ARTHUR D. LITTLE MEMORIAL FUND</b>			
\$40,000	U. S. Treasury . . . . . 2s 1953-51	\$40,000.00	\$800.00
40,000	U. S. Treasury . . . . . 2s 1954-52	40,000.00	800.00
466	Arthur D. Little, Inc., Pfd. . . . .	46,600.00	2,796.00
5,543	Arthur D. Little, Inc., Com. . . . .	110,860.00	27,715.00
	Income from bonds sold . . . . .	. . . . .	332.97
	<i>Total Little Fund . . . . .</i>	<u>\$237,460.00</u>	<u>\$32,443.97</u>
<b>INVESTMENTS, RICHARD LEE RUSSEL FUND</b>			
\$1,000	Mortgage Note (participation) . . . . .	\$1,000.00	\$50.00
3,000	Mortgage . . . . .	3,000.00	150.00
	<i>Total Russel Fund . . . . .</i>	<u>\$4,000.00</u>	<u>\$200.00</u>
<b>INVESTMENTS, SOLAR ENERGY FUND</b>			
5,000	Godfrey L. Cabot, Inc. . . . .	\$647,700.00	\$30,000.00
530	General Electric . . . . .	20,171.83	1,378.00
108	Mission Corporation . . . . .	6,291.00	614.25
54	Mission Development . . . . .	614.25	. . . . .
	Income from stocks and bonds sold . . . . .	. . . . .	349.42
	<i>Total Solar Energy Fund . . . . .</i>	<u>\$674,777.08</u>	<u>\$32,341.67</u>
<b>INVESTMENTS, FRANCES E. AND SAMUEL M. WESTON FUND</b>			
	Income on paid-up mortgage . . . . .	. . . . .	<u>\$201.81</u>

## SCHEDULE A-2 — (Continued)

<i>Par Value or Shares</i>			<i>Book Value</i>	<i>Net Income<sup>1</sup></i>
<b>INVESTMENTS, JONATHAN WHITNEY FUND</b>				
\$331,000	U. S. Savings "G" . . . . .	2½s 1954-60	\$331,000.00	\$8,275.00
40,000	American & For. Pr. . . . .	5s 2030	37,178.70	2,000.00
20,000	Pacific Gas & Elec. . . . .	3s 1974	20,550.00	500.00
400	Armstrong Cork. . . . .		19,123.35	1,340.00
410	Bankers Trust, N. Y. . . . .		18,937.50	779.00
500	Boston Edison . . . . .		18,567.12	1,400.00
337	Boston Insurance. . . . .		19,171.56	764.40
300	Chrysler . . . . .		16,594.85	1,725.00
400	du Pont . . . . .		15,279.10	1,500.00
250	First National Bank of Boston. . . . .		11,525.00	562.50
500	General Electric . . . . .		13,188.05	1,300.00
66	Guaranty Trust, N. Y. . . . .		18,087.30	924.00
400	Inland Steel . . . . .		16,220.12	1,200.00
600	International Paper . . . . .		14,642.60	1,650.00
400	National City, N. Y. . . . .		18,850.00	760.00
322	Standard Oil, N. J. . . . .		12,311.87	1,449.00
450	United Fruit . . . . .		10,690.25	1,800.00
	<i>Total Whitney Fund . . . . .</i>		<u>\$611,917.37</u>	<u>\$27,928.90</u>
<b>INVESTMENTS, TECHNOLOGY LOAN FUND</b>				
\$600,000	U. S. Savings "G" . . . . .	2½s 1954-60	\$600,000.00	\$15,000.00
20,000	U. S. Treasury . . . . .	1½s 1955	20,000.00	13.86
100,000	U. S. Treasury . . . . .	2s 1953-51	100,000.00	2,000.00
96,000	U. S. Treasury . . . . .	2¼s 1962-59	96,000.00	2,160.00
88,000	U. S. Treasury . . . . .	2½s 1958-56	88,000.00	2,000.00
100,000	U. S. Treasury . . . . .	2½s 1954-52	100,000.00	2,200.00
35,000	American Tel. & Tel. . . . .	2¾s 1980	35,000.00	962.50
15,000	Pacific Gas & Elec. . . . .	3s 1974	15,000.00	450.00
450	American Can . . . . .		36,089.83	1,800.00
1,200	Cleveland Electric Illuminating. . . . .		46,337.47	2,760.00
800	du Pont . . . . .		29,304.00	3,000.00
1,000	General Electric . . . . .		25,813.25	2,600.00
177	Guaranty Trust, N. Y. . . . .		50,333.82	2,478.00
625	Gulf Oil . . . . .		32,630.80	2,343.75
1,100	National Cash Register . . . . .		38,458.96	2,750.00
1,100	National City, N. Y. . . . .		40,650.00	2,090.00
1,000	Public Service of Indiana . . . . .		25,097.50	1,250.00
750	Procter & Gamble . . . . .		29,511.45	2,437.50
70	St. Paul Fire & Marine Ins. . . . .		6,737.50	126.00
643	Standard Oil, N. J. . . . .		24,864.43	2,893.50
1,250	Stone & Webster, Inc. . . . .		36,698.75	2,812.50
1,200	Union Carbide and Carbon . . . . .		27,726.00	2,400.00
900	United Fruit . . . . .		21,360.20	3,600.00
534	Hartford Fire Insurance of Conn. . . . .		44,802.33	1,201.00
	Income from bonds and stocks sold . . . . .			2,078.05
	<i>Total Technology Loan Fund . . . . .</i>		<u>\$1,570,416.29</u>	<u>\$63,378.94</u>

<sup>1</sup>Net after Premium Amortization.

INVESTMENTS

251

SCHEDULE A-2 — (Continued)

<i>Par Value or Shares</i>			<i>Book Value</i>	<i>Net Income<sup>1</sup></i>
<b>INVESTMENTS, JOSEPH HEWETT FUND</b>				
\$10,000	U. S. Savings "G" . . . . . 2½s	1958	\$10,000.00	\$250.00
50,000	U. S. Savings "G" . . . . . 2½s	1954	50,000.00	1,250.00
5,000	U. S. Savings "G" . . . . . 2½s	1960	5,000.00	125.00
2,000	U. S. Savings "G" . . . . . 2½s	1961	2,000.00	25.00
15,000	Alabama Power . . . . . 3½s	1972	15,000.00	525.00
15,000	Puget Sound Pr. & Lt. . . . . 4¼s	1972	15,125.00	612.50
12,000	Baltimore & Ohio . . . . . 4s	1975	12,000.00	480.00
10,000	Northern Pacific . . . . . 4s	1997	10,450.00	350.00
10,000	Southern Pacific . . . . . 4½s	1981	10,210.00	420.00
12,000	Texas & New Orleans . . . . . 3¾s	1990	12,000.00	405.00
120	Bankers Trust, N. Y. . . . .		4,775.00	228.00
22	Guaranty Trust, N. Y. . . . .		5,078.70	308.00
100	American Can . . . . .		7,520.00	400.00
200	du Pont . . . . .		8,271.55	750.00
300	General Electric . . . . .		8,107.50	780.00
165	National Cash Register . . . . .		5,428.99	412.50
50	St. Paul Fire & Marine Insurance . . . . .		4,812.50	90.00
200	Standard Oil, Ind. . . . .		9,498.65	541.40
217	Standard Oil, N. J. . . . .		8,363.38	971.50
300	Union Carbide and Carbon . . . . .		6,944.20	600.00
300	United Fruit . . . . .		7,120.00	1,200.00
	Income from stocks sold . . . . .		.....	50.00
	<i>Total Hewett Fund</i> . . . . .		<u>\$217,705.47</u>	<u>\$10,773.90</u>
<b>INVESTMENTS, GEORGE S. WITMER FUND</b>				
\$17,800	U. S. Savings "G" . . . . . 2½s	1945-59	\$17,800.00	\$395.00
5,000	Atlantic Coast Line . . . . . 4s	1952	4,854.44	200.00
5,000	Northern Pacific . . . . . 4s	1997	4,903.79	200.00
4,000	Southern Pacific . . . . . 4½s	1981	3,942.68	180.00
150	Commonwealth Edison . . . . .		5,082.43	236.25
205	Middle South Utilities . . . . .		1,384.05	169.14
140	Pacific Gas & Electric . . . . .		5,490.49	266.00
295	United Gas Corporation . . . . .		2,165.95	295.00
30	St. Paul Fire & Marine Insurance . . . . .		2,887.50	54.00
50	General Electric . . . . .		1,718.25	130.00
45	General Motors . . . . .		2,503.46	382.50
100	R. J. Reynolds Tobacco . . . . .		4,200.00	210.00
100	Safeway Stores . . . . .		2,400.00	120.00
100	The Sperry Corporation . . . . .		2,500.00	200.00
43	Standard Oil, Ind. . . . .		1,967.70	116.40
43	Standard Oil, N. J. . . . .		1,715.20	193.50
90	Union Carbide and Carbon . . . . .		2,051.85	180.00
65	Bankers Trust, N. Y. . . . .		3,071.50	123.50
22	Guaranty Trust, N. Y. . . . .		5,920.20	308.00
	Real Estate, Sanford, Fla. . . . .		4,223.84	267.39
	Income from bonds and stocks sold . . . . .		.....	110.00
	<i>Total Witmer Fund</i> . . . . .		<u>\$80,783.33</u>	<u>\$4,336.68</u>
	<i>Total of Investments of Funds Separately Invested</i> . . . . .		<u>\$3,607,279.38</u>	<u>\$182,123.08</u>
			(Schedule A)(Schedule B-2a)	

<sup>1</sup> Net after Premium Amortization.

## REPORT OF THE TREASURER

*SCHEDULE A-3*  
**ENDOWMENT FUNDS**  
**INCOME FOR GENERAL PURPOSES**

		<i>PRINCIPAL</i>		
	<i>Balance, June 30, 1949</i>	<i>Gifts and Other Receipts</i>	<i>Other Additions</i>	<i>Balance, June 30, 1950</i>
101	George Robert Armstrong . . . . .	\$5,000.00		\$5,000.00
103	George Blackburn Memorial . . . . .	962,130.22	\$113.18	962,243.40
105	Clara H. Briggs . . . . .	12,514.55		12,514.55
107	James A. Carney . . . . .	17,170.01		17,170.01
109	Charles Choate . . . . .	35,858.15		35,858.15
110	Class of 1909 . . . . .	15,984.21	2,676.48	\$500.00(1) 18,160.69
111	Eben S. Draper . . . . .	107,485.41	133.34	107,618.75
113	Coleman du Pont . . . . .	221,325.48		221,325.48
115	Eastman Contract . . . . .	9,498,869.55		9,498,869.55
117	Charles W. Eaton . . . . .	261,148.19		261,148.19
119	Educational Endowment . . . . .	7,573,855.60		7,573,855.60
121	Martha Ann Edwards . . . . .	30,000.00		30,000.00
123	William Endicott . . . . .	25,000.00		25,000.00
125	Francis Appleton Foster . . . . .	1,000,000.00		1,000,000.00
127	John W. Foster . . . . .	299,650.64	276.01	299,926.65
129	Alexis H. French . . . . .	5,000.00		5,000.00
131	Jonathan French . . . . .	90,850.25	146.67	90,996.92
133	Henry C. Frick . . . . .	2,208,482.92		2,208,482.92
135	General Endowment . . . . .	1,527,449.00		1,527,449.00
137	Eliot Granger . . . . .	21,568.43		21,568.43
139	Charles Hayden . . . . .	1,000,000.00		1,000,000.00
141	John Marshall Hills . . . . .	366,430.96		366,430.96
142	Walter W. Hodges . . . . .	36,809.70		36,809.70
143	James Fund . . . . .	163,654.21		163,654.21
145	Dale G. Kilburn . . . . .	68,893.95		68,893.95
147	Thomas McCammon . . . . .	15,000.00		15,000.00
149	Kate M. Morse . . . . .	25,000.00		25,000.00
151	Everett Morss . . . . .	25,000.00		25,000.00
152	Samuel Munch Memorial . . . . .		1,200.00	1,200.00
153	Richard Perkins . . . . .	50,000.00		50,000.00
155	J. W. and B. L. Randall . . . . .	83,452.36		83,452.36
156	John D. Rockefeller, Jr. . . . .		1,021,475.00	1,021,475.00
157	William Barton Rogers Memorial . . . . .	250,225.00		250,225.00
159	Saltonstall Fund . . . . .	68,918.87		689.00(2) 69,607.87
160	Homer E. Sargent . . . . .		2,415.63	2,415.63
161	Samuel E. Sawyer . . . . .	4,764.40		4,764.40
163	Andrew Hastings Spring . . . . .	50,000.00		50,000.00
165	George G. Stone . . . . .	4,677.35		4,677.35
167	Seth K. Sweetser . . . . .	25,061.62		25,061.62
168	Henry P. Talbot . . . . .	45,210.57	32.04	45,242.61
169	William J. Walker . . . . .	23,613.59		23,613.59
171	Horace Herbert Watson . . . . .	36,057.19		36,057.19
172	Arthur P. Watt (Memorial) . . . . .	1,500.00		1,500.00
173	Albion B. K. Welch . . . . .	5,000.00		5,000.00
175	Everett Westcott . . . . .	171,394.00	800.00	172,194.00
177	Marion Westcott . . . . .	245,604.74	1,375.88	246,980.62
179	George Wigglesworth . . . . .	26,873.65		107.00(3) 26,980.65
181	Edwin A. Wyeth . . . . .	254,703.94		254,703.94
<b>Totals . . . . .</b>		<b>\$26,967,188.71</b>	<b>\$1,030,644.23</b>	<b>\$296.00 \$27,998,128.94</b>

(1) Award specially authorized by Class.

(2) One-fourth net income to Fund.

(3) One-tenth net income to Fund.

(Schedule A)

ENDOWMENT FUNDS  
INCOME FOR GENERAL PURPOSES

<i>INCOME AND EXPENDITURES</i>					
<i>Unexpended Balance June 30, 1949</i>	<i>Investment Income</i>	<i>Other Income</i>	<i>Expended</i>	<i>Transferred</i>	<i>Unexpended Balance June 30, 1950</i>
.....	\$200.00	.....	\$200.00	.....	.....
.....	38,488.00	.....	38,488.00	.....	.....
.....	500.00	.....	500.00	.....	.....
.....	688.00	.....	688.00	.....	.....
.....	1,436.00	.....	1,436.00	.....	.....
.....	700.00	.....	700.00	.....	.....
.....	3,357.50	.....	3,357.50	.....	.....
.....	8,852.00	.....	8,852.00	.....	.....
.....	379,956.00	.....	379,956.00	.....	.....
.....	10,444.00	.....	10,444.00	.....	.....
.....	302,956.00	.....	302,956.00	.....	.....
.....	1,200.00	.....	1,200.00	.....	.....
.....	1,000.00	.....	1,000.00	.....	.....
.....	40,000.00	.....	40,000.00	.....	.....
.....	11,996.00	.....	11,996.00	.....	.....
.....	200.00	.....	200.00	.....	.....
.....	3,640.00	.....	3,640.00	.....	.....
.....	88,340.00	.....	88,340.00	.....	.....
.....	61,096.00	.....	61,096.00	.....	.....
.....	864.00	.....	864.00	.....	.....
.....	40,000.00	.....	40,000.00	.....	.....
.....	14,656.00	.....	14,656.00	.....	.....
.....	1,472.00	.....	1,472.00	.....	.....
.....	6,548.00	.....	6,548.00	.....	.....
.....	2,756.00	.....	2,756.00	.....	.....
.....	600.00	.....	600.00	.....	.....
.....	1,000.00	.....	1,000.00	.....	.....
.....	1,000.00	.....	1,000.00	.....	.....
.....	20.00	.....	20.00	.....	.....
.....	2,000.00	.....	2,000.00	.....	.....
.....	3,340.00	.....	3,340.00	.....	.....
.....	6,808.00	.....	6,808.00	.....	.....
.....	10,008.00	.....	10,008.00	.....	.....
.....	2,756.00	.....	2,067.00	\$689.00	.....
.....	8.00	.....	8.00	.....	.....
.....	192.00	.....	192.00	.....	.....
.....	2,000.00	.....	2,000.00	.....	.....
.....	188.00	.....	188.00	.....	.....
.....	1,004.00	.....	1,004.00	.....	.....
.....	1,808.00	.....	1,808.00	.....	.....
.....	944.00	.....	944.00	.....	.....
.....	1,444.00	.....	1,444.00	.....	.....
.....	60.00	.....	60.00	.....	.....
.....	200.00	.....	200.00	.....	.....
.....	6,872.00	.....	6,872.00	.....	.....
.....	9,844.00	.....	9,844.00	.....	.....
.....	1,076.00	.....	969.00	107.00	.....
.....	10,188.00	.....	10,188.00	.....	.....
.....	\$1,084,705.50	.....	\$1,083,909.50	\$796.00	.....

REPORT OF THE TREASURER  
*SCHEDULE A-4*  
 ENDOWMENT FUNDS  
 INCOME FOR DESIGNATED PURPOSES

		<i>PRINCIPAL</i>			
		<i>Balance,</i>	<i>Gifts and</i>	<i>Other</i>	<i>Balance,</i>
		<i>June 30, 1949</i>	<i>Other Receipts</i>	<i>Additions</i>	<i>June 30, 1950</i>
<b>DEPARTMENTS AND RESEARCH</b>					
201	William Parsons Atkinson (English).....	\$13,082.20	.....	.....	\$13,082.20
202	Julian M. Avery.....	.....	\$5,145.67	\$7,196.38(1)	12,342.05
203	Albert Farwell Bemis (Bemis Foundation)....	308,941.88	.....	.....	308,941.88
205	Frank Walter Boles Memorial (Architecture)...	25,200.00	.....	.....	25,200.00
206	Godfrey L. Cabot (Chemical Engineering).....	.....	10,000.00	.....	10,000.00
207	Samuel Cabot (Chemical Engineering).....	50,000.00	.....	.....	50,000.00
209	William E. Chamberlain (Architecture).....	7,309.77	.....	.....	7,309.77
211	Crosby Honorary (Geology).....	1,633.60	.....	.....	1,633.60
213	Susan E. Dorr (Physics).....	95,955.67	.....	.....	95,955.67
215	George Eastman (Chemistry and Physics).....	400,000.00	.....	.....	400,000.00
217	Harold H. Fletcher (Medical).....	10,000.00	.....	.....	10,000.00
218	Edith Morrill Hobbs (Arch. Library).....	5,000.00	.....	5,000.00(2)	.....
219	William R. Kales (Medical).....	75,001.48	.....	.....	75,001.48
221	Arthur E. Kennelly (Mathematics).....	67,058.49	.....	.....	67,058.49
223	Arthur D. Little Memorial (Chem. & Chem. Eng.)	157,535.00	1,140.53	.....	158,675.53
225	Katherine Bigelow Lowell (Physics).....	5,000.00	.....	.....	5,000.00
227	George Henry May (Chemistry).....	4,250.00	.....	.....	4,250.00
231	Edward D. Peters (Geology).....	5,000.00	.....	.....	5,000.00
233	Pratt Naval Architectural (Naval Architecture).	395,676.29	.....	.....	395,676.29
234	Raymond B. Price (Chemistry).....	9,000.00	3,000.00	.....	12,000.00
235	Ellen H. Richards (Sanitary Engineering)....	15,076.05	.....	.....	15,076.05
237	Charlotte B. Richardson (Chemical Engineering)	30,000.00	.....	.....	30,000.00
241	William Barton and Emma Savage Rogers (Research).....	193,797.97	.....	7,752.00(3)	201,549.97
243	Frances E. Roper (Mechanical Engineering)....	2,000.00	.....	.....	2,000.00
245	Arthur Rotch (Architecture).....	25,000.00	.....	.....	25,000.00
251	Solar Energy (Research).....	645,513.48	2,001.85	.....	643,511.63
255	Edmund K. Turner (Civil Engineering).....	291,283.26	.....	2,913.00(4)	294,196.26
256	United Fruit Company.....	.....	250,000.00	.....	250,000.00
257	William R. Ware (Architecture).....	15,000.00	.....	.....	15,000.00
		<u>\$2,853,315.14</u>	<u>\$267,284.35</u>	<u>\$12,861.38</u>	<u>\$3,133,460.87</u>
<b>LIBRARY</b>					
261	Walter S. Barker.....	\$10,000.00	.....	.....	\$10,000.00
263	Samuel Berke.....	20,000.00	.....	.....	20,000.00
267	Charles Lewis Flint.....	5,000.00	.....	.....	5,000.00
268	Edith Morrill Hobbs.....	.....	.....	\$5,000.00(2)	5,000.00
269	William Hall Kerr.....	2,000.00	.....	.....	2,000.00
271	George A. Osborne.....	10,000.00	.....	.....	10,000.00
273	Arthur Rotch Architectural.....	5,000.00	.....	.....	5,000.00
275	John Hume Todd.....	2,500.00	.....	.....	2,500.00
277	Theodore N. Vail Memorial.....	68,072.34	.....	.....	68,072.34
		<u>\$122,572.34</u>	.....	<u>\$5,000.00</u>	<u>\$127,572.34</u>

(1) Transferred from other funds.

(2) Correction of classification.

(3) Income added to principal until 1957.

(4) One-fourth net income carried to Fund.



ENDOWMENT FUNDS  
INCOME FOR DESIGNATED PURPOSES

<i>INCOME AND EXPENDITURES</i>					
<i>Unexpended Balance, June 30, 1940</i>	<i>Investment Income</i>	<i>Other Income</i>	<i>Expended</i>	<i>Transferred</i>	<i>Unexpended Balance June 30, 1950</i>
.....	\$516.00	.....	\$516.00	.....	.....
.....	340.00	.....	.....	\$340.00	.....
\$55,719.67	14,340.00	.....	12,640.38	.....	\$57,419.29
13,992.01	1,548.00	.....	1,214.12	.....	14,325.89
.....	264.00	.....	.....	.....	264.00
10,348.20	2,412.00	.....	.....	.....	12,760.20
28.95	288.00	.....	276.00	.....	40.95
458.69	80.00	.....	172.25	.....	366.44
.....	3,840.00	.....	3,840.00	.....	.....
.....	16,000.00	.....	16,000.00	.....	.....
307.23	404.00	.....	400.00	.....	311.23
202.80	.....	.....	.....	202.80	.....
1,273.78	2,992.00	.....	3,000.00	.....	1,265.78
3,827.47	2,764.00	.....	3,500.00	.....	3,091.47
78,962.51	32,443.97	.....	50,150.00	7,500.00	53,756.48
.....	200.00	.....	200.00	.....	.....
1,380.25	224.00	.....	.....	.....	1,604.25
1,378.88	256.00	.....	256.00	.....	1,378.88
.....	15,788.00	.....	15,788.00	.....	.....
384.00	424.00	.....	.....	.....	808.00
10,101.52	1,008.00	.....	.....	.....	11,109.52
22,753.78	2,112.00	.....	2,112.00	.....	22,753.78
.....	7,752.00	.....	.....	7,752.00	.....
80.00	84.00	.....	.....	.....	164.00
.....	1,000.00	.....	1,000.00	.....	.....
38,532.47	32,341.67	.....	15,065.00	12,104.69	43,704.45
.....	11,652.00	.....	8,739.00	2,913.00	.....
.....	6,668.00	.....	5,000.00	.....	1,668.00
779.71	624.00	\$25.00	471.53	.....	957.18
<u>\$240,511.92</u>	<u>\$158,365.64</u>	<u>\$25.00</u>	<u>\$140,340.28</u>	<u>\$30,812.49</u>	<u>\$227,749.79</u>
648.35	\$416.00	.....	\$419.69	.....	\$644.66
1,805.31	856.00	.....	844.07	.....	1,817.24
978.78	236.00	.....	246.23	.....	968.55
.....	200.00	.....	200.05	\$202.80	202.75
2,735.90	188.00	.....	62.09	.....	2,861.81
3,292.85	528.00	.....	264.01	.....	3,556.84
.....	200.00	.....	200.00	.....	.....
1,489.99	160.00	.....	100.01	.....	1,549.98
2,246.24	2,812.00	.....	2,041.37	.....	3,016.87
<u>\$13,197.42</u>	<u>\$5,596.00</u>	.....	<u>\$4,377.52</u>	<u>\$202.80</u>	<u>\$14,618.70</u>

## REPORT OF THE TREASURER

## SCHEDULE A-4—(Continued)

## ENDOWMENT FUNDS

## INCOME FOR DESIGNATED PURPOSES — (Continued)

		<i>PRINCIPAL</i>			
		<i>Balance, June 30, 1949</i>	<i>Gifts and Other Receipts</i>	<i>Other Additions</i>	<i>Balance, June 30, 1950</i>
<b>SALARIES</b>					
281	Samuel C. Cobb.....	\$36,551.31	.....	.....	\$36,551.31
283	Sarah H. Forbes.....	500.00	.....	.....	500.00
285	George A. Gardner.....	20,000.00	.....	.....	20,000.00
287	James Hayward.....	18,800.00	.....	.....	18,800.00
289	William P. Mason.....	18,800.00	.....	.....	18,800.00
291	Henry B. Rogers.....	25,000.00	.....	.....	25,000.00
293	Alfred P. Sloan Professorship.....	350,000.00	.....	.....	350,000.00
295	Nathaniel Thayer.....	25,000.00	.....	.....	25,000.00
297	Elihu Thomson.....	23,700.00	.....	.....	23,700.00
		\$518,351.31	.....	.....	\$518,351.31
<b>GRADUATE SCHOLARSHIPS AND FELLOWSHIPS</b>					
301	Edward Austin.....	\$360,000.00	.....	.....	\$360,000.00
303	William Sumner Boles.....	25,000.00	.....	.....	25,000.00
305	Malcolm Cotton Brown.....	1,506.25	.....	.....	1,506.25
307	Francis W. Chandler.....	7,988.02	.....	.....	7,988.02
309	Collamore.....	10,100.00	.....	.....	10,100.00
311	Dalton Graduate Chemical.....	5,000.00	.....	.....	5,000.00
313	Richard C. du Pont Memorial.....	108,772.07	.....	.....	108,772.07
315	Clarence J. Hicks Memorial.....	20,000.00	.....	.....	20,000.00
316	Edith Morrill Hobbs.....	5,000.00	.....	.....	5,000.00
317	Rebecca R. Joslin.....	6,540.00	.....	.....	6,540.00
319	Wilfred Lewis.....	5,000.00	.....	.....	5,000.00
321	Moore.....	37,137.44	.....	.....	37,137.44
323	James F. Norris.....	25,226.89	\$34,365.22	.....	59,592.11
325	Willard B. Perkins.....	6,000.00	.....	.....	6,000.00
327	Henry Bromfield Rogers.....	20,057.03	.....	.....	20,057.03
329	Richard Lee Russel.....	2,000.00	.....	.....	2,000.00
331	Henry Saltonstall.....	10,000.00	.....	.....	10,000.00
333	James Savage.....	10,000.00	.....	.....	10,000.00
335	Susan H. Swett.....	10,000.00	.....	.....	10,000.00
337	Gerard Swope.....	100,050.00	.....	.....	100,050.00
339	Frank Hall Thorp.....	10,000.00	.....	.....	10,000.00
340	Tillotson.....	1,900.00	.....	.....	1,900.00
341	Thomas Upham.....	409,018.92	.....	.....	409,018.92
343	Luis Francisco Verges.....	10,000.00	.....	.....	10,000.00
345	Jonathan Whitney.....	516,193.95	3.06	.....	516,197.01
		\$1,722,490.57	\$34,368.28	.....	\$1,756,858.85

## ENDOWMENT FUNDS

## INCOME FOR DESIGNATED PURPOSES — (Continued)

INCOME AND EXPENDITURES					
<i>Unexpended Balance June 30, 1940</i>	<i>Investment Income</i>	<i>Other Income</i>	<i>Expended</i>	<i>Transferred</i>	<i>Unexpended Balance June 30, 1950</i>
.....	\$1,464.00	.....	\$1,464.00	.....	.....
.....	20.00	.....	20.00	.....	.....
.....	800.00	.....	800.00	.....	.....
.....	752.00	.....	752.00	.....	.....
.....	752.00	.....	752.00	.....	.....
.....	1,000.00	.....	1,000.00	.....	.....
\$12,963.44	14,288.00	.....	11,500.00	.....	\$15,751.44
.....	1,000.00	.....	1,000.00	.....	.....
.....	948.00	.....	948.00	.....	.....
\$12,963.44	\$21,024.00	.....	\$18,236.00	.....	\$15,751.44
\$75,626.79	\$17,024.00	.....	\$20,000.00	.....	\$72,650.79
6,583.27	1,252.00	.....	600.00	.....	7,235.27
2,597.54	153.00	.....	100.00	.....	2,650.54
3,296.62	452.00	.....	.....	.....	3,748.62
5,606.43	620.00	.....	600.00	.....	5,626.43
2,941.04	312.00	.....	300.00	.....	2,953.04
14,577.00	4,848.00	.....	3,550.00	\$800.00	15,075.00
629.25	812.00	.....	600.00	.....	841.25
232.00	208.00	.....	.....	.....	440.00
6,846.33	536.00	.....	.....	.....	7,382.33
2,869.76	316.00	.....	.....	.....	3,185.76
3,736.43	1,616.00	.....	900.00	.....	4,452.43
672.00	1,724.00	.....	.....	.....	2,396.00
1,783.13	312.00	.....	.....	.....	2,095.13
8,312.05	1,112.00	.....	1,200.00	.....	8,224.05
2,709.79	200.00	.....	.....	.....	2,909.79
2,016.41	480.00	.....	.....	.....	2,496.41
4,820.73	580.00	.....	585.00	.....	4,815.73
2,406.55	496.00	.....	.....	.....	2,902.55
6,663.50	4,168.00	.....	5,000.00	.....	5,831.50
1,948.56	476.00	.....	.....	.....	2,424.56
84.00	80.00	.....	.....	.....	164.00
20,807.00	16,480.00	.....	37,000.00	1,050.00	1,337.00
2,111.22	484.00	.....	.....	.....	2,595.22
97,234.86	27,928.90	.....	43,718.67	.....	81,445.09
\$277,112.26	\$82,669.90	.....	\$114,153.67	\$250.00	\$245,878.49

## REPORT OF THE TREASURER

## SCHEDULE A-4—(Continued)

## ENDOWMENT FUNDS

## INCOME FOR DESIGNATED PURPOSES — (Continued)

	PRINCIPAL			
	Balance, June 30, 1940	Gifts and Other Receipts	Other Additions	Balance, June 30, 1950
UNDERGRADUATE SCHOLARSHIPS				
351 Louie G. Applebee . . . . .	\$400.00	.....	.....	\$400.00
353 Elisha Atkins . . . . .	5,000.00	.....	.....	5,000.00
357 Thomas Wendell Bailey . . . . .	2,172.24	.....	.....	2,172.24
359 Charles Tidd Baker . . . . .	38,218.49	.....	\$842.00(1)	39,060.49
361 Billings Student . . . . .	50,000.00	.....	.....	50,000.00
363 Huse Templeton Blanchard . . . . .	6,550.64	.....	.....	6,550.64
365 Levi Boles . . . . .	10,000.00	.....	.....	10,000.00
367 Jonathan Bourne . . . . .	10,000.00	.....	.....	10,000.00
369 Albert G. Boyden . . . . .	571,692.25	\$30.14	.....	571,722.39
371 Harriet L. Brown . . . . .	6,024.79	.....	.....	6,024.79
373 Mabel Blake Case . . . . .	25,000.00	.....	.....	25,000.00
375 Nino Teshler Catlin . . . . .	12,265.07	.....	.....	12,265.07
377 Lucius Clapp . . . . .	4,900.00	.....	.....	4,900.00
379 Class of 1895 Memorial . . . . .	25,000.00	.....	.....	25,000.00
381 Class of 1896 . . . . .	5,577.00	.....	.....	5,577.00
385 Class of 1922 . . . . .	20,505.88	5.00	.....	20,510.88
387 Class of 1922, Special . . . . .	4,800.00	.....	4,800.00(2)	.....
389 Class of 1938 . . . . .	1,067.84	461.51	.....	1,529.35
393 Fred L. and Florence L. Coburn . . . . .	5,000.00	.....	.....	5,000.00
397 Coffin Memorial . . . . .	36,018.50	.....	.....	36,018.50
399 William A. Conant . . . . .	153,415.61	.....	.....	153,415.61
401 Albert Conro . . . . .	25,000.00	.....	.....	25,000.00
403 George R. Cooke . . . . .	3,500.00	.....	.....	3,500.00
405 Lucretia Crocker . . . . .	50,551.06	.....	.....	50,551.06
406 Eunice M. Cruft . . . . .	.....	1,250.00	.....	1,250.00
407 Isaac W. Danforth . . . . .	5,000.00	.....	.....	5,000.00
408 Development Fund Scholarships . . . . .	.....	.....	500,000.00(3)	500,000.00
409 Ann White Dickinson . . . . .	40,000.00	.....	.....	40,000.00
411 Dormitory Fund . . . . .	2,857.10	.....	.....	2,857.10
413 Thomas Messenger Drown . . . . .	50,000.00	.....	.....	50,000.00
415 Frances and William Emerson . . . . .	100,000.00	.....	.....	100,000.00
417 Farnsworth . . . . .	5,000.00	.....	.....	5,000.00
419 Charles Lewis Flint . . . . .	5,000.00	.....	.....	5,000.00
421 Sarah S. Forbes . . . . .	3,454.87	.....	.....	3,454.87
423 Philip Jacob Friedlander . . . . .	1,000.00	.....	.....	1,000.00
425 Norman H. George . . . . .	89,452.96	.....	.....	89,452.96
427 Arthur B. Gilmore . . . . .	10,000.00	.....	.....	10,000.00
429 Barnett D. Gordon . . . . .	10,000.00	.....	.....	10,000.00
431 Lucia G. Hall . . . . .	54,413.71	.....	.....	54,413.71
433 Hall-Mercer . . . . .	76,572.55	242.37	.....	76,814.92
435 James H. Haste . . . . .	241,074.18	.....	.....	241,074.18
437 Charles Hayden Memorial . . . . .	100,000.00	.....	.....	100,000.00
439 Charles Hayden Memorial, Special . . . . .	.....	.....	.....	.....
440 George Hollingsworth . . . . .	5,000.00	.....	.....	5,000.00

(1) One-half net income to fund.

(2) Transferred to other funds.

(3) Transferred from Development Fund.

## ENDOWMENT FUNDS

## INCOME FOR DESIGNATED PURPOSES — (Continued)

INCOME AND EXPENDITURES					
<i>Unexpended Balance June 30, 1949</i>	<i>Investment Income</i>	<i>Other Income</i>	<i>Expended</i>	<i>Transferred</i>	<i>Unexpended Balance June 30, 1950</i>
\$132.37	\$20.00	.....	.....	.....	\$152.37
118.08	200.00	.....	\$200.00	.....	118.08
199.89	96.00	.....	.....	.....	295.89
4,131.62	1,684.00	.....	400.00	\$842.00	4,573.62
990.24	2,009.76	.....	3,000.00	.....	.....
339.50	272.00	.....	100.00	.....	511.50
340.15	404.00	.....	400.00	.....	344.15
182.10	400.00	.....	400.00	.....	182.10
132,100.60	27,172.00	.....	49,046.32	.....	110,226.28
558.96	264.00	.....	.....	.....	822.96
1,052.34	1,020.00	.....	1,000.00	.....	1,072.34
406.96	504.00	.....	75.00	.....	835.96
336.72	204.00	.....	200.00	.....	340.72
.....	1,000.00	.....	.....	1,000.00	.....
5,426.31†	416.00	.....	.....	.....	5,842.31†
3,449.63	960.00	.....	.....	.....	4,409.63
.....	.....	.....	.....	.....	.....
340.64	60.00	.....	.....	.....	400.64
272.26	208.00	.....	200.00	.....	280.26
6,647.23	1,676.00	.....	1,500.00	.....	6,823.23
22,151.20	6,976.00	.....	2,400.00	.....	26,727.20
3,067.89	1,108.00	.....	650.00	.....	3,525.89
457.58	160.00	.....	.....	.....	617.58
32,250.77	3,244.00	.....	3,400.00	.....	32,094.77
.....	44.00	.....	.....	.....	44.00
274.48	208.00	.....	200.00	.....	282.48
.....	.....	.....	.....	.....	.....
558.38	1,600.00	.....	1,600.00	.....	558.38
158.32	120.00	.....	.....	.....	278.32
1,034.84	2,000.00	.....	2,000.00	.....	1,034.84
6,151.85	4,172.00	.....	3,720.00	.....	6,603.85
365.84	212.00	.....	200.00	.....	377.84
236.22	204.00	.....	200.00	.....	240.22
131.50	140.00	.....	100.00	.....	171.50
130.50	44.00	.....	.....	.....	174.50
6,794.18	3,780.00	.....	3,500.00	.....	7,074.18
1,655.25	460.00	.....	400.00	.....	1,715.25
445.75	408.00	.....	425.00	.....	428.75
1,284.50	2,184.00	.....	2,100.00	.....	1,368.50
1,767.80	3,076.00	.....	3,000.00	.....	1,843.80
27,725.23	10,216.00	.....	26,750.00	.....	11,191.23
.....	4,000.00	.....	.....	4,000.00	.....
24,795.86	868.00	2,500.00	9,925.00	4,000.00	22,238.86
163.73	204.00	.....	200.00	.....	167.73

†Includes students' notes receivable.

## REPORT OF THE TREASURER

## SCHEDULE A-4—(Continued)

## ENDOWMENT FUNDS

## INCOME FOR DESIGNATED PURPOSES — (Continued)

		PRINCIPAL			
UNDERGRADUATE SCHOLARSHIPS (Continued)		Balance, June 30, 1949	Gifts and Other Receipts	Other Additions	Balance, June 30, 1950
441	Loren C. Holm.....		\$5,955.89		\$5,955.89
442	Elias Howe, Jr.....		17,600.36		17,600.36
443	Samuel P. Hunt.....	\$7,495.80			7,495.80
445	T. Sterry Hunt.....	3,000.00			3,000.00
447	William F. Huntington.....	5,000.00			5,000.00
449	David L. Jewell.....	25,000.00			25,000.00
451	Edward A. Jones.....	41,254.33			41,254.33
453	Joy Scholarships.....	7,500.00			7,500.00
454	Amelia S. Kneisner.....	18,000.00			18,000.00
456	Kurrelmeyer.....			\$2,000.00(1)	2,000.00
457	Jacob and Jennie Lichter.....			10,474.75(1)	10,474.75
458	William Litchfield.....	5,000.00			5,000.00
459	Elisha T. Loring.....	5,000.00			5,000.00
461	Lowell Institute.....	2,314.76			2,314.76
463	Rupert A. Marden.....	2,000.00			2,000.00
464	Waldo A. Martin.....		10,000.00		10,000.00
465	M. I. T. Club of Chicago.....	7,360.00		610.00(2)	6,750.00
467	Margaret A. Mathews.....	111,682.17			111,682.17
469	George Henry May.....	5,000.00			5,000.00
471	Robert W. Milne.....	75,856.47			75,856.47
473	James H. Mirrlees.....	2,500.00			2,500.00
475	Fred W. Morrill.....	2,000.00			2,000.00
477	Nichols.....	5,000.00			5,000.00
478	Wm. E. Nickerson.....	9,312.00	26,066.77		35,378.77
479	Charles C. Nichols.....	5,000.00			5,000.00
481	John Felt Osgood.....	5,000.00			5,000.00
483	George L. Parmelee.....	17,641.69			17,641.69
484	Frank Stetson Pecker.....	59,731.18			59,731.18
485	Richard Perkins.....	50,000.00			50,000.00
487	Florence E. Prince.....	7,689.28			7,689.28
489	Thomas Adelbert Read.....	21,117.00			21,117.00
491	Willis Ward Reeves.....	2,700.00	150.00		2,850.00
493	Charles A. Richards.....	31,719.32			31,719.32
495	John Roach.....	6,290.20			6,290.20
496	William B. Rogers.....	36,504.83			36,504.83
497	William P. Ryan Memorial.....	3,557.42			3,557.42
499	John P. Schenkl.....	43,821.12			43,821.12
500	Paul D. Seghers, Jr.....	4,800.00			4,800.00
501	Frank Arnold Sherman.....	10,000.00			10,000.00
503	Thomas Sherwin.....	5,000.00			5,000.00
505	G. H. Miller Smith.....	10,000.00			10,000.00
507	Horace T. Smith.....	33,019.41			33,019.41
509	Sons and Daughters of New England Puritan Colony.....	600.00			600.00
511	Anna Spooner.....	10,896.14			10,896.14

(1) Transferred from other funds.

(2) Expendable portion of fund transferred to unexpended income.

ENDOWMENT FUNDS

INCOME FOR DESIGNATED PURPOSES — (Continued)

INCOME AND EXPENDITURES					
Unexpended Balance, June 30, 1949	Investment Income	Other Income	Expended	Transferred	Unexpended Balance June 30, 1950
.....	\$20.00	.....	.....	.....	\$20.00
.....	352.00	.....	.....	.....	352.00
\$383.25	316.00	.....	\$300.00	.....	399.25
87.76	120.00	.....	.....	.....	207.76
322.08	208.00	.....	200.00	.....	330.08
2,627.99	1,084.00	.....	1,000.00	.....	2,711.99
1,883.50	1,692.00	.....	1,600.00	.....	1,975.50
10,105.35	704.00	.....	.....	.....	10,809.35
792.75	752.00	.....	.....	.....	1,544.75
.....	88.00	.....	.....	\$197.29	285.29
.....	440.00	.....	400.00	752.00	792.00
212.91	204.00	.....	200.00	.....	216.91
159.88	204.00	.....	200.00	.....	163.88
1,479.89	152.00	.....	.....	.....	1,631.89
383.23	92.00	.....	100.00	.....	375.23
.....	32.00	.....	.....	.....	32.00
308.25	284.00	.....	1,200.00	610.00	2.25
10,758.50	4,848.00	.....	2,500.00	.....	13,106.50
11,298.13†	556.00	.....	.....	.....	11,854.13†
1,762.75	3,036.00	.....	3,900.00	.....	898.75
123.48	104.00	.....	.....	.....	227.48
265.80	92.00	.....	.....	.....	357.80
92.77	200.00	.....	200.00	.....	92.77
.....	1,156.00	.....	.....	.....	1,156.00
357.40	212.00	.....	200.00	.....	369.40
346.88	208.00	.....	200.00	.....	354.88
138.00	704.00	.....	650.00	.....	192.00
2,448.00	2,412.00	.....	3,800.00	.....	1,060.00
825.21	2,000.00	.....	2,000.00	.....	825.21
366.50	316.00	.....	300.00	.....	382.50
621.42	852.00	.....	800.00	.....	673.42
108.00	116.00	.....	100.00	.....	124.00
814.22	1,276.00	.....	1,250.00	.....	840.22
561.51	276.00	.....	.....	.....	837.51
20,398.01†	2,216.00	.....	.....	.....	22,614.01†
2,269.34†	228.00	\$35.37	.....	.....	2,532.71†
2,408.01	1,816.00	.....	1,600.00	.....	2,624.01
224.00	200.00	.....	.....	.....	424.00
408.00	408.00	.....	400.00	.....	416.00
376.48	212.00	.....	200.00	.....	388.48
662.25	420.00	.....	400.00	.....	682.25
4,234.54	1,428.00	.....	3,200.00	.....	2,462.54
249.88	32.00	.....	.....	.....	281.88
377.12	444.00	.....	400.00	.....	421.12

†Includes students' notes receivable.

## REPORT OF THE TREASURER

SCHEDULE A-4—(Continued)  
 ENDOWMENT FUNDS

INCOME FOR DESIGNATED PURPOSES — (Continued)

	PRINCIPAL			
	Balance, June 30, 1949	Gifts and Other Receipts	Other Additions	Balance, June 30, 1950
<b>UNDERGRADUATE SCHOLARSHIPS (Continued)</b>				
513 Samuel E. Tinkham.....	\$2,338.16			\$2,338.16
515 F. B. Tough.....	465.00			465.00
517 Susan Upham.....	1,000.00			1,000.00
519 Samson R. Urbino.....	1,000.00			1,000.00
521 Vermont Scholarship.....	25,000.00			25,000.00
523 Ann White Vose.....	60,718.27			60,718.27
525 Arthur M. Waitt.....	9,761.45			9,761.45
527 Grant Walker.....	55,000.00			55,000.00
529 James Watt.....	13,359.48			13,359.48
531 Louis Weisbein.....	4,000.00			4,000.00
533 Frances Erving Weston.....	5,000.00			5,000.00
535 Samuel Martin Weston.....	5,000.00			5,000.00
537 Amasa J. Whiting.....	4,515.65			4,515.65
539 Elizabeth Babcock Willmann.....	5,065.51			5,065.51
541 Morrill Wyman.....	66,538.18			66,538.18
	<u>\$2,835,609.56</u>	<u>\$61,762.04</u>	<u>\$507,906.75</u>	<u>\$3,405,278.35</u>
<b>PRIZES</b>				
551 Babson.....	\$10,000.00			\$10,000.00
553 Robert A. Boit.....	5,000.00			5,000.00
555 Class of 1904.....	447.00			447.00
556 Karl T. Compton.....	2,000.00	\$5,959.50	\$4,800.00 (1)	12,759.50
557 William Emerson.....	2,145.00			2,145.00
558 Harry M. Goodwin.....		9,824.00		9,824.00
559 Roger Defriez Hunneman.....	1,050.00			1,050.00
561 James Means.....	2,700.00			2,700.00
565 Arthur Rotch.....	5,000.00			5,000.00
567 Arthur Rotch, Special.....	5,000.00			5,000.00
568 Henry Webb Salisbury.....	1,000.00			1,000.00
571 Samuel W. Stratton.....	1,880.00			1,880.00
	<u>\$36,222.00</u>	<u>\$15,783.50</u>	<u>\$4,800.00</u>	<u>\$56,805.50</u>
<b>MISCELLANEOUS</b>				
575 Ednah Dow Cheney.....	\$13,965.16			\$13,965.16
576 Margaret Compton.....	1,500.00	\$10.00		1,510.00
577 Jacob and Jennie Lichter.....	10,474.75		\$10,474.75 (1)	
579 Edward F. and Mary R. Miller.....	10,000.00			10,000.00
580 Teachers Fund.....			100,000.00 (1)	100,000.00
581 W. B. S. Thomas.....		2,002.50	2,000.00 (1)	4,002.50
582 Alice Brown Tyler.....	1,559.64			1,559.64
	<u>\$37,499.55</u>	<u>\$2,012.50</u>	<u>\$91,525.25</u>	<u>\$131,037.30</u>
<b>Totals.....</b>	<u>\$8,126,060.47</u>	<u>\$381,210.67</u>	<u>\$622,093.38</u>	<u>\$9,129,364.52</u>

(1) Transfer of funds for reclassification.

(Schedule A)



ENDOWMENT FUNDS

INCOME FOR DESIGNATED PURPOSES — (Continued)

<i>INCOME AND EXPENDITURES</i>					
<i>Unexpended Balance June 30, 1949</i>	<i>Investment Income</i>	<i>Other Income</i>	<i>Expended</i>	<i>Transferred</i>	<i>Unexpended Balance June 30, 1950</i>
\$254.70	\$100.00	.....	\$100.00	.....	\$254.70
471.64	36.00	.....	.....	.....	507.64
176.00	48.00	.....	.....	.....	224.00
133.35	44.00	.....	.....	.....	177.35
4,211.05	1,160.00	.....	500.00	.....	4,871.05
280.00	2,428.00	.....	2,400.00	.....	308.00
185.09	392.00	.....	375.00	.....	202.09
1,430.75	2,200.00	.....	3,225.00	.....	405.75
618.30	552.00	.....	450.00	.....	720.30
141.36	164.00	.....	.....	.....	305.36
4,079.88	364.90	.....	.....	.....	4,444.78
667.88	220.91	.....	200.00	.....	688.79
203.37	184.00	.....	200.00	.....	187.37
745.48	232.00	.....	.....	.....	977.48
5,811.53	2,800.00	.....	4,600.00	.....	4,011.53
<u>\$389,280.69</u>	<u>\$127,435.57</u>	<u>\$2,535.37</u>	<u>\$156,641.32</u>	<u>\$282.71</u>	<u>\$362,327.60</u>
\$3,851.59	\$706.71	.....	.....	.....	\$4,558.30
2,042.91	280.00	.....	\$275.00	.....	2,047.91
384.71	32.00	.....	.....	.....	416.71
.....	144.00	.....	.....	.....	144.00
575.95	108.00	.....	50.00	.....	633.95
.....	236.00	.....	.....	.....	236.00
19.00	44.00	.....	.....	.....	63.00
1,636.33	168.00	.....	100.00	.....	1,704.33
3,932.97	356.00	.....	352.00	.....	3,936.97
10,024.63	600.00	.....	352.00	.....	10,272.63
379.17	56.00	.....	60.54	.....	374.63
.....	76.00	.....	8.49	.....	67.51
<u>\$22,847.26</u>	<u>\$2,806.71</u>	<u>.....</u>	<u>\$1,198.03</u>	<u>.....</u>	<u>\$24,455.94</u>
\$935.69	\$592.00	.....	\$117.36	.....	\$1,410.33
4.00	60.00	.....	54.00	.....	10.00
752.00	.....	.....	.....	\$752.00	.....
2,581.62	504.00	.....	1,000.00	.....	2,085.62
.....	4,628.00	\$8,064.03	10,926.69	17,961.35	19,726.69
.....	152.00	.....	390.00	797.24	559.24
637.63	88.00	.....	30.00	.....	695.63
<u>\$4,910.94</u>	<u>\$6,024.00</u>	<u>\$8,064.03</u>	<u>\$12,518.05</u>	<u>\$18,006.59</u>	<u>\$24,487.51</u>
<u>\$960,823.93</u>	<u>\$403,921.82</u>	<u>\$10,624.40</u>	<u>\$447,464.87</u>	<u>\$12,635.81</u>	<u>\$915,269.47</u>

(Schedule A)

## REPORT OF THE TREASURER

*SCHEDULE A-5*  
STUDENT LOAN FUNDS

	<i>Balance June 30, 1940</i>	<i>Gifts and Other Receipts</i>
583 Bursar's.....	\$37,376.67†	\$25.73
584 Class of 1898.....	13,413.58	
585 Dean's.....	12,437.68†	28.95
587 Dennett, Carl P.....	1,995.29†	46.01
589 George, Nathan R.....	35,790.12	
591 Lamson-Virgin.....	11,023.50	
592 Medical Department.....	5,489.47†	1.49
593 Rogers, Minnie Hempel.....	1,379.54	
595 Summer Surveying Camp.....	3,125.72†	3.87
597 Technology Loan.....	2,009,040.49†	13,328.76
598 William H. Timbie.....	5,303.50	
<i>Totals.....</i>	<u>\$2,136,375.56</u>	<u>\$13,434.81</u>

*SCHEDULE A-6*  
BUILDING FUNDS

PRINCIPAL AND INCOME AVAILABLE

600 Campbell Soup Company.....		\$1,000,000.00
601 Arthur J. Conner.....	\$220,387.38	8,166.49
603 George Eastman.....	135,589.02	
604 Electronics Laboratory.....		100.00
605 Matilda A. Fraser.....	1,103.98	
609 Charles Hayden Memorial Library.....	181,496.71	
611 Hydrodynamics Laboratory and Towing Tank.....	211,598.38	10,000.00
613 Library Building.....	1,117.50	
615 Metals Processing Laboratory.....	80,931.97	
619 A. P. Sloan Metals Processing Laboratory.....		250,000.00
621 Charles D. Waterbury.....	17,928.65	
<i>Totals.....</i>	<u>\$850,153.59</u>	<u>\$1,268,266.49</u>

*SCHEDULE A-7*  
OTHER INVESTED FUNDS  
PRINCIPAL AND INCOME AVAILABLE

GENERAL PURPOSES

623 Anonymous H.....	\$10,000.00	
625 Anonymous J.....	1,102.00	\$600.00
626 Anonymous LE.....		10,000.00
627 Anonymous M.....	1,500.00	
629 Anonymous R.....	57,150.00	10,000.00
633 Edmund Dana Barbour.....	20,736.94	
635 Stephen L. Bartlett.....		2.10
638 Class of 1899.....	14,621.00	1,000.00
639 Class of 1923.....	63,166.67	
640 Class of 1924.....	77,620.20	1,030.00
641 Class of 1925.....		22,800.96
642 Arthur J. Conner.....		101,245.54
643 Co-operative Foundation.....	1,577.44	
645 Development Fund.....	179,574.45	1,730,713.08
647 Charles H. Eames.....		20,000.00
649 Erastus C. Gaffield.....	1,796.58	
651 William T. Henry.....	50,324.55	19,720.00

STUDENT LOAN FUNDS

<i>Net Transfers</i>	<i>Investment Income</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance, June 30, 1950</i>
.....	\$1,372.00	.....	.....	\$38,774.40†
<b>\$13,413.58</b>	.....	.....	.....	.....
.....	404.00	.....	.....	12,870.63†
.....	12.00	.....	.....	2,053.30†
.....	1,432.00	.....	.....	37,222.12
.....	440.00	.....	.....	11,463.50
.....	116.00	.....	.....	5,606.96†
.....	56.00	.....	.....	1,435.54
.....	112.00	.....	.....	3,241.59†
1,000.00	63,378.94	.....	\$1,510.38	2,085,237.81†
.....	212.00	.....	.....	5,515.50
<b>\$12,413.58</b>	<b>\$67,534.94</b>	.....	<b>\$1,510.38</b>	<b>\$2,203,421.35</b>

†Includes students' notes receivable.

(Schedule A)

BUILDING FUNDS

PRINCIPAL AND INCOME AVAILABLE

.....	\$16,668.00	.....	\$4,731.11	\$1,011,936.89
.....	8,908.00	.....	.....	237,461.87
<b>\$771.07</b>	5,392.00	.....	.....	140,209.95
.....	4.00	.....	.....	104.00
.....	44.00	.....	.....	1,147.98
250,000.00	8,628.00	.....	440,124.71	.....
.....	4,232.00	.....	225,830.38	.....
.....	24.00	.....	.....	1,141.50
<b>70,000.00</b>	436.00	.....	.....	11,367.97
.....	832.00	.....	20,602.82	230,229.18
.....	716.00	.....	.....	18,644.65
<b>\$179,228.93</b>	<b>\$45,884.00</b>	.....	<b>\$691,289.02</b>	<b>\$1,652,243.99</b>

(Schedule A)

OTHER INVESTED FUNDS

PRINCIPAL AND INCOME AVAILABLE

.....	\$400.00	\$400.00	.....	\$10,000.00
.....	56.00	56.00	.....	1,702.00
.....	32.00	32.00	.....	10,000.00
.....	60.00	60.00	.....	1,500.00
.....	2,420.00	2,420.00	.....	67,150.00
.....	828.00	828.00	.....	20,736.94
.....	.....	.....	.....	2.10
.....	604.00	604.00	.....	15,621.00
<b>\$153.00</b>	2,532.00	2,532.00	.....	63,319.67
<b>3,115.22</b>	3,244.00	3,244.00	.....	81,765.42
20,282.28	900.00	900.00	.....	43,083.24
.....	980.00	980.00	.....	101,245.54
.....	64.00	64.00	.....	1,577.44
<b>775,000.00</b>	2,004.00	126,052.50	\$991,309.99	19,929.04
.....	.....	.....	.....	20,000.00
.....	72.00	72.00	.....	1,796.58
.....	2,380.00	2,380.00	.....	70,044.55

*SCHEDULE A-7 — (Continued)*  
**OTHER INVESTED FUNDS**  
**PRINCIPAL AND INCOME AVAILABLE — (Continued)**

GENERAL PURPOSES (Continued)	<i>Balance, June 30, 1949</i>	<i>Gifts and Other Receipts</i>
653 Ernest R. Hosbach.....	\$1,000.00	.....
659 Keller.....	52.63	.....
661 Edwin J. Lewis, Jr.....	.....	\$24,303.54
663 Augustus B. Martin, Jr.....	.....	61,000.00
665 Alice Butts Metcalf.....	59,000.00	.....
666 Leonard Metcalf Memorial.....	.....	2,573.48
667 John Wells Morss.....	59,000.00	.....
669 William E. Nickerson.....	9,312.00	26,066.78
671 Edward A. Sumner.....	.....	10,694.44
673 Herman W. Tamkin.....	14,860.13	.....
675 Towle.....	10,500.00	.....
677 Charles A. Tripp.....	100,000.00	.....
679 Grant Walker.....	25,500.00	.....
681 Edwin S. Webster.....	.....	25,217.50
683 Harry C. Wiess.....	151,229.50	.....
684 Belle A. Williston.....	17,118.68	.....
686 Edwin J. Wood.....	5,000.00	.....
<i>Totals.....</i>	<u>\$913,742.77</u>	<u>\$2,066,967.42</u>

*SCHEDULE A-8*

**DEPARTMENTS AND RESEARCH**

701 Anonymous (S).....	\$352,951.00	.....
703 Applied Mathematics.....	17,301.50	.....
705 Julian M. Avery.....	5,899.57	.....
709 Bemis — Land Account.....	9,300.00	.....
715 Badger — Chemical Engineering.....	18,622.31	.....
717 Chemical Engineering Practice.....	259,087.67	.....
718 Collins Helium Cryostat.....	96.53	\$2,190.00
720 Development Fund No. 2.....	87,500.00	.....
721 Electronics, Research Laboratory of.....	63,628.50	.....
722 Electronics, Industrial Fellowships in.....	71,502.25	25,000.00
723 Food Technology.....	94,883.94	30,000.00
724 Ford Motor Co. — Ind. Rel.....	25,083.44	.....
725 John A. Grimmons.....	3,040.19	3,113.86
729 Harvey Non-Ferrous Forgings.....	10,824.00	.....
731 Hayden Dental Clinic.....	2,228.34	.....
733 Industrial Economics, Graduate.....	29,063.55	8,000.00
737 Industrial Fund.....	593,762.78	77,579.68
739 Industrial Relations Section.....	155,926.28	26,250.00
741 Instrumentation Fund.....	212,967.86	.....
743 A. Norton Kent.....	204.00	.....
749 John Lawrence Mauran.....	3,436.87	.....
750 Merrill Foundation.....	22,450.85	.....
751 Susan Minns.....	40,000.00	.....
753 Forris Jewett Moore.....	27,677.74	.....

OTHER INVESTED FUNDS

PRINCIPAL AND INCOME AVAILABLE — (Continued)

<i>Net Transfers</i>	<i>Investment Income</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance, June 30, 1950</i>
.....	\$40.00	\$40.00	.....	\$1,000.00
.....	4.00	6.36	.....	50.27
.....	752.00	752.00	.....	24,303.54
.....	2,240.00	2,240.00	.....	61,000.00
.....	2,000.00	2,000.00	.....	50,000.00
.....	52.00	52.00	.....	2,573.48
.....	2,000.00	2,000.00	.....	50,000.00
.....	1,156.00	1,156.00	.....	35,378.78
.....	284.00	284.00	.....	10,694.44
.....	596.00	596.00	.....	14,860.13
.....	420.00	420.00	.....	10,500.00
.....	4,000.00	4,000.00	.....	100,000.00
.....	1,020.00	1,020.00	.....	25,500.00
.....	588.00	588.00	.....	25,217.50
.....	6,048.00	.....	.....	157,277.50
.....	684.00	684.00	.....	17,118.68
.....	200.00	200.00	.....	5,000.00
<u>\$751,449.50</u>	<u>\$38,660.00</u>	<u>\$156,662.86</u>	<u>\$991,309.99</u>	<u>\$1,119,947.84</u>

(Schedule A)

.....	\$14,120.00	.....	.....	\$367,071.00
.....	592.00	\$5,000.00	.....	12,893.50
\$5,899.57	.....	.....	.....	.....
.....	.....	.....	\$7,300.00	2,000.00
.....	488.00	12,891.90	.....	6,218.41
.....	9,924.00	21,811.62	.....	247,200.05
.....	20.00	.....	.....	2,306.53
87,500.00	.....	.....	.....	.....
.....	2,560.00	.....	.....	66,188.50
100.00	2,984.00	6,600.00	3,200.00	89,786.25
10,000.00	3,380.00	66,434.21	.....	71,829.73
.....	1,004.00	30.56	.....	26,118.00
.....	124.00	2,000.00	.....	4,278.05
.....	432.00	.....	.....	11,256.00
.....	68.00	1,000.00	.....	1,296.34
.....	1,172.00	5,000.00	.....	33,235.55
27,294.02	21,328.00	50,000.00	.....	615,376.44
601.59	5,988.00	32,479.39	2,550.00	153,736.48
28,300.00	7,780.00	9,197.62	.....	183,250.24
.....	8.00	.....	.....	212.00
.....	136.00	136.00	.....	3,436.87
.....	676.00	13,658.86	.....	9,467.99
.....	.....	.....	.....	40,000.00
.....	1,076.00	1,599.62	.....	27,154.12

## REPORT OF THE TREASURER

## SCHEDULE A-8 — (Continued)

## OTHER INVESTED FUNDS

## PRINCIPAL AND INCOME AVAILABLE — (Continued)

DEPARTMENTS AND RESEARCH (Continued)	Balance, June 30, 1949	Gifts and Other Receipts
755 Nuclear Science and Engineering . . . . .	.....	\$1,000.00
757 F. Ward Paine . . . . .	\$3,719.87	.....
758 Theodore B. Parker Memorial . . . . .	2,966.00	.....
759 Pratt Spectroscopy . . . . .	.....	42,000.00
760 Radioactivity Center . . . . .	32,679.00	.....
761 Richards Memorial . . . . .	926.98	.....
763 W. T. Sedgwick . . . . .	44,880.69	.....
765 Servomechanism Laboratory . . . . .	37,062.25	.....
767 Servomechanism Research . . . . .	52,419.33	.....
769 Sloan Automotive Laboratory . . . . .	5,076.17	.....
771 Special Research, Padelford . . . . .	2,838.42	.....
773 Submarine Signal Co. . . . .	18,976.08	.....
775 Henry N. Sweet . . . . .	10,978.72	.....
777 Swift Amino Acid . . . . .	9,100.50	.....
779 Swift Protein Research . . . . .	6,102.50	.....
781 Nellie Florence Treat . . . . .	709.00	.....
783 Twentieth Century Fox Film Corporation Research . . . . .	2,790.75	.....
785 William Lyman Underwood . . . . .	8,583.92	.....
786 Union Carbide & Carbon Corporation . . . . .	12,417.46	.....
	<u>\$2,359,666.81</u>	<u>\$215,133.54</u>
<b>LIBRARY</b>		
791 Boston Stein Club . . . . .	\$27,342.50	\$215.00
792 Carnegie S. A. L. Center . . . . .	36,280.00	40,000.00
793 Frank Harvey Cilley . . . . .	85,215.59	.....
795 Class of 1874 . . . . .	290.67	.....
797 Arthur Elson . . . . .	563.31	.....
799 Library Growth . . . . .	4,917.49	.....
	<u>\$154,609.56</u>	<u>\$40,215.00</u>
<b>MISCELLANEOUS FUNDS AND DEPOSITS</b>		
801 Albert . . . . .	\$2,570.00	.....
802 Athletics Fields Special . . . . .	1,068.00	\$3,500.00
803 Bess Bigelow . . . . .	39,322.24	.....
804 A. V. Clarke Scholarship . . . . .	1,550.50	.....
805 Class of 1898 . . . . .	.....	600.00
806 Class of 1917 . . . . .	1,263.81	.....
807 Class of 1918 Organ . . . . .	152.88	.....
808 Davis R. Dewey Memorial . . . . .	627.70	.....
809 Drama Club Theatre . . . . .	600.39	.....
810 Oscar H. Horovitz . . . . .	1,618.75	500.00
811 Ellen A. King Mem. Stud. . . . .	10.00	.....
812 Llorca C. Krueger . . . . .	.....	.....
813 Kurrelmeyer . . . . .	2,197.29	.....
814 Lever Bros. Co. . . . .	2,532.00	.....
815 Arthur D. Little Memorial Lectureship . . . . .	3,819.15	2,500.00
816 John R. Macomber . . . . .	1,287.99	500.00
817 M. I. T. Alumni 1940-1949 . . . . .	248,336.08	.....
819 M. I. T. Alumni 1949-50 . . . . .	77,094.39	61,051.37
820 M. I. T. Alumni 1950-51 . . . . .	.....	998.50
821 M. I. T. Teachers Insurance . . . . .	178,425.42	78,275.79

OTHER INVESTED FUNDS

PRINCIPAL AND INCOME AVAILABLE — (Continued)

<i>Net Transfers</i>	<i>Investment Income</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance, June 30, 1950</i>
.....	\$24.00	.....	.....	\$1,024.00
.....	148.00	.....	.....	3,867.87
.....	120.00	.....	.....	3,086.00
.....	840.00	.....	.....	42,840.00
.....	1,308.00	.....	.....	33,987.00
.....	36.00	.....	.....	962.98
.....	1,756.00	\$1,900.00	.....	44,736.69
.....	1,284.00	10,000.00	.....	28,346.25
.....	2,096.00	.....	.....	54,515.33
.....	204.00	.....	.....	5,280.17
.....	112.00	.....	.....	2,950.42
\$18,976.08	.....	.....	.....	.....
.....	240.00	10,000.00	.....	1,218.72
5,000.00	164.00	.....	.....	4,264.50
6,102.50	.....	.....	.....	.....
.....	28.00	.....	.....	737.00
.....	112.00	.....	.....	2,902.75
.....	344.00	.....	.....	8,927.92
12,417.46	.....	.....	.....	.....
<u>\$180,788.04</u>	<u>\$82,676.00</u>	<u>\$249,678.66</u>	<u>\$13,050.00</u>	<u>\$2,213,959.65</u>
.....	\$808.00	.....	\$13,398.25	\$14,967.25
\$26,975.00	1,712.00	.....	.....	51,017.00
3,200.00	3,340.00	\$300.00	.....	85,055.59
.....	12.00	11.00	.....	291.67
.....	24.00	20.00	.....	567.31
.....	196.00	.....	.....	5,113.49
<u>\$30,175.00</u>	<u>\$6,092.00</u>	<u>\$331.00</u>	<u>\$13,398.25</u>	<u>\$157,012.31</u>
.....	\$60.00	.....	\$2,090.00	\$540.00
.....	44.00	\$3,957.60	.....	654.40
.....	1,472.00	5,000.00	.....	35,794.24
.....	64.00	.....	.....	1,614.50
\$24,966.42	1,040.00	516.00	.....	26,090.42
.....	52.00	.....	.....	1,315.81
.....	4.00	50.00	.....	106.88
.....	24.00	.....	.....	651.70
.....	24.00	.....	.....	624.39
.....	84.00	.....	.....	2,202.75
.....	.....	.....	.....	10.00
1,255.36	52.00	.....	.....	1,307.36
2,197.29	.....	.....	.....	.....
.....	100.00	.....	.....	2,632.00
.....	184.00	1,260.35	.....	5,242.80
.....	28.00	1,711.50	.....	104.49
248,336.08	.....	.....	.....	.....
6,663.92	3,264.00	8,475.00	48,707.42	77,563.42
1,040.00	.....	825.00	.....	1,213.50
.....	7,188.00	.....	39,831.27	224,057.94

## REPORT OF THE TREASURER

*SCHEDULE A-8 — (Continued)*  
OTHER INVESTED FUNDS

PRINCIPAL AND INCOME AVAILABLE — (*Continued*)

MISCELLANEOUS FUNDS AND DEPOSITS ( <i>Continued</i> )		<i>Balance, June 30, 1940</i>	<i>Gifts and Other Receipts</i>
823	John D. Mitsch Memorial . . . . .	\$2,847.00	.....
825	Henry A. Morss Nautical . . . . .	59.90	.....
827	Charles Francis Park Memorial . . . . .	5,917.25	.....
829	President's, Special . . . . .	10,312.61	.....
830	Tubby Rogers . . . . .	1,081.00	\$225.00
831	William Patrick Ryan, Special . . . . .	211.06	.....
833	Sedgwick Memorial Lecture . . . . .	17,865.11	148.75
835	Tau Beta Pi Memorial Scholarship . . . . .	2,589.85	.....
837	Teachers' Fund . . . . .	117,961.35	.....
839	Technology Press . . . . .	122,472.52	2.75
841	Towle Lecture . . . . .	937.00	.....
		<u>\$844,731.24</u>	<u>\$148,302.16</u>
<b>RESERVES</b>			
850	Amortization of Dormitories . . . . .	.....	\$77,418.21
861	Photo Service . . . . .	\$23,119.04	.....
863	Use of Facilities . . . . .	390,559.97	380,336.00
865	Walker Memorial . . . . .	14,162.50	.....
867	Walker Memorial Dining Service . . . . .	14,971.41	.....
		<u>\$442,812.92</u>	<u>\$457,754.21</u>
	<i>Totals</i> . . . . .	<u>\$3,801,820.53</u>	<u>\$861,404.91</u>

*SCHEDULE A-9*

DEPOSITS AND ADVANCES HELD FOR INVESTMENT

ALUMNI AND CLASS FUNDS			
881	Class of 1887 . . . . .	\$4,514.86	.....
883	Class of 1889 . . . . .	181.63	.....
884	Class of 1900 . . . . .	10,000.00	\$4,995.00
885	Class of 1901 . . . . .	.....	369.50
886	Class of 1903 . . . . .	.....	950.00
887	Class of 1914 . . . . .	1,056.62	.....
888	Class of 1917 . . . . .	1,819.00	4,283.15
889	Class of 1919, Special . . . . .	3,441.00	.....
891	Class of 1920 . . . . .	4,147.25	.....
893	Class of 1921 . . . . .	4,884.75	1,865.00
897	Class of 1924, Anonymous . . . . .	3,115.22	.....
901	Class of 1925 . . . . .	20,435.28	.....
903	Class of 1926 . . . . .	44,387.97	3,860.22
905	Class of 1927 . . . . .	24,558.56	.....
906	Class of 1927, Joseph W. Hammond Memorial . . . . .	.....	30.00
907	Class of 1928 . . . . .	49,476.22	50.00
909	Class of 1929 . . . . .	19,794.46	4.20
911	Class of 1930 . . . . .	16,350.38	.. .. .
912	Class of 1933 . . . . .	216.72	508.45
913	Class of 1934 . . . . .	4,390.74	36.94
915	Class of 1934, Special . . . . .	846.00	.....
917	Class of 1935 . . . . .	2,319.46	1,000.34
919	Class of 1936 . . . . .	1,520.98	71.58
920	Class of 1937 . . . . .	205.92	1,006.32



OTHER INVESTED FUNDS

PRINCIPAL AND INCOME AVAILABLE — (Continued)

<i>Net Transfers</i>	<i>Investment Income</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance, June 30, 1950</i>
.....	\$112.00	.....	.....	\$2,959.00
.....	4.00	.....	.....	63.90
<i>\$5,917.25</i>	.....	.....	.....	.....
<i>2,000.00</i>	372.00	.....	.....	8,684.61
.....	40.00	\$558.12	.....	787.88
.....	8.00	.....	.....	219.06
.....	720.00	.....	.....	18,733.86
.....	104.00	.....	.....	2,693.85
<i>117,961.35</i>	.....	.....	.....	.....
.....	3,480.00	32,000.00	\$16,956.86	110,912.13
.....	36.00	.....	.....	973.00
<u><i>\$355,814.11</i></u>	<u>\$18,560.00</u>	<u>\$54,353.57</u>	<u>\$73,671.83</u>	<u>\$527,753.89</u>
.....	.....	.....	.....	\$77,418.21
.....	\$924.00	\$861.50	.....	23,181.54
<i>\$1,315.70</i>	10,980.00	30,935.65	\$234,026.06	518,229.96
.....	564.00	.....	.....	14,726.50
.....	388.00	10,662.41	.....	4,697.00
<u><i>\$1,315.70</i></u>	<u>\$12,856.00</u>	<u>\$42,459.56</u>	<u>\$234,026.06</u>	<u>\$638,253.21</u>
<u><i>\$565,461.45</i></u>	<u>\$120,184.00</u>	<u>\$346,822.79</u>	<u>\$334,146.14</u>	<u>\$3,536,979.06</u>

(Schedule A)

DEPOSITS AND ADVANCES HELD FOR INVESTMENT

.....	\$180.00	.....	.....	\$4,694.86
.....	8.00	.....	.....	189.63
.....	416.00	.....	.....	15,411.00
.....	.....	.....	\$369.50	.....
.....	.....	.....	.....	950.00
.....	44.00	.....	.....	1,100.62
.....	108.00	.....	2,433.15	3,777.00
.....	.....	.....	.....	3,441.00
.....	.....	.....	.....	4,147.25
.....	240.00	.....	.....	6,989.75
<i>\$3,115.22</i>	.....	.....	.....	.....
<i>20,435.28</i>	.....	.....	.....	.....
.....	1,856.00	.....	59.32	50,044.87
.....	984.00	.....	.....	25,542.56
.....	.....	.....	.....	30.00
.....	1,980.00	.....	.....	51,506.22
.....	792.00	.....	.....	20,590.66
.....	656.00	.....	.....	17,006.38
.....	12.00	.....	715.29	21.88
.....	176.00	.....	.....	4,603.68
.....	32.00	.....	.....	878.00
.....	124.00	.....	.....	3,443.80
.....	60.00	.....	.....	1,652.56
.....	12.00	.....	1,160.63	63.61

## REPORT OF THE TREASURER

*SCHEDULE A-9 — (Continued)*  
**DEPOSITS AND ADVANCES HELD FOR INVESTMENT**  
*(Continued)*

<i>ALUMNI AND CLASS FUNDS (Continued)</i>		<i>Balance June 30, 1949</i>	<i>Gifts and Other Receipts</i>
921	Class of 1939 .....	\$1,241.72	\$468.01
922	Class of 1944 .....	.....	553.32
923	Class of 1945 .....	25.00	.....
925	Class of 1946 .....	25.00	.....
927	Class of 1947 .....	80.00	.....
928	Class of 1948, Athletic Award .....	593.42	.....
929	Class of 1948 .....	20.00	100.00
930	Class of 1949 .....	.....	264.85
931	Association of Class Secretaries .....	3,120.33	.....
932	M. I. T. Alumni Association, Permanent .....	107,392.12	.....
933	M. I. T. Alumni Association, Class of 1898 .....	12,592.84	.....
		<u>\$342,753.45</u>	<u>\$20,416.88</u>
<b>STUDENT ACTIVITIES</b>			
951	Alpha Chi Sigma House .....	\$5,870.85	.....
953	Major Briggs .....	37,595.41	.....
954	Charles Francis Park Memorial .....	.....	.....
955	Lillie C. Smith .....	6,880.11	.....
957	Walter B. Snow .....	10,457.82	.....
958	Technology Christian Assoc. ....	2,064.00	.....
959	Technology Matrons' Teas .....	9,117.62	.....
960	M. I. T. Women's Dormitory .....	1,393.25	\$150.00
961	W. B. S. Thomas .....	2,797.24	.....
962	Tech Show Trust .....	.....	545.27
963	Undergraduates Activities Trust .....	1,908.87	.....
965	Undergraduate Publications Trust .....	4,446.23	.....
967	Undergraduate Dues, Athletics .....	20,848.87	.....
969	Undergraduate Dues, Reserve and Contingent .....	17,061.75	500.00
		<u>\$120,442.02</u>	<u>\$1,195.27</u>
<i>Totals</i> .....		<u>\$463,195.47</u>	<u>\$21,612.15</u>

*SCHEDULE A-10*  
**CONDITIONAL GIFTS**  
**INCOME NOT YET AVAILABLE**

981	Anonymous Q .....	\$8,733.50	\$3,010.00
983	Anonymous X .....	20,648.12	24,900.00
984	Anonymous Y .....	104.00	.....
985	Avoca .....	80,700.00	.....
987	Joseph Hewett .....	216,231.14	1,137.10
988	Percival Lowell Scholarship .....	27,441.50	.....
989	Knight W. Wheeler .....	.....	20,000.00
990	George S. Witmer .....	78,372.80	2,639.76
<i>Totals</i> .....		<u>\$432,231.06</u>	<u>\$51,686.86</u>

*SCHEDULE A-11*  
**ACCUMULATED NET GAIN ON GENERAL INVESTMENTS**

995	Endowment Reserve .....	<u>\$2,523,090.12</u>	<u>\$969,945.88</u>
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DEPOSITS AND ADVANCES HELD FOR INVESTMENT  
(Continued)

<i>Net Transfers</i>	<i>Investment Income</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance, June 30, 1950</i>
.....	\$60.00	.....	.....	\$1,769.73
.....	.....	.....	\$438.49	114.83
.....	.....	.....	.....	25.00
.....	.....	.....	.....	25.00
.....	4.00	.....	.....	84.00
.....	24.00	.....	42.35	575.07
.....	4.00	.....	.....	124.00
.....	.....	.....	.....	264.85
.....	120.00	.....	.....	3,240.33
.....	4,264.00	.....	2,462.00	109,194.12
<u>\$12,592.84</u>	.....	.....	.....	.....
<u>\$36,143.34</u>	<u>\$12,156.00</u>	.....	<u>\$7,680.73</u>	<u>\$331,502.26</u>
.....	\$232.00	.....	.....	\$6,102.85
.....	1,504.00	.....	\$2,249.01	36,850.40
<u>\$5,917.25</u>	236.00	.....	.....	6,153.25
.....	264.00	.....	584.07	6,560.04
.....	420.00	.....	.....	10,877.82
.....	84.00	.....	.....	2,148.00
.....	356.00	.....	364.00	9,109.62
.....	56.00	.....	.....	1,599.25
<u>2,797.24</u>	.....	.....	.....	.....
.....	.....	.....	.....	545.27
.....	68.00	.....	400.00	1,576.87
.....	176.00	.....	.....	4,622.23
.....	832.00	.....	.....	21,680.87
.....	684.00	.....	472.80	17,772.95
<u>\$3,120.01</u>	<u>\$4,912.00</u>	.....	<u>\$4,069.88</u>	<u>\$125,599.42</u>
<u>\$33,023.33</u>	<u>\$17,068.00</u>	.....	<u>\$11,750.61</u>	<u>\$457,101.68</u>

(Schedule A)

CONDITIONAL GIFTS

INCOME NOT YET AVAILABLE

.....	\$412.00	.....	.....	\$12,155.50
.....	1,048.00	.....	\$1,948.00	44,648.12
.....	4.00	.....	.....	108.00
.....	6,300.00	.....	.....	87,000.00
.....	10,773.90	.....	8,027.00	220,115.14
.....	1,000.00	.....	4,784.86	23,656.64
.....	268.00	.....	440.00	19,828.00
.....	4,336.68	.....	4,349.84	80,999.40
<u>.....</u>	<u>\$24,142.58</u>	.....	<u>\$19,549.70</u>	<u>\$488,510.80</u>

(Schedule A)

ACCUMULATED NET GAIN ON GENERAL INVESTMENTS

<u>.....</u>	<u>.....</u>	<u>.....</u>	<u>.....</u>	<u>\$3,493,036.00</u>
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(Schedule A)

## REPORT OF THE TREASURER

## SCHEDULE A-12

## STUDENTS' NOTES RECEIVABLE

<i>Fund</i>	<i>Notes Receivable June 30, 1949</i>	<i>Loans Made 1949-50</i>	<i>Loans Repaid 1949-50</i>	<i>Notes Receivable June 30, 1950</i>	<i>Interest Received 1949-50</i>
Technology Loan Fund..	\$353,343.66	\$137,851.00	\$63,307.19*	\$427,887.47	\$3,827.45
Bursar's Fund.....	2,648.89	2,260.00	1,584.28	3,324.61	25.73
William B. Rogers Fund..	1,480.00	.....	.....	1,480.00	.....
Dean's Fund.....	2,295.06	1,500.00	2,040.00	1,755.06	28.95
Dean's Fund Special.....	.....	95.00	.....	95.00	.....
C. E. Summer Camp.....	260.00	330.00	130.00	460.00	3.87
Carl P. Dennett Fund....	1,768.37	.....	212.27	1,556.10	46.01
George Henry May Fund..	2,350.00	250.00	250.00	2,350.00	.....
Medical Department....	2,624.91	.....	59.55	2,565.36	1.49
Class of 1896 Fund.....	600.00	.....	.....	600.00	.....
Wm. P. Ryan Memorial..	161.32	.....	19.63	141.69	35.37
<i>Totals.....</i>	<u>\$367,532.21</u>	<u>\$142,286.00</u>	<u>\$67,602.92*</u>	<u>\$442,215.29</u>	<u>\$3,968.87</u>

(Schedule A)

\* Includes Written Off.

## SCHEDULE A-13

## ACCOUNTS RECEIVABLE

United States Government:	
Armed Services, N.A.C.A. and A.E.C. Research Contracts	\$1,074,764.20*
Veterans Administration.....	\$25,438.21
Other Tuition Fees.....	58,070.72
Miscellaneous Accounts.....	2,170.00
<i>Total United States Government.....</i>	<u>\$1,160,443.13</u>
Industrial Corporations—Research Contracts	\$48,396.93*
Others:	
Students' Fees and Deposits.....	2,672.45
Miscellaneous Accounts.....	25,927.97
<i>Total (Schedule A).....</i>	<u>\$1,237,440.48</u>

\* Total under direction of Division of Industrial Cooperation \$1,123,161.13

*SCHEDULE A-14*  
CONTRACTS IN PROGRESS

*United States Government:*

Armed Services, N.A.C.A. and A.E.C. Research Contracts	\$1,788,543.98*
Weather Bureau Research Program . . . . .	11,695.64

<i>Total United States Government</i> . . . . .	\$1,800,239.62
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Industrial Corporations — Research Contracts	\$33,972.22*
Armour & Co. Research . . . . .	1,454.89

Costs unallocated in above accounts, represented by Accounts Payable and Accrued Wages . . . . .	97,326.14*	132,753.25
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<i>Total (Schedule A)</i> . . . . .	\$1,932,992.87
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\*Total under direction of Division of Industrial Cooperation \$1,919,842.34.

*SCHEDULE A-15***INVENTORIES, PREPAID EXPENSES AND DEFERRED CHARGES***Inventories:*

## Department of Buildings and Power:

Maintenance Supplies .....	\$51,326.10
Oil .....	5,070.66
	<hr/>
	\$56,396.76
Laboratory Supplies .....	70,571.40
Dining Halls, Food and Supplies including	
Games Dept. ....	32,055.11
Photographic Supplies and Equipment .....	14,109.36
Dormitories, Room Service Supplies .....	16,896.62
Stationery and Stamps .....	3,250.43
Technology Store, Lecture Notes .....	1,034.00
Civil Engineering Summer Camp .....	229.58
	<hr/>

*Total Inventories* .....

\$194,543.26

*Prepaid Expenses and Deferred Charges:*

Deposits with Mutual Fire Insurance Companies	\$118,536.42
Unexpired Insurance Premiums .....	12,014.67
Cooperative Foundation Plan —	
Insurance Premiums .....	15,939.73
Folding Chairs, less Amortization .....	5,387.54
Barracks Dormitories, less Amortization .....	25,772.20
Westgate West, less Amortization .....	64,746.02
Boiler Plant Replacement .....	270,169.86
Foreign Student Project .....	14,744.78
Research Expenses Deferred .....	10,321.43
Equipment acquired by Division of Industrial	
Coöperation, less Depreciation .....	58,828.22
Division of Industrial Coöperation:	
Due from Vendors .....	\$2,873.58
Deferred Charges to Operations .....	1,838.85
	<hr/>
	4,712.43
Other Deferred Charges (principally accounts	
payable and accrued wages for expenses	
undistributed) .....	112,064.19
	<hr/>

*Total Prepaid Expenses and Deferred Charges* .....

713,237.49

*Total (Schedule A)* .....

\$907,780.75

WITHHOLDINGS, DEPOSITS, AND OTHER CREDITS 277

*SCHEDULE A-16*

STUDENTS' ADVANCE FEES AND DEPOSITS

1950 Summer Term:		
Tuition Fees.....	\$186,359.50	
Students' Deposits.....	3,229.40	
Dormitory Rentals.....	24,137.50	
Summer Surveying Camp.....	1,440.00	\$215,166.40
		<hr/>
1949-50 Students' Deposits, Returnable.....		4,660.28
1950-51 Tuition Fees.....		1,350.00
1950-51 Dormitory Rentals.....		19,285.00
		<hr/>
<i>Total</i> (Schedule A).....		<u>\$240,461.68</u>

*SCHEDULE A-17*

WITHHOLDINGS, DEPOSITS, AND OTHER CREDITS

Payroll Withholdings:		
Additional Group Insurance.....	\$ 623.89	
Blue Cross Hospital Program.....	7,349.28	
U. S. Government Savings Bonds.....	12,295.19	
U. S. Government Withholding Tax.....	108,470.31	\$128,738.67
		<hr/>
Division of Industrial Cooperation — Prepaid Income.....		132,848.92
Division of Industrial Cooperation — Overhead Suspense.....		17,931.43
Deposits for Designated Student Expenses:		
Brazilian Naval Students.....	\$ 144.70	
Iraqi Educational Directorate.....	1,695.38	
J. N. Tata Endowment.....	260.00	
Ku Lee Hazen.....	6,000.00	
Sander Deposit.....	900.00	
Vlachoustsios Deposit.....	3,000.00	
Patoutsanis Deposit.....	3,000.00	15,000.08
		<hr/>
Deposits of Student Activities:		
Sailing Account, I.C.Y.R.A.....	\$ 1,412.59	
Nautical Association.....	21.00	
Technology Christian Association.....	2.50	
World Student Service Fund.....	40.50	1,476.59
		<hr/>
Other Deposits.....		7,561.01
		<hr/>
<i>Total</i> (Schedule A).....		<u>\$303,556.70</u>

## SCHEDULE A-18

UNEXPENDED BALANCES OF GIFTS AND OTHER RECEIPTS  
FOR CURRENT EXPENSES — UNINVESTED

<i>Department Accounts</i>	<i>Balance June 30, 1949</i>	<i>Gifts and Other Receipts</i>	<i>Net Transfers</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance June 30, 1950</i>
<b>Aeronautical Engineering:</b>						
Aerodynamic Eng. Special (Hunsaker) . . . . .	\$1,105.14	\$1,000.00	.....	\$310.16	.....	\$1,794.98
Aviation Week Fellowship . . . . .	.....	1,800.00	.....	.....	.....	1,800.00
Carnegie Aerodynamics Research . . . . .	10,766.63	.....	\$9,266.63	.....	.....	1,500.00
Cascade Research . . . . .	16,805.63	4,553.94	.....	17,401.74	.....	3,957.83
Compressible Vortex Flow Investigation . . . . .	850.94	.....	6,000.00	4,707.25	.....	2,143.69
Diffuser Research . . . . .	2,058.41	.....	.....	162.95	.....	1,895.46
Douglas Aircraft Co. Fellowship . . . . .	1,500.00	.....	.....	700.00	\$800.00	.....
R. C. du Pont Memorial Research . . . . .	.....	.....	800.00	.....	.....	800.00
Elastic Research Lab. Alt. Spec. 2246 . . . . .	.....	.....	1,500.00	1,412.40	.....	87.60
Engine Auto. Control Research 2423 . . . . .	.....	.....	20,000.00	13,830.54	.....	6,169.46
Fire Control Instr. Lab. . . . .	2,376.83	.....	4,150.00	5,594.91	.....	931.92
Goodyear Fellowship . . . . .	3,038.50	6,000.00	.....	1,902.24	1,100.00	6,036.26
Instrument Laboratory Maintenance . . . . .	7,543.95	.....	4,151.21	10,431.24	.....	1,263.92
Rotating Wing Research . . . . .	101.61	.....	3,272.77	2,925.13	.....	449.25
Special Apparatus Wright Tunnel . . . . .	10,000.00	.....	.....	542.90	.....	9,457.10
Special Appro. No. 1990 . . . . .	1,789.91	.....	.....	289.75	.....	1,500.16
Special Appro. No. 2065 . . . . .	3,132.84	.....	.....	42.30	.....	3,090.54
Sperry Gyroscope Fund . . . . .	259.75	500.00	100.00	.....	.....	659.75
Structural Lab. Equipment . . . . .	72.66	.....	241.11	241.11	72.66	.....
Theoretical Analysis . . . . .	6.14	.....	6.14	.....	.....	.....
Vibration Research No. 1333 . . . . .	1.21	.....	1.21	.....	.....	.....
Wright Bros. Wind Tunnel . . . . .	108,002.79	58,217.50	.....	47,591.13	.....	118,629.16
Wright Bros. Tunnel, Equip. . . . .	30,000.00	.....	.....	.....	.....	30,000.00
<b>Architecture:</b>						
Special Appro. No. 2238 . . . . .	141.79	.....	60.85	202.64	.....	.....
Housing Research Special No. 1899 . . . . .	1,902.52	.....	.....	.....	.....	1,902.52
Floyd Naramore . . . . .	.....	1,000.00	.....	696.41	.....	303.59
Ralph Walker . . . . .	.....	300.00	.....	300.00	.....	.....
<b>Biology and Biological Engineering:</b>						
American Cancer Society . . . . .	.....	7,560.00	.....	7,205.18	354.82	.....
American Cancer Society — Vallee . . . . .	.....	1,000.00	.....	137.97	.....	862.03
American Cancer Society — Geren . . . . .	.....	500.00	.....	52.41	.....	447.59
American Cancer Society — Hershey . . . . .	.....	2,100.00	.....	3,646.11	1,546.11	.....
American Cancer Society — Robertson . . . . .	.....	500.00	.....	164.14	335.86	.....
American Cancer Society — Snell . . . . .	.....	500.00	.....	25.00	300.00	175.00
American Cancer Society — Spectro . . . . .	.....	18,209.00	.....	17,580.43	.....	628.57
Armour & Co. Research — Waugh . . . . .	.....	12,100.00	.....	11,939.82	160.18	.....
Baruch Fund . . . . .	7,413.26	.....	.....	5,905.20	.....	1,508.06
Baruch Comm. on Physical Medicine Fellowship . . . . .	186.94	.....	.....	.....	.....	186.94
Conservation Foundation — Vallee . . . . .	.....	3,600.00	.....	717.44	.....	2,882.56
Corn Industries Research Found. . . . .	5,610.71	.....	.....	4,172.27	.....	1,438.44
Electron Microscope Research . . . . .	897.62	.....	.....	344.19	.....	553.43
Gillette Safety Razor Co. . . . .	150.00	.....	.....	.....	.....	150.00
Illuminating Engineering Soc. Research Charles A. and Marjorie King Fund . . . . .	1,945.74	5,000.00	.....	5,441.39	25.00	1,479.35
Lilly P. I. Fund . . . . .	3,521.77	10,000.00	.....	1,472.65	.....	12,049.12
National Public Health — Latta . . . . .	1.43	.....	.....	1.43	.....	.....
.....	.....	540.00	.....	122.97	.....	417.03



UNINVESTED FUNDS

279

SCHEDULE A-18 — (Continued)

UNINVESTED FUNDS

<i>Department Accounts (Continued)</i>	<i>Balance June 30, 1949</i>	<i>Gifts and Other Receipts</i>	<i>Net Transfers</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance June 30, 1950</i>
<b>Biology and Biological Engineering: (Continued)</b>						
National Public Health — Hershey . . . . .		\$1,080.00		\$616.39		\$463.61
National Public Health — Hoch . . . . .		500.00		69.58		430.42
National Public Health — Spiro . . . . .		540.00				540.00
National Research Council — Vallee . . . . .		4,622.50				4,622.50
Pepsodent Keratin Research — Bear . . . . .	\$1,563.62	5,000.00		3,093.75		3,469.87
Mass. General Hospital — Gross . . . . .	142.78			70.29		72.49
Rockefeller Fund for Biological Eng. . . . .		50,000.00		40,210.73	\$144.00	9,645.27
Submarine Signal Fund . . . . .			\$1,976.08	1,864.49		111.59
<b>Building Engineering and Construction:</b>						
National Lime Association . . . . .	235.45	7,500.00		6,484.11	1,240.00	11.34
Plastic Materials Manufacturing Assoc. . . . .	16,631.42	33,537.68		29,189.98	1,230.00	19,749.12
Research Corporation Building Material . . . . .	18.19			18.19		
Revere Building Material Research . . . . .	1,071.65	3,500.00		3,028.49		1,543.16
Ross Francis Tucker Memorial Fund . . . . .	62.61					62.61
<b>Business and Engineering Administration:</b>						
Lemuel R. Boulware Fund . . . . .	17.53					17.53
Alvin Brown Fund . . . . .	11.13					11.13
H. W. Christopher . . . . .		200.00				200.00
R. E. Gillmor . . . . .		600.00		484.00		116.00
Newman M. Marsilius Fund . . . . .	244.30	1,000.00		918.80		325.50
Earl Newson . . . . .	150.00					150.00
Sloan Book Account . . . . .	98.32					98.32
Sloan Sponsored Fellowship, Operating . . . . .	5,166.61	50,000.00		44,592.65	7,400.00	3,173.96
Sloan Sponsored Fellowship, Special . . . . .	1,608.16			456.58		1,151.58
Sloan Sponsored Fellowship, Research . . . . .	2,372.54	1.00				2,373.54
Special Appro. No. 1850 . . . . .	454.47					454.47
Standard Oil of Cal. Fellowship . . . . .		1,250.00		1,250.00		
Howard D. Williams Fund . . . . .	135.51	500.00		634.86		.65
<b>Chemical Engineering:</b>						
Allied Chemical & Dye Corp. Fellowship . . . . .	421.38	1,600.00		1,200.00	400.00	421.38
American Cyanamid Co. Fellowship . . . . .	1,200.00	2,000.00		1,266.96	800.00	1,133.04
Bituminous Coal Research . . . . .	8,597.73	7,000.00		6,755.30		8,842.43
du Pont Fellowship . . . . .	1,000.00	2,800.00		1,803.56	400.00	1,596.44
Eastman Kodak Fellowship . . . . .	28.00			28.00		
Elastic Colloid Research Corp. . . . .	3,118.04	2,000.00		1,391.35	800.00	2,926.69
Fuels Research . . . . .	2,119.01					2,119.01
Gottesman Foundation . . . . .	1,162.60	2,600.00		1,557.78	300.00	1,904.82
Humble Oil & Refining Co. Fellowship . . . . .	3,550.00			825.00	400.00	2,325.00
S. C. Johnson & Son Colloid Chemistry Fellowship . . . . .	52.50					52.50
Kimberley Clark Corp. Fellowship . . . . .		4,000.00		1,200.00	800.00	2,000.00
Thomas Midgley, Jr. Fellowship . . . . .	1,507.00					1,507.00
Pan American Refining Corp. Fellowship . . . . .	1,500.00	2,500.00		1,200.00	800.00	2,000.00
Procter & Gamble Fellowship . . . . .	3,788.62	3,100.00		1,823.17	675.00	4,390.45
Pittsburgh Consolidation Coal Co. Fellowships . . . . .	2,301.28	3,100.00		1,860.71	925.00	2,615.57
Standard Oil of Indiana Fellowship . . . . .	2,061.28			1,234.00	600.00	227.28

## REPORT OF THE TREASURER

## SCHEDULE A-18 — (Continued)

## UNINVESTED FUNDS

<i>Department Accounts (Continued)</i>	<i>Balance June 30, 1949</i>	<i>Gifts and Other Receipts</i>	<i>Net Transfers</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance June 30, 1950</i>
<b>Chemical Engineering: (Continued)</b>						
Standard Oil of Cal. Fellowship . . . . .		\$1,775.00		\$1,250.00	\$525.00	
Standard Oil Co. Fellowship — Lewis . .	\$33.89					\$33.89
Standard Oil Development Co. Research	12,489.74	9,075.04		14,671.23		6,893.55
Special Research No. 1421 . . . . .	388.40					388.40
<b>Chemistry:</b>						
Allied Chemical & Dye Corp. Fellowship . . . . .		1,750.00		1,370.41	379.59	
American Academy of Arts and Sciences	688.08			142.00		546.08
American Society of Mech. Engineers . . . . .		6,000.00		3,916.40		2,083.60
Abbott Laboratories . . . . .	2,167.02			1,595.00		572.02
American Chicle Co. Fellowship . . . . .	2,874.66	6,000.00		7,053.25	480.00	1,341.41
Bristol Laboratories Research . . . . .	4,245.23	6,000.00		7,630.61	1,210.00	1,404.62
Building 2, Fire Account . . . . .	3,407.69			3,407.69		
Cope Research . . . . .	440.65			440.65		
Harshaw Chemistry Fund . . . . .	3,264.28			1,320.00		1,944.28
du Pont Fellowship . . . . .	6,698.78	2,800.00		3,200.00		6,298.78
du Pont Peroxide Research . . . . .	2,000.00					2,000.00
du Pont Fundamental Research . . . . .	10,000.00			6,326.51		3,673.49
Eastman Kodak Fellowship . . . . .	1,500.00	1,750.00		1,200.00	300.00	1,750.00
General Motors Special — Morton . . . . .		5,088.12		4,800.37		287.75
Journal Meetings . . . . .	246.27	260.93				507.20
Kettering Foundation . . . . .		10,000.00		1,572.02		8,427.98
Merck Fellowship . . . . .		2,500.00				2,500.00
Physical Chemistry Royalties . . . . .	3,858.04	222.44				4,080.48
Polymerization Research . . . . .	1,665.25					1,665.25
Procter & Gamble Fund . . . . .	2,684.85	1,000.00		1,000.00		2,684.85
Rockefeller Research Grant 45107 . . . . .	12,627.60	1,667.50		9,313.33		4,981.77
Research Corp. — Amdur . . . . .	5,464.78	4,200.00		3,955.25	150.00	5,559.53
Research Corp. Morton Fund . . . . .	3,920.86			41.60		3,879.26
Research Corp. — Swain . . . . .		4,000.00		1,090.84	240.00	2,669.16
Research Corp. Vitamins A and D Research . . . . .	2,819.80	6,400.00		6,270.24		2,949.56
Research Special 2391 — Beattie . . . . .			\$15,000.00	447.50		14,552.50
Riker Laboratories, Inc. . . . .		2,300.00		55.00		2,245.00
Royalty Receipts Pat. 665135 . . . . .	135.02			135.02		
Sharp and Dohme, Inc. . . . .	663.00	3,600.00		3,608.20		654.80
Sugar Research Fund . . . . .	8,389.79	4,950.00		11,537.70	970.00	832.09
Swift Amino Acid Fund . . . . .	165.58		5,000.00	4,515.49	480.00	170.09
Swift Protein Research . . . . .	1,119.52		6,102.50	2,520.54	730.00	3,971.48
Union Bay State — Milas . . . . .	236.97			236.97		
U. S. Rubber Co. Fellowship . . . . .	900.00	2,800.00		2,940.50	300.00	459.50
<b>City Planning:</b>						
Conference Account . . . . .		800.00		800.00		
<b>Civil Engineering:</b>						
<b>Concrete Structural and Dynamics</b>						
Laboratory . . . . .	5,850.02			2,446.24	3,403.78	
Equipment Special 1326 . . . . .	338.82					338.82
Freeman Hydraulic Research . . . . .	800.00					800.00
International Soc. of Soil Mechanics . . . . .		2,888.59		2,417.75		470.84

UNINVESTED FUNDS

281

SCHEDULE A-18 — (Continued)

UNINVESTED FUNDS

<i>Department Accounts (Continued)</i>	<i>Balance June 30, 1949</i>	<i>Gifts and Other Receipts</i>	<i>Net Transfers</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance June 30, 1950</i>
<b>Civil Engineering (Continued)</b>						
Photogrammetry Laboratory . . . . .	\$3,206.75	\$4,150.00	\$4,150.00	\$837.44	.....	\$2,369.31
Research Corporation — Ippen . . . . .	.....	5,115.00	.....	5,113.83	.....	1.17
Research Foundation Hydrodynamics . .	605.98	.....	12.25	593.73	.....	.....
River Hydraulic Laboratory . . . . .	.....	.....	2,712.25	2,712.25	.....	.....
Sanitary Engineering Lab. 2032 . . . . .	540.41	.....	1,505.77	1,505.77	\$190.41	350.00
Sanitary Science Lab. Special No. 2087 .	1,732.05	.....	.....	1,621.91	.....	110.14
Soil Mechanics Laboratory . . . . .	13.59	102.75	995.33	1,111.67	.....	.....
Sanitary Engineering Transportation . .	413.73	.....	.....	136.18	.....	549.91
Sewage Federation Research . . . . .	2,864.26	.....	.....	1,377.17	1,487.09	.....
Structural Laboratory . . . . .	54.49	.....	814.59	869.08	.....	.....
Structural Laboratory Donations . . . . .	.....	225.46	.....	.....	.....	225.46
Summer Camp Construction Reserve . .	14.88	.....	.....	1.11	.....	142.99
Wallace and Tiernan Grant . . . . .	38.98	.....	.....	.....	38.98	.....
Welding Research . . . . .	2,197.54	2,800.00	.....	2,803.09	.....	2,194.45
<b>Economics:</b>						
Map Project . . . . .	1,967.89	2,172.21	.....	2,032.49	.....	2,107.61
Rockefeller Foundation Grant 45082 . .	6,816.11	3,547.13	.....	5,768.39	.....	4,594.85
Overseas Study Fund . . . . .	.....	.....	1,000.00	1,454.91	454.91	.....
<b>Electrical Engineering:</b>						
Airborne Instrument Lab. Fellowship . .	2,000.00	.....	.....	1,200.00	800.00	.....
American Cancer Society Special Trump	3,699.45	20,000.00	.....	12,680.70	.....	11,018.75
American Philosophical Society — Kopal	887.94	.....	.....	449.71	.....	438.23
Army Officers Aid . . . . .	2,609.82	.....	.....	39.73	.....	2,570.09
Balsbaugh Research . . . . .	98.67	.....	.....	12.38	.....	86.29
Celotex Corp. Fellowship . . . . .	500.00	.....	.....	.....	.....	500.00
Center of Analysis . . . . .	.....	634.27	276.62	5,528.84	5,886.49	.....
Coating Metals Special No. 1946 . . . .	598.00	.....	598.00	.....	.....	.....
Course Revision Special No. 1250 . . . .	438.55	617.75	.....	609.51	.....	446.79
Course Six-A Travel . . . . .	.....	.....	1,107.76	1,107.76	.....	.....
Differential Analyzer . . . . .	.....	4,915.37	276.62	10,315.56	5,123.57	.....
du Pont Fellowship . . . . .	800.00	.....	.....	.....	.....	800.00
Edgerton Film Research . . . . .	1,158.49	3,732.50	.....	3,226.59	.....	1,664.40
Equipment Special . . . . .	14,544.25	.....	.....	11,177.28	3,366.97	.....
Hyams Radiation Research . . . . .	3,001.24	7,500.00	.....	767.98	.....	11,269.22
Jackson Memorial Room . . . . .	.....	2,567.47	8,239.00	8,159.39	.....	2,647.08
Int. Tel. & Tel. Research . . . . .	865.70	.....	.....	.....	.....	865.70
Network Analyzer . . . . .	9,816.95	7,156.48	.....	4,473.94	.....	12,499.49
Photoelectric Cells Res. Spec. 1874A . .	4,157.98	.....	4,157.98	.....	.....	.....
Radio Research Spec. 1550 . . . . .	1,724.15	.....	.....	.....	.....	1,724.15
Rapid Selection Research . . . . .	6,981.62	.....	.....	.....	.....	6,981.62
Research Corp. Arithmetical Mach. Spec.	412.97	.....	.....	.....	.....	412.97
Servo Research Special . . . . .	.....	400.00	15,000.00	2,480.06	.....	12,919.94
Servos Special Brown . . . . .	8,917.79	48.15	.....	3,509.45	.....	5,456.49
U. H. F. Dielectrics Res. Spec. 1874B . .	6,000.00	.....	6,000.00	.....	.....	.....
<b>English and History:</b>						
American Philosophical Society . . . . .	.....	2,000.00	.....	.....	.....	2,000.00
International Relations Library . . . . .	6.48	.....	.....	6.48	.....	.....
Roosevelt Spec. 2356 . . . . .	810.26	.....	.....	178.53	.....	631.73

## REPORT OF THE TREASURER

## SCHEDULE A-18 — (Continued)

## UNINVESTED FUNDS

<i>Department Accounts (Continued)</i>	<i>Balance June 30, 1949</i>	<i>Gifts and Other Receipts</i>	<i>Net Transfers</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance June 30, 1950</i>
<b>Food Technology:</b>						
Apple Fellowship . . . . .	\$1,431.20	.....	.....	\$344.84	.....	\$1,086.36
Bruce's Juices Inc. Fellowship . . . . .	2,000.00	.....	.....	.....	\$150.00	1,850.00
Campbell Special . . . . .	1,771.50	\$290.00	.....	789.61	.....	1,271.89
Carbide & Carbon Chemical Corp. . . . .	200.00	.....	.....	200.00	.....	.....
Dewey and Almy Fund . . . . .	.....	11,041.49	.....	8,737.46	1,817.34	486.69
Fat Research Fund . . . . .	1,362.46	4,338.00	.....	5,700.46	.....	.....
Hoffman La Roche Fund . . . . .	2,466.45	.....	.....	23.83	.....	2,442.62
Joe Lowe Corp. Research . . . . .	1,437.95	.....	.....	.....	200.00	1,237.95
Moore, Emma B., Ration Research, Proctor	500.00	.....	.....	.....	.....	500.00
Moore, Emma B., Ration Research, Harris	27.56	.....	.....	.....	.....	27.56
Nutrition Research . . . . .	1,894.03	3,930.84	\$1,753.76	4,054.25	.....	16.86
Procter and Gamble Research . . . . .	246.59	3,200.00	.....	2,781.59	665.00	.....
Quaker Nutrition Fund . . . . .	144.54	3,900.00	.....	1,788.14	150.00	2,106.40
Refrigeration Research Foundation . . . . .	3,500.00	.....	.....	2,100.00	1,400.00	.....
Royalties Receipts Pat. 665135 . . . . .	180.56	.....	.....	.....	.....	180.56
Standard Brands Fellowship . . . . .	9,856.38	2,200.00	10,000.00	1,256.38	800.00	.....
United Fruit Fund . . . . .	19,407.25	.....	.....	14,590.21	.....	4,817.04
Upjohn Co., Cathode Ray Research . . . . .	.....	6,000.00	.....	2,898.87	.....	3,101.13
Vitamin Foundation Research . . . . .	1,061.24	.....	1,753.76	2,729.03	.....	85.97
<b>Geology:</b>						
American Petroleum Institute Fund . . . . .	75.91	19,900.00	.....	21,237.09	1,261.18	.....
Geological Research Special 1863 . . . . .	1,681.64	.....	.....	1,681.64	.....	.....
G.S.A. 466-45 . . . . .	3,592.12	.....	.....	1,850.91	.....	1,741.21
Geophysical Research . . . . .	50.19	.....	.....	50.19	.....	.....
Nova Scotia Coal Research . . . . .	133.54	1,250.00	.....	1,383.54	.....	.....
Owens Illinois Glass Co. Fellowship . . . . .	295.61	.....	.....	4.51	.....	291.10
<b>Graphics:</b>						
National Research Council Grant . . . . .	180.01	.....	.....	.....	.....	180.01
<b>Industrial Relations:</b>						
Special Appr. No. 1955 . . . . .	601.59	.....	601.59	.....	.....	.....
<b>Mathematics:</b>						
Applied Mathematics Program . . . . .	4,917.35	.....	.....	1,300.00	1,100.00	2,517.35
Journal of Mathematics and Physics . . . . .	4,813.05	3,575.04	.....	3,010.85	.....	5,377.24
Special Appr. No. 2260 . . . . .	3,997.59	.....	.....	116.07	.....	3,881.52
Putnam Fund . . . . .	222.35	.....	.....	19.00	.....	203.35
Rockefeller Fund 47009 . . . . .	2,754.87	5,495.13	.....	5,495.46	.....	2,754.54
<b>Mechanical Engineering:</b>						
A. S. M. E. Research . . . . .	1,244.38	8,361.20	.....	7,320.21	.....	2,285.37
A. S. R. E. Research . . . . .	790.82	.....	.....	.....	.....	790.82
American Soc. of Tool Engineering . . . . .	417.50	300.00	.....	200.00	.....	517.50
Cavitation Research . . . . .	676.56	400.00	.....	549.44	.....	527.12
Chicopee Fellowship . . . . .	.....	2,600.00	.....	1,300.00	.....	1,300.00
Clark Thread Fellowship . . . . .	4,437.50	5,400.00	.....	2,700.00	1,100.00	6,037.50
deForest Research Special 1254 . . . . .	2,230.60	2,063.52	.....	2,361.64	.....	1,932.48
Detonation Research 2435 . . . . .	.....	.....	3,200.00	2,164.60	.....	1,035.40

UNINVESTED FUNDS

283

SCHEDULE A-18 — (Continued)

UNINVESTED FUNDS

<i>Department Accounts (Continued)</i>	<i>Balance June 30, 1949</i>	<i>Gifts and Other Receipts</i>	<i>Net Transfers</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance June 30, 1950</i>
<b>Mechanical Engineering: (Continued)</b>						
du Pont Predoctoral Fellowship.....	\$2,374.40	\$2,200.00	.....	\$1,759.63	\$400.00	\$2,414.77
Dynamics Special 2319.....	2,492.32	.....	.....	656.39	.....	1,835.93
Fatigue & Fracture of Metals Conference Fatigue Lab. Special No. 2224.....	181.93	500.00	.....	128.10	.....	371.90
Flower Fund.....	.....	88.00	.....	41.79	.....	140.14
Gas Turbine Building and Equipment..	5,659.55	.....	.....	3,853.26	.....	1,806.29
Heat Measurements Laboratory.....	233.11	.....	.....	233.11	.....	.....
Lab. Rev. Special No. 2095.....	1,841.26	79.71	.....	206.80	.....	1,714.17
Low Temperature Research.....	.....	300.00	.....	.....	.....	300.00
Machine Tool Lab. Spec. No. 2201....	296.32	2,100.00	.....	252.79	.....	2,143.53
Magnaflex Research Fund.....	5,952.64	.....	.....	3,150.00	.....	2,802.64
Mechanical Design Prize.....	.....	75.00	.....	75.00	.....	.....
Mechanics of Materials Spec. No. 2041	9,671.01	150.00	.....	2,053.59	.....	7,767.42
N. E. Textile Foundation Fellowship..	1,800.00	.....	.....	1,000.00	300.00	500.00
Proprietors Locks and Canals.....	1,573.02	.....	.....	755.95	.....	817.07
S. Slater & Sons, Inc., Fund.....	433.81	.....	.....	208.70	.....	225.11
Shell Fellowship.....	600.00	2,300.00	.....	1,200.00	800.00	900.00
Shop Maintenance Account.....	4,034.48	.....	.....	2,086.48	.....	6,120.96
Sloan Engine Control Research.....	4,326.40	.....	.....	3,297.76	.....	1,028.64
Special Appr. No. 2176.....	1,207.87	.....	.....	165.00	.....	1,042.87
Testing Materials Lab. Special.....	1,166.42	75.00	.....	.....	.....	1,241.42
Textile Equipment Special.....	54.36	245.00	.....	299.36	.....	.....
Textile Foundation Research.....	2,176.27	.....	.....	423.83	.....	1,752.44
Special Appropriation No. 2160.....	996.69	.....	\$771.07	1,767.76	.....	.....
Special Appr. 2169A.....	4,450.45	.....	.....	414.65	.....	4,035.80
Thermodynamic Research.....	935.51	.....	.....	253.70	.....	681.81
Wear Conference.....	590.43	.....	.....	168.77	.....	421.66
George Westinghouse Professorship...	3,775.38	30,000.00	.....	16,306.99	.....	17,378.39
<b>Metallurgy:</b>						
Aluminum Co. of America.....	.....	.....	25,000.00	20,646.58	2,400.00	1,953.42
American Brake Shoe Fellowship.....	969.68	700.00	.....	1,210.14	300.00	159.54
American Brake Shoe — Operating....	2,156.49	.....	566.32	1,463.11	.....	127.66
American Foundrymen's Society.....	.....	3,750.00	.....	3,810.47	60.47	.....
American Smelting & Ref. Co. Fell....	714.00	1,500.00	.....	1,500.00	500.00	214.00
Armour Dry Cyaniding.....	3,750.78	2,000.00	.....	4,871.68	.....	879.10
Armour Flotation Research — Gaudin.	5,750.74	12,000.00	.....	7,900.17	1,050.00	8,800.57
Chipman Research Special 1337.....	10,490.56	9,360.82	.....	10,207.88	640.00	9,003.50
Clay Research.....	383.75	.....	.....	9.02	.....	392.77
Corrosion Research.....	3,151.43	300.00	.....	1,261.56	.....	2,189.87
Engineering Foundation — Cohen.....	400.00	2,000.00	347.50	2,747.50	.....	.....
Engineering Foundation Welding Res..	3,335.90	.....	.....	43.35	.....	3,292.55
Equipment Spec. No. 1234.....	941.89	4,779.49	.....	1,406.75	.....	4,314.63
Equipment Special No. 1259.....	2,920.62	45.00	.....	2,447.95	.....	517.67
Equipment Special No. 2386.....	4,999.53	660.00	2,500.00	8,159.53	.....	.....
Equipment Special No. 2422.....	.....	.....	6,000.00	5,996.79	.....	3.21
Foundry Educational Foundation — Research.....	385.92	.....	566.32	952.24	.....	.....
Foundry Educational Foundation — Scholarship.....	600.00	15,000.00	.....	1,553.18	12,550.00	1,496.82
Mineral Dressing Research.....	.....	.....	1,500.00	1,500.00	.....	.....

## REPORT OF THE TREASURER

## SCHEDULE A-18 — (Continued)

## UNINVESTED FUNDS

<i>Department Accounts (Continued)</i>	<i>Balance June 30, 1949</i>	<i>Gifts and Other Receipts</i>	<i>Net Transfers</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance June 30, 1950</i>
<b>Metallurgy: (Continued)</b>						
Modernization of Processing Laboratory	\$2,415.49	.....	.....	.....	.....	\$2,415.49
Republic Steel Corp. Fund.....	7,029.16	.....	.....	\$2,894.11	\$425.00	3,710.05
Research Corporation — Schuhmann..	.....	\$3,000.00	.....	3,361.38	361.38	.....
Research Corporation — Uhlig.....	319.84	.....	.....	218.60	.....	101.24
Revere Copper and Brass Co. Res....	170.19	.....	.....	156.84	.....	13.35
Special Appropriation 2297.....	3,224.43	.....	.....	2,822.57	.....	401.86
Special Research No. 1818.....	477.54	.....	.....	191.13	.....	286.41
Steel Founders Society — Arc Furnace.	246.39	.....	.....	.....	.....	246.39
Steel Founders Society — Scholarship..	200.00	.....	.....	.....	.....	200.00
Timken Roller Bearing Research.....	260.53	10,000.00	.....	7,290.71	1,150.00	1,819.82
Titanium Co. Fund.....	1,775.89	1,500.00	\$347.50	2,581.44	.....	346.95
Union Carbide and Carbon Fellowship.	533.94	2,100.00	.....	1,124.69	925.00	584.25
Vanadium Corp. Fund.....	967.86	1,875.00	.....	2,433.51	.....	409.35
Wellman, S. K. Fund.....	1,369.74	2,500.00	.....	1,943.94	.....	1,925.80
Williams, Robert Seton Fund.....	63.14	.....	24.67	87.81	.....	.....
<b>Meteorology:</b>						
Pamphlets Deposit Special.....	164.00	.....	.....	164.00	.....	.....
Weather Bureau Research.....	.....	23,875.00	.....	25,321.81	1,446.81	.....
<b>Military Science:</b>						
Freshman Equipment Account.....	5,908.42	.....	.....	.....	3,654.65	2,253.77
Senior Uniform Account 1949-1950....	216.10	9,594.92	.....	.....	9,811.02	.....
Senior Uniform Upkeep Account.....	40.65	185.76	.....	.....	154.26	72.15
<b>Modern Languages:</b>						
Carnegie S.A.L. — Locke.....	.....	.....	5,000.00	3,643.36	.....	1,356.64
Carnegie S.A.L. — Perry.....	.....	.....	12,000.00	8,138.92	.....	3,861.08
Speech Communication Conference....	.....	.....	800.00	800.00	.....	.....
<b>Naval Architecture:</b>						
Lima Hamilton Corp. Research.....	1,627.02	.....	.....	.....	.....	1,627.02
Propeller Tunnel Special No. 1548A...	3,302.01	1,200.00	.....	1,218.60	.....	3,283.41
Special Fund (Anonymous).....	1,258.88	195.00	.....	968.16	.....	485.72
<b>Physics:</b>						
Armstrong Cork Co. Fellowship.....	3,000.00	.....	.....	1,800.00	800.00	400.00
Cabot Carbon Black.....	.....	6,000.00	.....	.....	.....	6,000.00
Cabot X-Ray Fund.....	5,693.75	.....	.....	.....	.....	5,693.75
Conference Low Temperature.....	5,000.00	1,564.00	4,272.29	10,836.29	.....	.....
Crystal Research.....	1,237.61	1,400.68	750.00	2,101.47	.....	1,286.82
du Pont Fellowship.....	2,600.00	.....	.....	.....	.....	2,600.00
Eastman Kodak Fellowship.....	.....	2,000.00	.....	.....	.....	2,000.00
Gulf Oil Corp. Fellowship.....	150.00	1,350.00	.....	1,200.00	300.00	.....
Harshaw-Stockbarger.....	1,536.38	8,000.00	750.00	3,977.85	339.29	4,469.24
Jewett, Frank B. Fellowship.....	979.69	.....	.....	365.15	.....	614.54
Magnetic Laboratory Special No. 1222.	298.10	.....	.....	2.65	.....	295.45
Methods of Theoretical Physics.....	1,300.00	.....	.....	.....	1,300.00	.....
Nuclear Research.....	8,903.19	.....	.....	7.32	.....	8,895.87
Radioactivity Center.....	47,007.94	1,691.10	.....	3,008.75	.....	45,690.29
Special Appro. No. 2047.....	17,160.38	.....	10,000.00	3,026.98	.....	4,133.40
Zeeman Effect Program Special 1755...	466.65	.....	.....	.....	.....	466.65

UNINVESTED FUNDS

285

SCHEDULE A-18 — (Continued)

UNINVESTED FUNDS

<i>Department Accounts (Continued)</i>	<i>Balance June 30, 1949</i>	<i>Gifts and Other Receipts</i>	<i>Net Transfers</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance June 30, 1950</i>
<b>Acoustics:</b>						
Acoustics Lab. Special No. 2115 . . . . .	\$512.24	\$91.44	\$8,000.00	\$8,603.68	.....	.....
Acoustics Material Association Fellow..	.....	3,000.00	.....	1,800.00	\$800.00	\$400.00
Acoustics Medical Project No. 2412 . . . . .	.....	.....	17,000.00	7,402.91	.....	9,597.09
<b>Solar Energy Research:</b>						
Solar Energy — Architecture . . . . .	.....	.....	16.68	16.68	.....	.....
Solar Energy — Chemistry . . . . .	239.97	.....	1,173.84	453.81	960.00	.....
Solar Energy — Elec. Eng. . . . .	4,736.08	.....	.....	20.36	.....	4,756.44
Solar Energy — Geology . . . . .	485.83	.....	485.83	.....	.....	.....
Solar Energy — Headquarters . . . . .	1,444.62	467.50	6,000.00	6,251.01	.....	1,661.11
Solar Energy — Metallurgy . . . . .	.....	.....	5,400.00	3,956.69	.....	1,443.31
<b>Spectroscopy:</b>						
Spectroscopy Lab. Special . . . . .	560.48	.....	.....	439.62	.....	120.86
Spectroscopy — Loofbourov . . . . .	25.78	225.00	3,000.00	939.62	600.00	1,711.16
Spectroscopy Research . . . . .	5,025.50	11,000.00	7,000.00	10,554.45	.....	12,471.05
Spectroscopy Special . . . . .	6,062.58	440.00	.....	235.00	.....	6,267.58
Spectroscopy-Biology — Mem. Hospital	3,194.43	8,000.00	.....	9,474.25	120.00	1,600.18
	\$803,853.24	\$756,732.42	\$162,908.14	\$874,446.65	\$78,407.96	\$770,639.19

*Other Accounts*

**Industrial Grants:**

Aluminum Co. of America . . . . .	\$25,000.00	.....	.....	.....	.....	\$25,000.00
Atlantic Refining Co. . . . .	20,000.00	.....	.....	\$20,000.00	.....	.....
Godfrey L. Cabot, Inc. . . . .	25,000.00	\$25,000.00	.....	50,000.00	.....	.....
California Research Corp. . . . .	50,000.00	.....	.....	.....	.....	50,000.00
Cities Service Res. & Development . . . . .	50,000.00	12,500.00	.....	62,500.00	.....	.....
Continental Oil Company . . . . .	25,000.00	.....	.....	25,000.00	.....	.....
Draper Corporation . . . . .	50,000.00	.....	.....	10,000.00	.....	40,000.00
Goodyear Tire & Rubber . . . . .	.....	250,000.00	.....	250,000.00	.....	.....
Humble Oil & Refining . . . . .	25,000.00	50,000.00	.....	75,000.00	.....	.....
Liquid Carbonic Corp. . . . .	10,000.00	.....	.....	.....	.....	10,000.00
Phelps-Dodge Corp. . . . .	.....	50,000.00	.....	10,000.00	.....	40,000.00
Saco-Lowell Shops, Inc. . . . .	20,000.00	.....	.....	10,000.00	.....	10,000.00
Sperry Gyroscope Co. . . . .	15,000.00	.....	.....	.....	.....	15,000.00
A. O. Smith Corporation . . . . .	10,000.00	.....	.....	10,000.00	.....	.....
Socony-Vacuum Oil Co. . . . .	50,000.00	.....	.....	50,000.00	.....	.....
Standard Oil Co. of Indiana . . . . .	50,000.00	.....	.....	.....	.....	50,000.00
Standard Oil Co. of New Jersey . . . . .	50,000.00	15,000.00	.....	35,000.00	.....	.....
Texas Company . . . . .	150,000.00	.....	.....	.....	\$44,320.26	105,679.74
Union Carbide & Carbon . . . . .	20,000.00	12,417.46	.....	32,417.46	.....	.....
United States Steel Corp. . . . .	150,000.00	.....	.....	30,000.00	.....	120,000.00
	.....	\$795,000.00	\$384,917.46	\$669,917.46	\$44,320.26	\$465,679.74

## REPORT OF THE TREASURER

## SCHEDULE A-18 — (Continued)

## UNINVESTED FUNDS

<i>Other Accounts (Continued)</i>	<i>Balance June 30, 1949</i>	<i>Gifts and Other Receipts</i>	<i>Net Transfers</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance June 30, 1950</i>
<b>Library:</b>						
American Chemical Society						
Library Fellowship.....	\$1,481.46	.....	.....	\$634.77	.....	\$846.69
Biology Library.....	4,977.65	.....	.....	488.86	.....	4,488.79
Carnegie S. A. L. Center.....	3,080.56	\$2,792.21	\$9,475.00	13,345.00	.....	2,002.77
Crafts Library.....	553.68	250.00	.....	124.35	.....	679.33
Dewey Library.....	3.67	.....	.....	3.67	.....	.....
German Chemical Documents.....	1,426.24	.....	.....	1,191.37	.....	234.87
Humanities Library Spec. No. 2103.....	8.42	.....	.....	8.42	.....	.....
Library Growth.....	3,671.66	.....	.....	193.15	.....	3,478.51
Special No. 1.....	2,773.40	1,376.52	.....	.....	.....	4,149.92
Special No. 1853.....	558.93	.....	.....	325.12	.....	233.81
Special Appropriation No. 2240.....	41.22	.....	.....	22.51	.....	63.73
Walker Memorial Library.....	922.72	13.25	3,200.00	2,611.77	.....	1,524.20
	<b>\$19,499.61</b>	<b>\$4,431.98</b>	<b>\$12,675.00</b>	<b>\$18,903.97</b>	.....	<b>\$17,702.62</b>
<b>Research (other than those under Department Accounts):</b>						
All American Aviation, Inc. Richard C. du Pont Memorial.....	\$1,100.00	.....	.....	.....	.....	\$1,100.00
Bush Research Fund.....	215.00	.....	.....	.....	.....	215.00
Cosmic Terrestrial Research.....	1,698.75	\$2,500.00	.....	\$4,198.75	.....	.....
General Radio Company Fund.....	2,000.00	.....	.....	.....	.....	2,000.00
	<b>\$5,013.75</b>	<b>\$2,500.00</b>	.....	<b>\$4,198.75</b>	.....	<b>\$3,315.00</b>
<b>Reserves:</b>						
Bemis Real Estate.....	\$7,977.72	\$1,748.37	.....	.....	.....	\$9,726.09
Division of Laboratory Supplies.....	12,984.42	2,881.19	.....	.....	.....	15,865.61
Medical Student Health.....	5,997.75	10,284.17	.....	.....	.....	16,281.92
Radar School, Harbor Building.....	10,588.17	128.49	\$1,036.59	\$10,000.00	.....	1,753.25
Round Hills.....	13,286.16	.....	.....	.....	\$13,286.16	.....
Special War Reserve Fund.....	20,405.77	.....	.....	11,537.86	.....	8,867.91
	<b>\$71,239.99</b>	<b>\$15,042.22</b>	<b>\$1,036.59</b>	<b>\$21,537.86</b>	<b>\$13,286.16</b>	<b>\$52,494.78</b>
<b>Plant Operations:</b>						
Additional Power — Building 35.....	\$19,958.02	.....	.....	.....	\$19,958.02	.....
Ames Street Parking Lot 2361.....	3,005.07	.....	.....	\$3,005.07	.....	.....
Analytical Chem. Laboratory.....	.....	.....	\$40,000.00	31,041.57	.....	\$8,958.43
Arch. Drafting Room Lighting.....	14,000.00	.....	673.00	13,327.00	.....	.....
Biology Renovations.....	16,258.41	.....	.....	12,465.48	.....	3,792.93
Building 5 Special 2333.....	2,376.18	.....	.....	1,074.91	.....	1,301.27
Building 18 Renovations.....	2,246.64	.....	488.56	1,758.08	.....	.....
Building 20 Painting.....	4,441.73	.....	.....	1,014.09	.....	3,427.64
Building 20 Power Lines.....	1,275.15	.....	1,275.15	.....	.....	.....
Building 20 Spec. 2376.....	118.95	.....	.....	118.95	.....	.....
Cabinets for Room 2-190.....	.....	.....	200.00	86.52	.....	113.48



SCHEDULE A-18—(Continued)

UNINVESTED FUNDS

Other Accounts (Continued)	Balance June 30, 1949	Gifts and Other Receipts	Net Transfers	Expense	Other Charges	Balance June 30, 1950
Plant Operations: (Continued)						
Civil Eng. — Drafting Room Lighting.	\$6,600.00			\$6,491.37	\$108.63	
Civil Eng. Camp — Painting	357.14			357.14		
Decorating Room 2-290			\$5,000.00	4,967.78		\$32.22
Demonstration Special 2351	2,484.88					2,484.88
Drainage East Parking 2387	697.55				697.55	
Electrical Dist. Special 2209	1,419.39				1,419.39	
Fly Ash Eliminator	2,099.77			490.00	1,609.77	
Hayden Library Dedication			5,500.00	4,667.65		832.35
Install. of Arc Furnace — Bldg. 35			27,500.00	25,915.05		1,584.95
Library Move			20,000.00	8,897.12		11,102.88
Lighting Improvements	2,000.00			2,000.00		
Loading Frames — Civil			10,000.00			10,000.00
Medical Department X-Ray		\$5,100.00				5,100.00
Modernization of Lighting	3,052.70			212.41		2,840.29
Parking Control Expense			10,000.00	1,217.89		8,782.11
Planting Expense			1,500.00	50.37		1,449.63
Renovations City Planning Headquarters	379.56					379.56
Repairing Freight Elevators			10,075.00	5,600.00		4,475.00
Repairing Roads West of Mass. Ave.	3,716.06			3,262.22		453.84
Space Changes 2296	1,626.42		182,600.00	183,866.96		359.46
Vassar Street Driveway	40.55		40.55			
Ventilation of Room 24-407			1,200.00			1,200.00
Water Line Building 2	2,139.83			2,139.83		
Westgroup Elec. Distribution	17,600.00		2,346.64	19,946.64		
	\$107,894.00	\$5,100.00	\$313,444.38	\$333,974.10	\$23,793.36	\$68,670.92

Miscellaneous:

D. I. C. — A. M. P. Royalty Account	\$7,538.93			\$7,538.93		
Alumni Register		\$316.19		42.55		\$273.64
Anonymous L.		1,900.00		1,100.00	\$800.00	
Richard D. du Pont Mem. Special	388.56					388.56
Emma Rogers Room Special	29.12					29.12
High Altitude Lab. Special 2299	1,600.00				1,600.00	
New Student Program	31,774.19		\$11,000.00	33,655.54	4,000.00	5,118.65
Summer Session 1949 Spec. 2390	503.00				503.00	
Tech War Record Spec. 2116	7,132.69			7,132.69		
Vocational Guidance 2416			5,000.00	2,909.45		2,090.55
Visiting Committee	95.00		85.00	180.00		
Westgate Survey	2,500.00			500.00		2,000.00
Boat House Equipment	256.60					256.60
Building Key Account	4,247.04			382.51		4,629.55
Chairman's Fund	645.08		1,000.00	1,324.50		320.58
S. H. Caldwell Special	1,000.00				1,000.00	
Carnegie S. A. L. — Hill			500.00	113.59		386.41
Corporation K Fund	69.17					69.17
Corporation Flower Fund	568.68			65.60		503.08
Dean's Fund Special		1,000.00		300.00		700.00†
Eager Student Aid Fund		250.00				250.00
Faculty Flower Fund	516.50	15.26		67.35		464.41

† Includes Students' notes receivable.

## REPORT OF THE TREASURER

## SCHEDULE A-18 — (Continued)

## UNINVESTED FUNDS

<i>Other Accounts (Continued)</i>	<i>Balance June 30, 1949</i>	<i>Gifts and Other Receipts</i>	<i>Net Transfers</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance June 30, 1950</i>
<i>Miscellaneous: (Continued)</i>						
Foreign Student Project 1948-49 . . . . .	\$66.99		\$66.99			
Foreign Student Project 1949-50 . . . . .		\$28,651.21	5,066.99	\$42,810.36	\$9,092.16	
Foreign Student Air Travel Dept. . . . .	210.81			101.54		\$109.27
Graduate Student Fund . . . . .	136.82					136.82
Greer Rowing Equipment . . . . .		600.00		399.50		200.50
Haynes Student Aid Fund . . . . .	725.00					725.00
Dard Hunter Museum . . . . .		4,400.00		337.95		4,062.05
Kasch Fellowships . . . . .	180.00					180.00
William S. Knudsen Fellowship . . . . .	925.00	2,500.00		1,800.00	300.00	1,325.00
Land Grant Colleges Expense . . . . .	32.68				32.68	
Llora Culver Krueger Fund . . . . .	1,255.36		1,255.36			
Lecture Fund . . . . .	26.14	3,215.00	2,000.00	5,241.14		
Thurman Lee Fund . . . . .	2,250.00				750.00	1,500.00
A. D. Little Fellowship . . . . .			7,500.00	6,700.00	150.00	650.00
A. D. Little Inc., Spec. Royalties . . . . .	956.81		956.81			
Melvin Trust Scholarships . . . . .	8,400.00	11,787.00			8,225.00	11,962.00
Photographic Service . . . . .				360.05		360.05
President's Fund . . . . .	748.42			250.00		498.42
President's Special Fund L . . . . .	4,350.00	10,000.00			2,100.00	12,250.00
Emma Rogers Room — Social . . . . .		30.79				30.79
George Scher Scholarship Fund . . . . .	1,000.00					1,000.00
Science Teachers Fellowship . . . . .	12,500.00	12,500.00	500.00	10,901.25	2,080.00	12,518.75
Teagle Foundation . . . . .	12,376.00				11,450.00	926.00
Undergrad. Scholarship Award Spec. . . . .		1,350.00			850.00	500.00
UNESCO Fellowship Special . . . . .	1,050.00		1,050.00			
Herman E. Weihmiller . . . . .	702.40					702.40
Granger Whitney Fund . . . . .	213.50	200.00			200.00	213.50
Radar School, Harbor Building . . . . .	4,770.32		548.03	4,222.29		
	\$111,740.81	\$78,715.45	\$28,774.80	\$126,951.67	\$24,948.52	\$67,330.87
Total . . . . .	\$1,119,241.40	\$1,657,522.07	\$903,756.37	\$2,049,930.46	\$184,756.26	\$1,445,833.12

EDUCATIONAL PLANT

289

SCHEDULE A-19

EDUCATIONAL PLANT ASSETS<sup>1</sup>

Land in Cambridge:		
Campus — east of Massachusetts Avenue	\$1,125,766.67	
Campus — west of Massachusetts Avenue	850,014.82	\$1,975,781.49
<hr/>		
Educational Buildings, Cambridge:		
Main Group.....	\$5,655,949.64	
Charles Hayden Memorial Library.....	3,696,190.24	
George Eastman Research Laboratories...	1,225,098.58	
Pratt School of Naval Architecture.....	674,971.70	
Chemical Engineering Laboratories.....	536,268.99	
Guggenheim Aeronautical Laboratory....	293,637.46	
Wright Brothers Memorial Wind Tunnel..	217,506.25	
Magnetic Substation.....	76,272.73	
Gas Turbine Laboratory.....	545,892.45	
Sloan Automotive Laboratories.....	549,936.81	
Mechanic Arts Building.....	83,658.89	
Metals Processing Laboratory (Under Construction).....	20,602.82	
Nuclear Research Laboratory.....	42,891.27	
Cyclotron Laboratory.....	20,247.92	
Solar Energy Laboratory.....	10,500.00	
Hyams Radiation Laboratory.....	13,500.00	
Research Building (Servo-mechanisms)...	104,589.55	
Biological and Food Tech. Bldg. (Preliminary Costs).....	4,731.11	
Hydraulic Laboratory (Building 21).....	11,000.00	
Hydrodynamics Laboratory and Towing Tank (Under Construction).....	529,044.07	
Chemical Engineering Laboratory (Bldg.38)	31,000.00	
Building Twenty-Four.....	318,049.27	
Building Eighteen.....	44,158.93	
Twelve M.E.V. Bldg. (Under Construction)	201,143.74	14,906,842.42
Educational Equipment.....		2,039,953.60
Undergraduate Dormitories.....	\$1,487,423.79	
New Dorm.....	500,000.00 <sup>2</sup>	1,987,423.79
<hr/>		
Infirmary, Recreational and Athletic Buildings:		
Homberg Memorial Infirmary.....	\$188,441.60	
Walker Memorial.....	714,587.02	
Alumni Swimming Pool.....	377,992.93	
Boat House.....	54,244.13	
Barbour Field House and Squash Courts..	84,042.54	
Sailing Pavilion.....	28,849.09	
Briggs Field House and Track.....	121,197.99	
Rockwell Cage.....	216,902.14	1,786,257.44
Summer Camp: East Machias, Maine.....		120,558.00
Round Hill, Dartmouth, Massachusetts.....		175,000.00
<hr/>		
Miscellaneous:		
Power Plant.....	\$389,064.17	
Steam and Electrical Distribution System.	310,795.32	
Service Building and Garages.....	55,369.74	
Other Plant Assets.....	466,916.61	1,222,145.84
<b>Total, June 30, 1950 (Schedule A).....</b>		<b><u>\$24,213,962.58</u></b>

<sup>1</sup>Not including properties devoted to Institute use included in Real Estate in General Investments, page 245.  
<sup>2</sup>Additional Construction Cost provided for by Investment Funds (see Investments, page 245).

## SCHEDULE A-20

PRINCIPAL GIFTS AND APPROPRIATIONS  
FOR EDUCATIONAL PLANT

## For Land:

T. C. duPont . . . . .	\$625,000.00	
A. F. and Ida F. Estabrook Funds . . . . .	105,000.00	
Maria A. Evans . . . . .	169,080.60	
Edmund D. Barbour Fund . . . . .	234,634.18	
From Miscellaneous Contributors . . . . .	277,222.89	
Appropriations from Funds—		
Blake, \$5,000; Lyman, \$5,000; Kimball, \$10,000; McGregor, \$2,500; Philbrick, \$2,000; Richards, \$1,000; Perkins, \$3,252.32;		
Current Income, \$6,500 . . . . .	35,252.32	\$1,446,189.99

For Educational Buildings (including President's House,  
Power Plant and buildings other than Dormitories and  
those used for Student Recreational and Athletic  
Purposes):

George Eastman . . . . .	\$5,808,752.88*		
T. C. and P. S. duPont, Charles Hayden, Arthur Winslow for Mining Engineering Building . . . . .	225,000.00		
Maria A. Evans Fund . . . . .	100,000.00		
C. A. Stone and E. S. Webster . . . . .	187,500.00		
Sale of Land and Building in Boston (1938)	972,283.33		
Pratt Fund, for School of Naval Architecture	675,150.00		
Guggenheim Fund, for Aeronautical Labora- tory . . . . .	230,000.00		
Appropriations for Aeronautical Laboratory—			
From Funds: Perkins, \$12,508.02; Hayden, \$42,700.76; Frisbie, \$7,614.98 . . . . .	62,823.76		
Alfred P. Sloan, Jr., for Automotive Labora- tory . . . . .	367,533.01		
Appropriation for Automotive Laboratory—			
From Current Income and Wind Tunnel Account . . . . .	160,000.00		
Edmund D. Barbour Fund for:			
Nuclear Laboratory . . . . .	32,341.27		
Magnetic Laboratory . . . . .	40,772.73		
Power Plant . . . . .	90,006.59		
Miscellaneous Contributions and Appropri- ations from Funds for: Magnetic Lab., \$5,500; Nuclear Research Lab., \$2,500; Cyclotron, \$20,247.92; Hyams Radiation Lab., \$13,500; and Solar Energy Lab., \$10,500; Anonymous, \$1,000, Bldg. 6; Industrial Fund for Bldg. 32, \$27,753.67; Hydrodynamics Lab., \$529,044.07; Gas Turbine Lab., \$530,699.10; Bldg. 24, \$318,049.27; Metals Processing Lab., \$20,602.82; Biology and Food Tech Bldg., \$4,731.11; Twelve M.E.V. Bldg., \$44,320.26 . . . . .			1,528,448.22

\* Includes Mr. Eastman's original gift of \$3,500,000 together with appropriations from the \$2,500,000 Building Fund which he established.

EDUCATIONAL PLANT

291

SCHEDULE A-20 — (Continued)

For Educational Buildings (Continued)

Subscriptions to Wright Brothers Memorial Wind Tunnel.....	\$95,795.00*	
Appropriation for Wind Tunnel — Current Income.....	9,000.00	
Miscellaneous Appropriations from Current Income for: Compression Lab., \$31,000; Tractor Garage, \$6,400; Gas Turbine Lab., \$15,193.35; Bldg. 18, \$44,158.93; Twelve M.E.V. Bldg., \$156,823.48.....	<u>253,575.76</u>	\$10,838,982.55

For Educational Equipment:

Emma Rogers Fund.....	\$528,077.06	
F. W. Emery Fund.....	126,423.80	
C. L. W. French Fund.....	100,843.34	
Equipment moved from Boston (1916) Est. Alumni Fund.....	500,000.00	
	82,119.38	
Appropriations from Funds — Drew, \$305,171.52; Peabody, \$52,238.89; duPont, \$12,500; Tuttle, \$50,000; Thayer, \$25,000; Dorr, \$49,573.47.....	494,483.88	
Appropriations from Current Income.....	193,576.34	
Miscellaneous Contributions.....	<u>14,429.80</u>	2,039,953.60

For Charles Hayden Memorial Library:

Charles Hayden Foundation Fund.....	\$2,445,482.00	
Alumni Fund.....	250,000.00	
Boston Stein Club.....	13,398.25	
Development Fund.....	<u>987,309.99</u>	3,696,190.24

For Dormitories:

Maria A. Evans Fund.....	\$261,192.55	
T. C. duPont.....	100,000.00	
Alumni Dormitory Fund.....	566,945.66	
Alumni Fund 1947 — New Dormitory....	500,000.00	
Edmund D. Barbour Fund.....	258,599.40	
Erastus C. Gaffield Fund.....	120,000.00	
Appropriations from Funds — Robb, \$28,750; Thorndike, \$15,000; Hodges, \$57,316.26; Wood, \$28,750; Miscellaneous Funds, \$28,500.....	158,316.26	
Appropriated, Current Income.....	<u>22,369.92</u>	1,987,423.79

For Summer Camp:

Edward Cunningham Fund.....	\$15,000.00	
Charles W. Eaton Fund.....	15,501.45	
Appropriations from Current Income.....	<u>90,056.55</u>	120,558.00

For Infirmary, Recreational and Athletic Buildings:

Julius Rosenwald and family — Homberg Infirmary.....	\$110,225.00	
Appropriations from Funds — Homberg Infirmary — Chase, \$4,090.09; A.H. Munsell, \$7,908.28; M. A. Munsell, \$1,105.32; Industrial, \$41,137.61; A. F. Estabrook, \$10,000; I.F. Estabrook, \$2,157.51; Perkins, \$764.66	67,163.47	

\* Otherwise paid for from Eastman Building Fund.

## REPORT OF THE TREASURER

*SCHEDULE A-20 — (Continued)*For Infirmary, Recreational and Athletic Buildings (*Continued*):

Appropriation for Homberg Infirmary from Current Funds . . . . .	\$11,500.00	
Walker Memorial Fund . . . . .	167,303.96	
Improvement Fund, for Walker Memorial. Alumni Fund, for Walker Memorial . . . . .	24,491.34	
Edmund D. Barbour Fund, for Field House Alumni Fund, for Swimming Pool . . . . .	490,000.00	
Stephen Bartlett Fund, for Swimming Pool Class of 1923, Sun Garden . . . . .	55,000.00	
Alumni Fund, for Briggs Field House and Track . . . . .	228,479.15	
Edmund D. Barbour Fund, Sailing Pavilion Anonymous for Boat House . . . . .	117,071.64	
Miscl. funds for Rockwell Cage . . . . .	10,000.00	
Appropriations from Current Income for: Boat House . . . . .	156,169.13	
Sailing Pavilion . . . . .	13,363.89	
Squash Courts . . . . .	30,000.00	
Rifle Range . . . . .	216,902.14	
		\$1,750,197.46
Miscellaneous:		
From Sale of Land and Buildings in Boston 1916 . . . . .	\$656,919.45	
Mrs. Wilks, Round Hill . . . . .	175,000.00	
Other Contributions, Appropriations, etc. . . . .	1,502,547.50	2,334,466.95
<i>Total June 30, 1950 (Schedule A) . . . . .</i>		<u><u>\$24,213,962.58</u></u>

*SCHEDULE B-1*

## STUDENTS' FEES

## TUITION

Students' Payments . . . . .	\$2,364,195.01	
Veterans Administration . . . . .	1,129,445.60	
Other Government Contracts . . . . .	178,343.00	
Scholarship Awards . . . . .	365,299.33	
Student Loan Awards . . . . .	88,766.20	
		\$4,126,049.14
Locker, Examination and Other Fees . . . . .		7,682.45
<i>Total (Schedule B) . . . . .</i>		<u><u>\$4,133,731.59</u></u>

## SCHEDULE B-2

ALLOCATION OF INVESTMENT INCOME AND GIFTS  
AND OTHER RECEIPTS FOR CURRENT EXPENSES

<i>Department</i>	<i>Gifts and Other Receipts</i>	<i>Investment Income</i>	<i>Total</i>
Aeronautical Engineering.....	\$165,629.86	.....	\$165,629.86
Architecture.....	2,099.20	\$2,936.65	5,035.85
Biology.....	104,853.83	.....	104,853.83
Building Engineering and Construction.....	38,720.77	.....	38,720.77
Business and Engineering Administration.....	98,336.89	11,500.00	109,836.89
Chemical Engineering.....	178,458.96	2,112.00	180,570.96
Chemical Engineering Practice School.....	46,811.62	.....	46,811.62
Chemistry.....	236,992.71	66,000.00	302,992.71
Civil Engineering.....	16,710.71	8,739.00	25,449.71
Economics.....	9,255.79	.....	9,255.79
Industrial Relations.....	43,218.87	.....	43,218.87
Electrical Engineering.....	162,550.81	948.00	163,498.81
English and History.....	6.48	516.00	522.48
Food Technology.....	114,428.88	5,000.00	119,428.88
Geology.....	32,457.88	1,180.25	33,638.13
Mathematics.....	64,941.38	3,500.00	68,441.38
Mechanical Engineering.....	123,603.43	.....	123,603.43
Metallurgy.....	133,675.08	.....	133,675.08
Meteorology.....	25,485.81	.....	25,485.81
Modern Languages.....	11,782.28	.....	11,782.28
Naval Architecture.....	2,186.76	13,821.00	16,007.76
Physics.....	105,801.52	5,040.00	110,841.52
Acoustics Laboratory.....	17,806.59	.....	17,806.59
Bemis Research.....	.....	10,640.38	10,640.38
Nuclear Science and Engineering.....	15,000.00	.....	15,000.00
Solar Energy Research.....	10,657.83	15,065.00	25,722.83
Spectroscopy Laboratory.....	21,642.94	.....	21,642.94
Unallocated to Departments...	65,000.00	4,036.00	69,036.00
Staff Scholarships.....	.....	37,000.00	37,000.00
<i>Sub-Totals</i> .....	<u>\$1,848,116.88</u>	<u>\$188,034.28</u>	<u>\$2,036,151.16</u>
Library and Museums.....	\$53,823.79	\$6,344.52	\$60,168.31
Medical Department.....	1,000.00	3,400.00	4,400.00
General Expense.....	170,909.52	19,625.20	190,534.72
Plant Operation.....	69,841.82	.....	69,841.82
Undergraduate Budget Board..	3,800.00	.....	3,800.00
General Purposes.....	.....	1,114,818.35	1,114,818.35
<i>Totals</i> .....	<u>\$2,147,492.01</u>	<u>\$1,332,222.35</u>	<u>\$3,479,714.36</u>
	(Schedule B)	(Schedule B)	

## REPORT OF THE TREASURER

## SCHEDULE B-2a

## USE OF INCOME FROM INVESTMENTS

Income from General Investments \$1,825,439.71 (Schedule A-1) less Compensation of Financial Agent.....		\$1,795,439.71
Income from Funds Separately Invested (Schedule A-2).....		182,123.08
		<u>\$1,977,562.79</u>
Income Distributed to Funds:		
Used for Current Expense (Schedule B-2).....	\$1,332,222.35	
Used for Scholarships and Fellowships, Transferred to Income from Tuition.....	221,174.99	
Net Addition to Fund Balances.....	248,703.50	1,802,100.84
		<u>1,802,100.84</u>
Added to Undistributed Investment Income.....		\$175,461.95
Balance of Undistributed Investment Income June 30, 1949.....		67,258.01
		<u>\$175,461.95</u>
Balance of Undistributed Investment Income June 30, 1950.....		<u>\$242,719.96</u>

## SCHEDULE B-2b

## EXPENDABLE GIFTS AND OTHER RECEIPTS USED FOR CURRENT EXPENSES

Gifts and Other Receipts Used for Current Expenses (Schedule B-2).....		\$2,147,492.01
Gifts and Other Receipts Used for Other Purposes:		
Used for Scholarships and Fellowships Transferred to Income From Tuition.....		89,172.88
Expenditures of Funds (principally for educational plant) not Reflected in the Statement of Income and Expense.....		1,371,984.19
Net Additions to Fund Balances.....		987,869.72
		<u>\$2,457,526.79</u>
Total Expendable Gifts and Other Receipts of the Current Year.....		<u>\$4,596,518.80</u>
Expendable Gifts per Gift List (Page 232).....		\$3,778,675.80
Other Receipts:		
Appropriations from Research Contract Revenues:		
Reserve for Use of Facilities.....		380,336.00
Industrial Fund.....		63,671.00
Special Services, Laboratory Facilities, Scrap, Notes, Journals, and Conference Subscriptions.....		114,541.16
Royalty Receipts.....		19,689.21
Miscellaneous.....		239,605.63
		<u>\$4,596,518.80</u>
Total, as above.....		<u>\$4,596,518.80</u>



## RESEARCH CONTRACTS

295

## SCHEDULE B-3

## RESEARCH CONTRACTS

## DIVISION OF INDUSTRIAL COOPERATION

Revenues from Research Contracts . . . . .		\$12,858,611.18
Less Appropriations Therefrom:		
Reserve for Use of Facilities . . . . .	\$ 380,336.00	
Industrial Fund . . . . .	63,671.00	
Investment Income for Use of Funds and Amortization of Facilities . . . . .	37,745.00	481,752.00
Net Revenues (Schedule B) . . . . .		<u>\$12,376,859.18</u>
Direct Expenses on Research Contracts:		
Salaries and Wages . . . . .	\$6,457,813.16	
Materials and Services . . . . .	2,294,591.17	
Subcontracts . . . . .	748,521.86	
Construction of Major Facilities . . . . .	391,459.72	
Travel . . . . .	241,573.01	
Other . . . . .	110,370.85	\$10,244,329.77
Direct Expenses of Division of Industrial Cooperation:		
Salaries and Wages . . . . .	\$147,961.57	
Materials and Services . . . . .	31,064.53	
Travel . . . . .	5,679.61	
Vacation Accrual — Hourly Employees . . . . .	81,000.00	
Depreciation on Equipment . . . . .	26,635.37	
Insurance . . . . .	18,208.91	
Auditing and Professional Services . . . . .	4,250.00	
Outside Rentals . . . . .	30,613.88	
Instrumentation Laboratory — Indirect expenses . . . . .	18,341.06	
Servomechanisms Laboratory — Indirect Expenses . . . . .	19,267.65	
Health Physics Program . . . . .	32,200.63	
Unallowable Contract Expense . . . . .	10,767.88	
Other . . . . .	4,391.25	430,382.34
Total Direct Expenses (Schedule B) . . . . .		<u>\$10,674,712.11</u>
Allowance for Institute's Expenses of Administration and Plant Operation . . . . .		<u>1,702,147.07</u>
Total . . . . .		<u>\$12,376,859.18</u>

*SCHEDULE B-4*

## OTHER INCOME

Anonymous for Chemical Engineering . . . . .	\$1,000.00
Land Rentals . . . . .	4,599.98
Lecture Notes . . . . .	653.90
General Electric Company for Course VI-A . . . . .	7,000.00
General Radio Company for Course VI-A . . . . .	1,200.00
Boston Edison Company for Course VI-A . . . . .	1,200.00
Philco Corporation for Course VI-A . . . . .	7,000.00
American Gas and Electric Company for Course VI-A . . . . .	2,500.00
Rentals — Coryell . . . . .	1,050.00
Recovery — Julia H. S. Smith . . . . .	3,999.85
Federal Aid . . . . .	21,602.52
U. S. Government — Veterans Administration . . . . .	4,398.77
<i>Total</i> (Schedule B) . . . . .	<u>\$56,205.02</u>

## SCHEDULE B-5

SALARIES AND WAGES OF STAFF, ACCESSORY TO TEACHING  
AND LABORATORY SERVICE

<i>Department</i>	<i>Staff Salaries</i>	<i>Wages Accessory to Teaching</i>	<i>Wages Laboratory Service</i>	<i>Salaries and Wages Transferred to D.I.C.</i>	<i>Academic Salaries and Wages</i>
Aeronautical Engineering . . . . .	\$264,105.92	\$19,816.29	\$27,805.26	\$77,601.15	\$234,126.32
Architecture . . . . .	68,090.42	4,128.08	4,226.97	241.82	76,203.65
Biology and Biological Engineering . .	133,024.50	10,251.92	33,597.06	3,620.96	173,252.52
Building Eng. and Construction . . . .	57,325.00	4,077.17	11,253.80	1,553.00	74,208.97
Business and Eng. Administration . . .	131,529.70	21,782.40	.....	.....	153,312.10
Chemical Engineering . . . . .	179,312.76	13,815.65	20,916.15	40,863.56	173,181.00
Chemical Eng. Practice School . . . . .	32,645.55	.....	.....	.....	32,645.55
Chemistry . . . . .	357,741.80	23,018.97	38,696.54	77,518.92	341,938.39
City Planning . . . . .	32,500.00	2,706.17	.....	.....	35,206.17
Civil Engineering . . . . .	217,390.74	8,937.91	18,856.65	83,618.42	161,566.88
Economics . . . . .	176,513.60	14,870.41	.....	2,035.73	189,348.28
Electrical Engineering . . . . .	736,868.30	48,838.30	73,397.04	420,663.27	438,440.37
English and History . . . . .	161,736.91	7,156.83	.....	2,038.58	166,855.16
Food Technology . . . . .	86,792.82	10,006.34	6,550.66	829.94	102,519.88
General Eng. and General Science . . .	4,250.00	1,899.36	.....	.....	6,149.36
Geology . . . . .	98,086.49	4,610.19	7,204.68	15,774.00	94,127.36
Graphics . . . . .	52,600.00	1,790.32	.....	.....	54,390.32
Mathematics . . . . .	225,771.30	6,829.76	.....	23,074.65	209,526.41
Mechanical Engineering . . . . .	454,954.89	25,181.41	71,033.43	79,158.23	472,011.50
Metallurgy . . . . .	301,997.30	4,521.72	40,940.68	158,726.09	188,733.61
Meteorology . . . . .	84,049.20	16,038.06	.....	30,671.97	69,415.29
Military Science . . . . .	18,342.35	3,976.00	.....	.....	22,318.35
Modern Languages . . . . .	43,019.00	4,587.98	.....	12.12	47,619.10
Naval Architecture . . . . .	72,620.00	7,029.82	8,427.82	311.94	87,765.70
Physics . . . . .	447,332.70	16,368.01	64,705.37	232,044.35	296,361.73
Acoustics Laboratory . . . . .	2,800.00	.....	1,597.06	35.40	4,432.46
Bemis Research . . . . .	3,600.00	2,137.95	.....	.....	5,737.95
Nuclear Science and Engineering . . . .	10,500.00	.....	.....	2,625.00	7,875.00
Oak Ridge Pract. School . . . . .	10,010.48	.....	.....	.....	10,010.48
Solar Energy Research . . . . .	15,065.00	3,409.85	2,955.16	.....	21,430.01
Spectroscopy Labs . . . . .	7,899.94	1,247.32	6,477.34	.....	15,624.60
<b>Totals . . . . .</b>	<b>\$4,488,476.67</b>	<b>\$289,034.19</b>	<b>\$438,641.67</b>	<b>\$1,249,818.06</b>	<b>\$3,966,334.47</b>

(Schedule B)

## REPORT OF THE TREASURER

## SCHEDULE B-6

## DEPARTMENTAL EXPENSES

	<i>General</i>	<i>Staff Scholarships</i>	<i>Departmental Research</i>	<i>Total</i>
Aeronautical Engineering .	\$3,258.68	\$2,210.00	\$42,102.51	\$47,571.19
Architecture . . . . .	2,782.52	.....	3,790.75	6,573.27
Biology . . . . .	8,626.64	1,500.00	45,746.20	55,872.84
Building Eng. and Constr..	3,327.47	750.00	7,366.83	11,444.30
Business and Eng. Admin..	6,712.34	.....	37,051.89	43,764.23
Chemical Engineering . . . .	15,364.61	9,356.65	32,678.16	57,399.42
Chemical Eng. Practice . . .	11,811.62	.....	.....	11,811.62
Chemistry . . . . .	31,074.18	19,933.00	34,015.75	85,022.93
City Planning . . . . .	1,305.03	.....	.....	1,305.03
Civil Engineering . . . . .	4,937.23	3,190.00	19,525.56	27,652.79
Civil Engineering Camp . . .	13,985.86	.....	.....	13,985.86
Economics . . . . .	6,860.44	1,360.00	6,597.61	14,818.05
Industrial Relations . . . . .	4,733.31	.....	9,839.67	14,572.98
Electrical Engineering . . . .	20,905.21	9,974.82	32,124.72	63,004.75
English and History . . . . .	5,593.63	.....	185.01	5,778.64
Food Technology . . . . .	4,347.24	.....	36,183.82	40,531.06
General Science . . . . .	97.29	.....	.....	97.29
Geology . . . . .	11,078.03	1,200.00	8,861.01	21,139.04
Geology Camp . . . . .	1,791.14	.....	.....	1,791.14
Graphics . . . . .	1,524.88	.....	.....	1,524.88
Mathematics . . . . .	3,526.59	5,721.61	7,441.38	16,689.58
Mechanical Engineering . . .	22,469.58	7,123.00	18,311.55	47,904.13
Mechanical Metallurgy . . . .	3,434.56	.....	.....	3,434.56
Metallurgy . . . . .	10,238.91	2,433.00	74,542.44	87,214.35
Meteorology . . . . .	4,120.01	740.00	5,616.92	10,476.93
Military Science . . . . .	2,092.29	.....	.....	2,092.29
Modern Languages . . . . .	1,547.63	.....	3,576.16	5,123.79
Naval Architecture . . . . .	2,480.94	.....	2,186.76	4,667.70
Physics . . . . .	15,303.79	9,326.25	19,494.12	44,124.16
Acoustics Laboratory . . . . .	.....	.....	13,374.13	13,374.13
Bemis Research . . . . .	4,902.43	.....	.....	4,902.43
Nuclear Science . . . . .	3,175.21	.....	.....	3,175.21
Oak Ridge . . . . .	1,672.38	.....	.....	1,672.38
Solar Energy . . . . .	.....	.....	4,292.82	4,292.82
Spectroscopy Laboratory . . .	.....	.....	6,018.34	6,018.34
<i>Totals</i> . . . . .	<u>\$235,081.67</u>	<u>\$74,818.33</u>	<u>\$470,924.11</u>	<u>\$780,824.11</u>

(Schedule B)

## SCHEDULE B-7

## LIBRARY AND MUSEUM EXPENSES

Library:		
Salaries — Staff . . . . .	\$62,973.39	
Salaries — Other . . . . .	88,944.33	
Expenses:		
Books, Periodicals and Binding . . . . .	36,247.82	
Other . . . . .	25,216.12	\$213,381.66
<hr/>		
Museums:		
Salaries . . . . .	\$14,631.48	
Expenses . . . . .	4,666.68	19,298.16
<hr/>		
Total (Schedule B) . . . . .		<u>\$232,679.82</u>

## SCHEDULE B-8

CLERICAL SALARIES AND ADMINISTRATIVE  
OFFICE EXPENSE

	<i>Salaries</i>	<i>Expense</i>	<i>Total</i>
President . . . . .	\$16,898.14	\$10,841.32	\$27,739.46
Dean of Architecture . . . . .	2,261.00	262.53	2,523.53
Dean of Engineering . . . . .	2,844.00	700.00	3,544.00
Dean of Science . . . . .	1,549.67	377.94	1,927.61
Dean of Humanities . . . . .	.....	636.62	636.62
Dean of Students . . . . .	8,702.59	1,743.59	10,446.18
Dean of Graduate School . . . . .	2,782.10	679.71	3,461.81
Registrar . . . . .	66,778.60	22,959.56	89,738.16
Director of Admissions . . . . .	34,173.25	12,937.07	47,110.32
Treasurer and Bursar . . . . .	86,639.17	19,511.44	106,150.61
Superintendent . . . . .	28,330.35	3,197.43	31,527.78
News Service . . . . .	4,620.00	5,288.35	9,908.35
Undergraduate Scholarship and Loan Fund Board . . . . .	7,440.00	4,084.47	11,524.47
New Student Publicity . . . . .	.....	4,000.00	4,000.00
Placement Bureau . . . . .	22,574.46	2,953.53	25,527.99
Register of Former Students . . . . .	.....	9,460.16	9,460.16
Personnel Office . . . . .	13,601.30	2,656.57	16,257.87
Industrial Liaison Office . . . . .	5,494.51	18,553.99	24,048.50
Provost Office . . . . .	2,430.00	1,026.05	3,456.05
Summer Sessions Office . . . . .	2,915.33	5,555.02	8,470.35
Division of Laboratory Supplies . . . . .	51,975.48	.....	51,975.48
<hr/>			
Totals . . . . .	<u>\$362,009.95</u>	<u>\$127,425.35</u>	<u>\$489,435.30</u>

(Schedule B-9) (Schedule B-9)

## SCHEDULE B-9

## GENERAL AND ADMINISTRATIVE EXPENSES

Salaries of Officers of Administration .....		\$344,412.74
Clerical Salaries (Schedule B-8) .....		362,009.95
Administrative Office Expenses (Schedule B-8) .....		127,425.35
Staff, Employee Pensions and Retirement Allowances .....		460,598.64
Development Program Expense .....		530,392.15
Other Administrative Expenses:		
Telephone (Net) .....	\$101,139.16	
Bulletins and Publicity .....	43,117.70	
New Student Publicity .....	33,655.54	
Professional Services .....	28,719.27	
Travel .....	23,598.95	
Commencement .....	20,669.06	
Lowell Institute Cooperative Broadcasting ..	6,250.00	
Educational Survey .....	5,977.90	
Taxes (Net) .....	5,739.25	
President's Fund .....	3,371.63	
Services (Net) .....	3,192.72	
Miscellaneous .....	17,746.60	293,177.78
General Expenses:		
Foreign Student Project .....	\$42,810.36	
Fellowships, Prizes and Awards .....	33,285.28	
Walker Dining Equipment .....	10,662.41	
Lectures .....	6,501.49	
Hobby Shop .....	5,951.02	
Radar School .....	4,222.29	
Cosmic Terrestrial Research .....	4,198.75	
Vocational Guidance .....	2,909.45	
Staff Subscriptions to <i>The Tech</i> .....	2,840.15	
Society of Arts .....	1,827.64	
Miscellaneous .....	11,630.00	126,838.84
<i>Total</i> (Schedule B) .....		<u>\$2,244,855.45</u>

EXPENSES

301

*SCHEDULE B-10*  
PLANT OPERATION

Building Services:

Janitors . . . . .	\$150,291.80	
Night Cleaners . . . . .	124,876.19	
Watchmen . . . . .	53,933.69	
Window Cleaning . . . . .	21,733.71	
Heating and Ventilating . . . . .	38,035.35	
Mail Clerks and Elevator Operators . . . . .	17,359.79	
Shipping, Stock Room, Matron and Messenger	29,166.37	
Shop Foreman (Net) . . . . .	<u>4,867.19</u>	\$440,264.09

Repairs, Alterations and Maintenance:

Buildings . . . . .	\$173,356.20	
Grounds, Roads, etc. . . . .	56,224.60	
Mains and Conduits . . . . .	26,555.68	
Water and Gas . . . . .	24,199.45	
Furniture . . . . .	9,835.41	
Elevators . . . . .	6,630.04	
Misc. (Net) . . . . .	<u>62,966.14</u>	359,767.52

Fire Insurance . . . . .

17,853.31

Safety Engineer Expense . . . . .

1,472.19

Power Rate Investigation . . . . .

4,338.60

Power Plant and Electric Power:

Fuel Oil . . . . .	\$159,864.62
Coal . . . . .	152.65
Power (Cambridge Electric Light Co.) . . . . .	167,518.35
Salaries . . . . .	50,457.76
Repairs . . . . .	14,443.70
Water, Supplies, etc. . . . .	<u>5,278.40</u>

Total Operating Cost . . . . . \$397,715.48

Less Credits for Power Sold:<sup>1</sup>

Electric Power . . . . .	\$39,039.72	
Steam . . . . .	<u>80,499.89</u>	<u>119,539.61</u>
		278,175.87
		<u>\$1,101,871.58</u>

Special Alterations, Maintenance and Construction:<sup>2</sup>

Buildings . . . . .	\$278,678.24
Grounds . . . . .	29,291.80
Space Changes . . . . .	183,866.96
Westgroup Elect. Distr. . . . .	<u>19,946.64</u>

Off Campus Buildings — Maintenance:

Round Hill — Dartmouth . . . . .	\$44,221.81	
Watertown Arsenal . . . . .	18,547.72	
Servomechanisms . . . . .	11,193.34	
Hood & Whittemore . . . . .	60,187.16	
Barta Building . . . . .	30,705.23	
Supersonic Wind Tunnel . . . . .	15,103.93	
Lexington Station . . . . .	<u>6,798.97</u>	<u>186,758.16</u>
		698,541.80

Total (Schedule B) . . . . . \$1,800,413.38

<sup>1</sup> Including Dormitories, Graduate House, Walker Memorial and Bexley Hall.  
<sup>2</sup> Including approximately \$205,000 for improvements to educational plant.

*SCHEDULE B-11*

## MEDICAL DEPARTMENT

Salaries, Staff . . . . .		\$66,030.36
Expense of Clinic:		
Salaries . . . . .	\$28,164.16	
Supplies, etc. . . . .	16,422.16	
X-Ray Operation . . . . .	5,467.31	
Physical Examinations . . . . .	4,566.50	54,620.13
Expense of Infirmary:		
Salaries . . . . .	\$33,823.20	
Supplies, etc. . . . .	6,584.47	
Food . . . . .	11,071.20	
Laundry . . . . .	3,858.24	55,337.11
Expense of Dental, Eye, Nose and Throat Clinics . . . . .		5,994.28
Maintenance and Repairs . . . . .		5,492.31
		<u>\$187,474.19</u>
Less Services Billed . . . . .		36,874.16
<i>Total</i> (Schedule B) . . . . .		<u><u>\$150,600.03</u></u>

*SCHEDULE B-12*

## UNDERGRADUATE BUDGET BOARD

Athletic Coaches' Salaries . . . . .	\$59,758.25
Director's Office Expense . . . . .	855.42
Non-Staff Salaries . . . . .	6,886.98
Student Activities Appropriation . . . . .	50,000.00
Cambridge Armory, Rental of . . . . .	1,880.47
Walker Memorial (excluding Dining Service) (Net) . . . . .	42,061.64
Walker-Memorial Games (Loss) . . . . .	2,941.45
Athletic Fields, Maintenance . . . . .	27,228.98
Sailing Pavilion and Activities (Net) . . . . .	13,082.72
Rockwell Cage, Maintenance . . . . .	2,240.20
Boat House and Launches, Maintenance . . . . .	17,620.79
Musical Clubs, Equipment and Supplies . . . . .	3,109.94
Swimming Pool (Including Wages) . . . . .	33,235.46
Equipment for Freshman Athletics . . . . .	1,095.35
Publications Advertising . . . . .	425.68
<i>Total</i> (Schedule B) . . . . .	<u><u>\$262,423.33</u></u>



*SCHEDULE B-13*

## AUXILIARY ACTIVITIES

	<i>Dining Services</i>	<i>Dormitories</i>	<i>Housing Projects</i>	<i>Total</i>
Revenues:				
Rental or Receipts . . . . .	\$691,942.41	\$578,351.55	\$143,662.15	\$1,413,956.11
Miscellaneous . . . . .	.....	9,777.67	150.40	9,928.07
<i>Total</i> . . . . .	<u>\$691,942.41</u>	<u>\$588,129.22</u>	<u>\$143,812.55</u>	<u>\$1,423,884.18</u>
				(Schedule B)
Expenses:				
Food . . . . .	\$363,917.76	.....	.....	\$363,917.76
Salaries . . . . .	254,845.20	\$300,715.77	.....	555,560.97
Supplies . . . . .	14,112.60	26,665.58	\$226.70	41,004.88
Utilities . . . . .	19,711.02	87,899.99	20,534.42	128,145.43
Laundry . . . . .	8,804.69	14,387.04	.....	23,191.73
Repairs and Maintenance . .	11,180.81	39,000.00	31,905.17	82,085.98
Equipment . . . . .	3,457.43	6,573.75	240.00	10,271.18
Misc. Operating Expenses . .	.....	1,255.91	445.63	1,701.54
Administration . . . . .	6,428.35	16,375.55	10,486.16	33,290.06
House Tax Allowance . . . . .	.....	8,049.00	.....	8,049.00
Real Estate Taxes . . . . .	.....	8,976.42	27,581.40	36,557.82
Occupancy . . . . .	6,000.00	.....	.....	6,000.00
Amortization . . . . .	.....	80,400.00	41,750.12	122,150.12
Investment Income . . . . .	.....	649.70	10,642.95	11,292.65
<i>Total</i> . . . . .	<u>\$688,457.86</u>	<u>\$590,948.71</u>	<u>\$143,812.55</u>	<u>\$1,423,219.12</u>
				(Schedule B)

A BRIEF DESCRIPTION OF THE ENDOWMENT  
AND OTHER INVESTED FUNDS OF THE INSTITUTE

Including funds which have been wholly expended since 1916 for plant, equipment, facilities, and special projects. The reference numbers correspond with the active funds, listed by groups on pp. 252-273, Schedules A-3 to A-11.

- 801 ALBERT, 1930-49. Gifts from anonymous donor covering twenty years' operation (approximately \$2,000 per annum) of M. I. T. Student House on Bay State Road, Boston.
- 951 ALPHA CHI SIGMA HOUSE (Alpha Zeta Chapter), 1935-1949. Deposited for investment purposes only.
- 850 AMORTIZATION OF DORMITORIES, 1950. Provision from operating income for major charges or write-offs of housing units in the general investments.
- 623 ANONYMOUS (H), 1942-43, \$10,000. For general purposes of the Institute.
- 625 ANONYMOUS (J), 1944-50, \$4,000. Gift for unrestricted purposes.
- 626 ANONYMOUS (LE), 1950, \$10,000. For general purposes of the Institute.
- 627 ANONYMOUS (M), 1941, \$1,500. For general purposes of the Institute.
- 981 ANONYMOUS (Q), 1945-50. Balance \$12,155.50. Subject to special annuity provisions.
- 629 ANONYMOUS (R), 1946, \$67,150. Principal and income for general purposes of the Institute.
- 701 ANONYMOUS (S), 1946, \$500,000. For research.
- 983 ANONYMOUS (X), 1944-50. Balance \$44,648.12. Subject to special annuity provisions.
- 984 ANONYMOUS (Y), 1948, \$100. For general purposes or a possible Faculty Fund.
- 897 ANONYMOUS CLASS OF 1924. Gift of member of Class of 1924 to accumulate until twenty-fifth reunion of Class in 1949. Balance \$3,115.22 transferred to Class of 1924.
- 351 APPLEBEE, Louie G., 1941-42, \$400. Bequest for assisting deserving students.
- 703 APPLIED MATHEMATICS, 1943. Balance \$12,894. Appropriated from surplus to provide support for postwar program.

- 101 ARMSTRONG, George Robert, 1902, \$5,000. Bequest of George W. Armstrong in honor of son. Income available for general purposes of the Institute.  
ARMY AND NAVY TRAINING RESERVE, 1943-1944. Balance \$28,779.80 used for new construction, 1947.
- 931 ASSOCIATION OF CLASS SECRETARIES, 1940-45. Balance \$3,000. Held for investment purposes only.
- 802 ATHLETIC FIELDS SPECIAL, 1948-50, \$4,500. Gift for improvements.
- 353 ATKINS, Elisha, SCHOLARSHIP, 1894, \$5,000. Bequest of Mary E. Atkins. For undergraduate scholarship.
- 201 ATKINSON, William Parsons, 1918, \$13,082. Bequest of Charles F. Atkinson as a memorial to father — for English Department of the Institute.
- 301 AUSTIN, Edward, 1899, \$360,000. Bequest. Interest paid to needy, meritorious students and teachers to assist in payment of studies.
- 202 AVERY, Julian M., 1949-50, balance \$12,342. Income for special research, after fund has accumulated \$25,000.
- 985 AVOCA, 1946, \$76,200. In trust, subject to life annuities.
- 551 BABSON, 1938, \$10,000. Gift of Babson's Statistical Organization Inc. Income to be applied at intervals of not more than three years as prizes for one or more persons for certain studies and research in Economics.  
BADGER, E. B., AND SONS Co., 1944, \$10,000. Gift. Used for new construction 1947.
- 715 BADGER, E. B. & SONS Co., 1945, \$20,000. Gift for use of Chemical Engineering Department.
- 357 BAILEY, Thomas Wendell, 1914, \$2,172. Bequest. Income used for rendering assistance to needy students in Department of Architecture.
- 359 BAKER, Charles Tidd, 1922, \$20,000. Bequest. One-half of net income for assistance of poor and worthy students and one-half to principal. Present balance \$39,060.
- 633 BARBOUR, Edmund Dana, 1926, \$847,000. Bequest. Principal and income for general purposes of Institute. Over \$826,000 used for buildings and equipment. Balance \$20,736.94.
- 261 BARKER, Walter S., 1927, \$10,000. Bequest. Income only available for purposes of the Library.  
BARTLETT, Sidney, 1889, \$10,000. Bequest. Appropriated for new dormitories, 1924.
- 635 BARTLETT, Stephen L., 1939-46, \$375,210.63. Bequest. Principal and income unrestricted, appropriated for educational plant, including swimming pool and current purposes.
- 203 BEMIS, Albert Farwell, 1938, \$270,000. Bequest. To establish and maintain the Albert Farwell Bemis Foundation for research on housing. Increased in 1941-46 through proceeds of sale of land carried under No. 709. Present balance \$308,941.88.

- 709 BEMIS, Albert Farwell — LAND ACCOUNT, 1938, \$119,450. Estimated book value of land in Wellesley, Newton, and Dedham received under bequest. Proceeds of sales carried to No. 203.  
BEMIS, Albert Farwell, 1923, \$100,000. Gift. Used for new dormitory unit, 1923.
- 263 BERKE, Samuel, 1943-46, \$20,000. Gifts. Income for general purposes of the Institute Library.
- 803 BIGELOW, Bess, 1936-38, \$25,000. Anonymous donation for special purposes as suggested by donor, but subject to approval of President.
- 361 BILLINGS STUDENT, 1900, \$50,000. Bequest of Robert C. Billings. Students receiving benefit are expected to abstain from use of alcohol or tobacco in any form.
- 103 BLACKBURN, George, MEMORIAL, 1931-50, \$962,243.40. Bequest of Harriette A. Nevins. Income for general purposes.  
BLAKE, Stanton, 1889, \$5,000. Bequest. Used for educational plant, 1926.
- 363 BLANCHARD, Huse Templeton, 1947, \$6,551. Bequest. For undergraduate scholarships.
- 553 BOIT, Robert A., 1921, \$5,000. Bequest. Income to stimulate students' interest in best use of English language through annual prizes of scholarships.
- 205 BOLES, Frank Walter, MEMORIAL, 1915, \$25,200. Under agreement between Harriet A. Henshaw and M. I. T., income paid to committee of Department of Architecture, to purchase fine arts material to supplement and strengthen instruction in architectural design and for the care and preservation of such material.
- 365 BOLES, Levi, 1915, \$10,000. Bequest of Frank W. Boles in memory of father. Income for assistance of needy and deserving students.
- 303 BOLLES, William Sumner 1924, \$25,000. Bequest of William P. Bolles in memory of son, to maintain either fellowship, traveling scholarship, or resident scholarship. Recipient to have character, ability, or promise.
- 791 BOSTON STEIN CLUB, 1945-50, \$27,557. Contributions for equipment of Map Room in Charles Hayden Memorial Library.
- 367 BOURNE, Jonathan, 1915, \$10,000. Bequest of Hannah B. Abbe. Income to aid deserving students.
- 369 BOYDEN, Albert G., 1931-50. Balance \$571,722. Bequest. Estate of Elizabeth R. Stevens. Income for scholarships. Preference to students from Fall River and Swansea, Mass.
- 105 BRIGGS, Clara H., 1941, \$12,514.55. Bequest. Income for general purposes.
- 953 BRIGGS, Major, 1940-42, \$32,969.71. Bequest under will of Frank Harrison Briggs, the principal and/or income to be used as Advisory Council in Athletics may decide. No part of either principal or income is to be used to defray living expense or tuition fees of any student.

- 371 BROWN, Harriet L., 1922, \$6,024. Bequest. Income to needy and deserving young women students, as would otherwise be unable to attend. In case of two or more applicants of equal merit, preference given to native of either Massachusetts or New Hampshire.
- 305 BROWN, Malcolm Cotton, 1919, \$1,506. Under agreement between Caroline Cotton Brown, Charles A. Brown, and M. I. T., to establish memorial to son, Lieutenant Brown, R. A. F., for advanced study and research in Physics.
- BRUSH, Matthew C., 1946, \$31,395.74. Bequest. Used for construction of Campus Room at Graduate House.
- 583 BURSAR'S, 1907, \$6,000. Bequest of Lyman S. Rhoads. Income and repayments used for loans to students in discretion of Bursar, subject to approval of President and Treasurer.
- 206 CABOT, Godfrey L., 1950, \$10,000. Income to be used for Chemical Engineering.
- 207 CABOT, Samuel, 1912, \$50,000. Gift of Helen N. Cabot in honor of husband. Income for purchase of apparatus and supplies required in conduct of research in Industrial Chemistry.
- 600 CAMPBELL SOUP COMPANY, 1950, \$1,000,000. For Biology and Food Technology.
- CARLETON, Mary A., 1946, \$14,456.48. Bequest for general purposes of the Institute. Appropriated for buildings, 1947.
- 792 CARNEGIE S. A. L. CENTER, 1948-50, \$100,000. Gift toward the support of a Center for Scientific Aids to Learning.
- 107 CARNEY, James A., 1944-45, \$17,170.01. Bequest. Income for general purposes.
- CARSON, Howard A., 1932, \$1,000. Bequest. Used for new equipment.
- 373 CASE, Mabel Blake, 1920, \$25,000. Bequest of Caroline S. Freeman. Income to aid deserving students (preferably women) who are in need of assistance.
- 375 CATLIN, Nino Teshler, 1926, \$1,000. Gift of Maria T. Catlin in memory of son. Income for needy and deserving students — not a condition but, if possible, award to be made to member of Lambda Phi Fraternity. Present balance \$12,265.07.
- 209 CHAMBERLAIN, William E., 1917-19, \$7,309. Bequest. Income used for Department of Architecture.
- 307 CHANDLER, Francis W., 1927-36, \$4,511. Originally a gift from Architectural Society and used as a loan fund to be administered by Head of Architectural Department. Increased by \$5,000 in 1939, gift of Mr. and Mrs. William Emerson and income to be used for Travelling Fellowship in City Planning. Present balance \$7,988.
- CHASE, William L., 1925, \$11,590.09. Bequest. \$7,500 appropriated for Homberg Infirmary, 1927. Balance used for educational plant, 1928.
- 717 CHEMICAL ENGINEERING PRACTICE, 1915-16, \$300,000. Gift of George Eastman for Chemical Engineering Stations provided Institute has carried forward this plan of education for a reasonable period.

- 575 CHENEY, Ednah Dow, 1905-06, \$13,965. Bequest. Income for maintenance and care of Margaret Cheney Room for women students.
- 109 CHOATE, Charles, 1906-21, \$35,858.15. Bequest. Income for general purposes.
- 793 CILLEY, Frank Harvey, 1913, \$57,700. Bequest. Income and such part of principal as necessary for purchase of suitable books, photographs, statuary, etc., for library and gymnasium of Walker Memorial.
- 377 CLAPP, Lucius, 1905, \$4,900. Bequest. Income to worthy students who may not be able to complete their studies without help.
- 804 CLARKE, A. V., SCHOLARSHIP, 1948, \$1,462.50. Gift. Principal and interest for student aid.
- 795 CLASS OF 1874, 1934, \$291.67. For purposes of the Library.
- 881 CLASS OF 1887, 1941-46. Balance \$4,514.86. Held for use of Class and for final distribution as provided in Declaration of Trust.
- 883 CLASS OF 1889, 1947. Balance \$181.63. Held for special purposes.
- 379 CLASS OF 1895 MEMORIAL, 1945-46. Balance \$25,000. Gift of the Class on fiftieth anniversary, income only to be used to provide scholarships to suitably qualified descendants of members of the Class. Balance of unexpended income in any year to be added to Technology Loan Fund.
- 381 CLASS OF '96, 1923-46. Balance \$5,577. Gift. Award subject to approval of Class Secretaries. Preference to descendants of members of Class. Scholarships to be considered a loan to be repaid when and if able.
- 584 CLASS OF 1898. Balance \$13,413.58. By subscription of certain members of class from 1927-31. Transferred to combined account.
- 638 CLASS OF 1899, 1949-50, \$15,621. Contributions from members of the Class. For general purposes.
- 884 CLASS OF 1900, 1949, \$10,000. Contributions by members of Class for Fifty Year Fund.
- 886 CLASS OF 1903, 1950, \$950. Contributions by members of Class for Fifty Year Fund.
- 555 CLASS OF 1904, 1925, \$447. Contributions received by Professor Gardner for Architectural Department prizes.
- 110 CLASS OF 1909, 1934-50. Balance \$18,160.69. Accumulated through contributions and from proceeds of life insurance policies. By vote of the Class the fund was made a General Endowment Fund, the income for the general purposes of the Institute.
- 887 CLASS OF 1914. Balance \$1,056.62. Held for investment purposes only.
- 806 CLASS OF 1917. Present balance \$1,263.81. For special purposes.
- 888 CLASS OF 1917, 1949, \$1,819. Contributions by members of Class for Fifty Year Fund.
- 807 CLASS OF 1918 (ORGAN). Balance \$106.88. Subscriptions by Class members toward purchase of an organ for Walker Memorial, purchased in 1948 for \$2,975.

- 889 CLASS OF 1919, SPECIAL, 1944. Balance \$3,441. Contributions from Class members toward gift to M. I. T. on the occasion of the twenty-fifth reunion of Class.
- 891 CLASS OF 1920, 1945-47. Balance \$4,147.25. Gift of U. S. Savings "F" Bonds and cash on the twenty-fifth reunion of the Class.
- 893 CLASS OF 1921, 1946-50. Balance \$6,989. Contributed for Class Twenty-Fifth Year Memorial Fund.
- 385 CLASS OF 1922 SCHOLARSHIP, 1942-50. Balance \$20,510. For scholarships.
- 387 CLASS OF 1922 SPECIAL SCHOLARSHIP, 1944-46. Balance \$4,800. Transferred to K. T. Compton Prize Fund.
- 639 CLASS OF 1923, 1949, \$63,166.67. Twenty-Five Year Gift of Class for general purposes.
- 640 CLASS OF 1924, 1949-50, \$78,650. Twenty-Five Year Gift of Class for general purposes.
- 641 CLASS OF 1925, 1950, \$43,083.24. Twenty-Five Year Gift of Class for general purposes.
- 906 CLASS OF 1927, JOSEPH W. HAMMOND MEMORIAL, 1950, \$30. Contributions in memory of Joseph W. Hammond.
- 389 CLASS OF 1938 SCHOLARSHIP, 1938-50. Balance \$1,529. Gift of Class of 1938. Income for scholarships.
- 895-930 inc.

CLASS ENDOWMENT FUNDS (see pages 270 to 273).

*Note:* These funds are being accumulated for the several classes whose members took out life insurance or are otherwise accumulating contributions toward a gift to the Institute on the occasion of their Twenty-Fifth Reunions. From certain of these, a portion may be applied in accordance with the terms of the several plans toward keeping alive policies that might lapse on account of nonpayment or as otherwise designated. By vote of the Class of 1923, \$10,000 was appropriated in 1940 from their Class Fund toward construction of the sun garden adjoining swimming pool.

- 928 CLASS OF 1948 ATHLETIC AWARD, 1949, \$682.84. For purchase of Trophy to be awarded annually to outstanding athlete.
- 281 COBB, Samuel C., 1916, \$36,551. Bequest. Income for salaries of President and professors.
- 393 COBURN, Fred L. and Florence L., 1932, \$5,000. Bequest. Income to aid needy and worthy students, preference being given to those residing in Somerville, Mass.
- 397 COFFIN MEMORIAL, \$35,000. Gift of the Estate of Charles A. Coffin. For loans or other aid to students as determined by Executive Committee. Present balance, \$36,019.
- 309 COLLAMORE, 1916, \$10,100. Bequest of Helen Collamore. Income primarily to aid women students in post graduate courses, and, secondarily, for purchase of instruments for Chemical Laboratory.
- HELEN COLLAMORE, 1917, \$12,384.97. Bequest. Used for new dormitories, 1924.

- COLLAMORE, Helen, 1947, \$49,500. Bequest. For unrestricted use. Used in 1948-49.
- 718 COLLINS HELIUM CRYOSTAT, 1949, \$2,380. For special research.
- COLT, Samuel P., 1920-22, \$20,000. Bequest. Used for new dormitories, 1924.
- 556 COMPTON, Karl Taylor, PRIZE, 1949-50, \$12,759. Gifts from Stein Club members. Income for prizes.
- 576 COMPTON, Margaret, 1949, \$1,510. Gifts from Technology Matrons to be expended on authorization by Mrs. Compton.
- 399 CONANT, William A., 1943-49, \$153,415.61. Bequest. The income to provide for scholarship carrying annual stipend of \$800 for New England Protestant boy of Protestant parents, preference to be given to graduates of the public schools of Brookline.
- 601 CONNER, Arthur J., DORMITORY, 1941-50. Balance \$237,461.87. The total of gifts and the residue of two trusts for construction of a dormitory.
- 642 CONNER, Arthur J., 1950, \$101,245.54. Bequest for general purposes of the Institute.
- 401 CONRO, Albert, 1943, \$25,000. Bequest for scholarship.
- 403 COOKE, George R., 1939-40, \$3,500. Gift of George R. Cooke, Jr. Income to be awarded, preferably in Civil Engineering or related field, to student preparing for Public Service and Government.
- 643 COOPERATIVE FOUNDATION, 1945, \$1,577.44. Cash surrender value of first insurance policy taken under Plan. Use of fund not yet determined.
- CRANE AUTOMOTIVE, 1928, \$5,000. Gift of Henry M. Crane. Used for purchase of equipment for Aeronautical Laboratory, 1928-40.
- 405 CROCKER, Lucretia, 1916, \$50,551. Bequest of Matilda H. Crocker. Income for establishment of scholarships for women in memory of sister.
- 211 CROSBY HONORARY, 1916, \$1,633. Contributions in honor of William Otis Crosby (Professor Emeritus). Income for upbuilding of the Geology Department, especially its collections.
- 406 CRUFT, Eunice M., 1950, \$1,250. Bequest. Income to assist students of insufficient means.
- CUNNINGHAM, Edward, 1917, \$15,000. Gift. For new building and equipment at Civil Engineering Summer Camp, Maine.
- 311 DALTON GRADUATE CHEMICAL, 1896, \$5,000. Gift of Charles H. Dalton. Income for scholarships for American male graduates of M. I. T., for advanced chemical study and research — preference given to chemical research especially applicable to textile industries.
- DANA, William S. B., 1946, \$500. Bequest for general purposes. Used for construction, 1947.
- 407 DANFORTH, Isaac W., 1903, \$5,000. Bequest of James H. Danforth. Income for scholarship purposes as a memorial to brother.



- DANFORTH, N. Loring, 1937, \$5,000. Bequest. Principal and income for general purposes. Appropriated for educational plant, 1940.
- 585 DEAN's, 1924, \$3,350. Contributions. To be loaned by Dean to needy students.
- 587 DENNETT, Carl P., 1926, \$500. Gift. To be loaned to students, preferably Freshmen, at discretion of President.
- 645 DEVELOPMENT FUND, 1949-50. Miscellaneous gifts for general purposes. Present balance \$19,929.
- 408 DEVELOPMENT FUND SCHOLARSHIPS, 1950, \$500,000. Established by transfer from Development Fund.
- 808 DEWEY, Davis R., MEMORIAL, 1943, \$500. To provide a suitable memorial for the late Professor Dewey.
- 409 DICKINSON, Ann White, 1898, \$40,000. Bequest. Income used to establish free scholarships. Such persons enjoying benefit shall be worthy young men of American origin.
- 411 DORMITORY, 1903, \$2,857. Contributions. Income for scholarship purposes.
- DORR, George B., 1890, \$49,573.47. Bequest. Appropriated for educational plant, 1918.
- 213 DORR, Susan E., 1914, \$95,955. Bequest. Income for use and benefit of Rogers Physical Laboratory.
- 809 DRAMA CLUB THEATRE, 1938, \$400. Deposited by Drama Club of M. I. T. toward future purchase of theatrical equipment.
- 111 DRAPER, Eben S., 1915, \$100,000. Bequest. Specially invested. Income used for general purposes of the Institute. Present balance \$107,618.75.
- DREW, Charles C., 1920, \$305,171.52. Bequest. Appropriation to educational plant, 1921-24.
- 413 DROWN, Thomas Messinger, 1928, \$50,000. Bequest of Mary Frances Drown. Income to establish scholarships for deserving undergraduate students.
- DUBBS, Carbon P., 1943, \$5,000. Gift. For general purposes. Used for new construction, 1947.
- 113 DU PONT, Coleman, 1931-38, \$221,325. Bequest. Income for support and maintenance of the Institute.
- DU PONT, Pierre, 1938, \$25,000. Gift. Used for new equipment.
- 313 DU PONT, Richard Chichester, MEMORIAL FUND, 1946, \$108,772. Contributions by members of his family to establish Memorial Fellowship in Aerodynamics or Meteorology.
- 647 EAMES, Charles H., 1950, \$20,000. Bequest for general purposes of the Institute.
- 115 EASTMAN CONTRACT, 1924, \$9,498,869. Gift of George Eastman. Income for general purposes of the Institute.

- 603 EASTMAN, George, BUILDING, 1916-17, \$2,500,000. Gift of George Eastman on condition that \$1,500,000 be raised by alumni and others. Balance to be used as needed for new educational buildings. \$1,225,000 used for George Eastman Research Laboratories in 1932, \$725,000 for Rogers Building and Wind Tunnel in 1939, \$268,700 for one-half of building No. 12 in 1943, \$80,000 for Medical Department alterations in 1943.
- 215 EASTMAN, George, 1918, \$400,000. Gift of George Eastman. Income for Chemistry and Physics. Principal available for addition to EASTMAN BUILDING FUND after latter is exhausted.  
The total of the gifts of GEORGE EASTMAN to the Institute for both buildings and endowment was \$20,500,000.
- 117 EATON, Charles W., 1929-43, \$261,148. Bequest. Income for advancement of general purposes of Institute. (From 1911 to 1923 Mr. Eaton gave \$15,501.45 for Civil Engineering Summer Camp in Maine.)
- 119 EDUCATIONAL ENDOWMENT, 1920-21, \$7,574,000. \$4,000,000 gift from George Eastman and balance contributed by alumni and others. Income for current educational expenses.
- 121 EDWARDS, Martha Ann, 1890, \$30,000. Bequest. Income for general purposes.
- 722 ELECTRONICS, INDUSTRIAL FELLOWSHIPS IN, 1946-49, \$86,200. Contributions for Fellowships.
- 721 ELECTRONICS, RESEARCH LABORATORY OF, 1943-50. Balance \$66,188.50. Appropriations from surplus for postwar research.
- 604 ELECTRONICS LABORATORY BUILDING, 1950. Gift \$100. For Electronics Laboratory Building.
- 797 ELSON, Arthur, 1944, \$500. For the purpose of special book purchases for the Library.
- 415 EMERSON, Frances and William, 1930, \$100,000. Gift. Income for aid of regular and special students in Department of Architecture.
- 557 EMERSON, William, PRIZE, 1939, \$2,145. Contributed by friends as a fund for prizes to architectural students.
- EMERY, F. W., 1916, \$120,000. Bequest. Used for buildings and equipment.
- 123 ENDICOTT, William, 1916, \$25,000. Bequest. Income for general purposes.
- 995 ENDOWMENT RESERVE, 1924. Created and otherwise increased by gains from sales or maturities of investments and decreased by premium amortization of bonds and losses and charges from sales or maturities. Belongs to all funds sharing general investments.
- ESTABROOK, Arthur F., 1923-38, \$100,800. Bequest. Used for purchase of land and equipment.
- ESTABROOK, Ida F., 1926-37, \$22,157.51. Bequest. Used for educational plant.

- 417 FARNSWORTH, 1889, \$5,000. Bequest of Mary E. Atkins. Income for scholarships.  
FITZ, Henrietta G., 1930, \$10,000. Bequest. For general purposes. Appropriated for educational plant, 1940
- 217 FLETCHER, Harold H., 1942, \$10,000. Bequest under will of Herbert H. Fletcher. To endow a bed in the Institute's Infirmary.
- 419 FLINT, Charles Lewis, 1889, \$5,000. Bequest. Income for support of worthy student, preference given graduate of English High School, Boston.
- 267 FLINT, Charles Lewis, 1889, \$5,000. Bequest. Income for purchase of books and scientific publications for Library.
- 723 FOOD TECHNOLOGY, 1945-50, \$290,000. Contribution for research.
- 283 FORBES, Sarah H., 1901, \$500. Gift of Malcolm Forbes as memorial to mother. Income for salaries.
- 421 FORBES, Sarah S., 1913, \$3,455. Gift of Sarah S. Forbes, William B. Rogers, and Henry S. Russell. Income for maintenance and education of scholar in M. I. T.
- 724 FORD MOTOR COMPANY, 1949, \$25,000. For special research in the field of Industrial Relations.
- 125 FOSTER, Francis Appleton, 1922, \$1,000,000. Bequest. Income for purposes of Institute.
- 127 FOSTER, John W., 1938, \$299,926. Bequest. Income for purposes of the Institute.
- 605 FRASER, Matilda A., 1942, \$859.89. Bequest. Towards construction of a women's dormitory.
- 129 FRENCH, Alexis H., 1930, \$5,000. Bequest. Income for general purposes of Institute.  
FRENCH, Caroline L. W., 1916, \$100,843.34. Bequest. Used for new equipment, 1928.
- 131 FRENCH, Jonathan, 1915-50, \$90,997. Bequest of Caroline L. W. French. For purposes of the Institute.
- 133 FRICK, Henry Clay, 1925-48, \$2,208,482.92. Bequest. Institute received ten shares of a total of one hundred shares of his residuary estate. Income for general purposes.
- 423 FRIEDLANDER, Philip Jacob, 1945, \$1,000. Gift. Income to be used to aid qualified students in need of assistance.  
FRISBIE, Walter L., 1923, \$7,614.98. Bequest. Used for educational plant, 1928.
- 649 GAFFIELD, Erastus C., 1944-45, \$387,854. Bequest. Principal and income available for general purposes. In 1945, \$120,000 was applied to retirement of Dormitory mortgages. In 1947, \$158,000 was applied toward the purchase from the U. S. Government of Building 24 and \$108,100 appropriated for miscellaneous purposes. Present balance \$1,796.58.

- 285 GARDNER, George A., 1898, \$20,000. Gift. Income for salaries of instructors.  
GAS TURBINE LABORATORY, 1946, \$500,000. Contributions from five industrial corporations for construction and operation of new laboratory. Used for construction 1946-48.
- 135 GENERAL ENDOWMENT, 1921, \$1,527,449. Contributions by alumni and others to meet George Eastman's condition relative to gift of \$2,500,000, his building fund.
- 589 GEORGE, Nathan R., 1943, \$29,197.37. Bequest. Income to be loaned to undergraduates under certain administrative conditions.
- 425 GEORGE, Norman H., 1919-25, \$89,453. Bequest. Income for assistance of worthy and needy students.
- 427 GILMORE, Arthur B., \$10,000, 1941. Bequest. Net income to assist needy students, members of Beta Theta Pi — not more than two students in any one year.  
GOODALE, Charles W., 1929, \$50,000. Bequest. Used for new dormitory, 1930.
- 558 GOODWIN, Harry A., 1950, \$9,824. Gift to create a Goodwin medal to award to graduate students.
- 429 GORDON, Barnett D., 1942-44, \$10,000. The income to be used as scholarships for deserving students.
- 137 GRANGER, Eliot, 1936, \$21,568.43. Bequest under will of Mary Granger in memory of deceased son. Income for the general purposes of the Institute.
- 725 GRIMMONS, John A., 1930-50. Balance \$4,278. Bequest of C. Lillian Moore of Malden. Principal held by Old Colony Trust Co., Trustee. Income for loans to undergraduates in Electrical Engineering. Unused balances available for purchase of apparatus and equipment in Department of Electrical Engineering.
- 431 HALL, Lucia G., SCHOLARSHIP, 1945-46. Balance \$54,413. Bequest of Louise K. Gunn. The income only used for aid of worthy students.
- 433 HALL-MERCER SCHOLARSHIP, 1940-49. Balance \$76,815. Bequest under will of Alexander G. Mercer. The income to be used for tuition and other necessary expenses of students.  
HAMILTON, George Wyman, 1935, \$54,414.15. Appropriated for new equipment, 1937-39.
- 729 HARVEY NONFERROUS FORGING, 1946, \$10,000. For research.
- 435 HASTE, James H., 1930-45. Balance \$241,074. Bequest. Income for aid of deserving students of insufficient means.
- 139 HAYDEN, Charles, 1937, \$1,000,000. Bequest of Charles Hayden. Income for general educational purposes of the Institute.  
HAYDEN, Charles, 1925, \$42,700.76. Gift. Used for educational plant.  
HAYDEN, Charles, 1927, \$100,000. Gift for new dormitories.

- 609 HAYDEN, Charles, MEMORIAL LIBRARY, 1945-47, \$2,200,000. Gift of Charles Hayden Foundation for new library. Used in 1948, 1949 and 1950 for library construction.
- 437 HAYDEN, Charles, MEMORIAL SCHOLARSHIP, 1940-43, \$100,000. From the Charles Hayden Foundation. For entrance scholarships. Preference given to students from Boston and New York.
- 439 HAYDEN, Charles, MEMORIAL SCHOLARSHIP, SPECIAL 1947, \$11,078.36. Accumulation of income of Scholarship Fund (No. 437).
- 731 HAYDEN, Charles, FOUNDATION DENTAL CLINIC, 1940, \$10,000. To assist in establishment of and necessary equipment for a Dental Clinic available to entire student body, faculty and employees.
- 287 HAYWARD, James, 1866, \$18,800. Bequest. Income for salaries.  
HENRY, James W., 1935, \$8,407. Bequest. Used for new equipment.
- 651 HENRY, William T., 1943-50. Present balance \$70,044. Income from Trust Fund held outside M. I. T. Fund for general purposes.
- 987 HEWETT, Joseph, 1921-24, \$200,000. In Trust subject to special annuity provisions.
- 315 HICKS, Clarence J., MEMORIAL, 1946, \$20,000. For fellowship in Industrial Relations.
- 141 HILLS, John Marshall, 1941-42, \$366,430.96. Bequest. Income for general purposes of M. I. T.
- 218 and 268 HOBBS, Edith Morrill, 1948, \$5,000. Bequest. Income for purchase of books on Architecture.
- 316 HOBBS, Edith Morrill, 1948, \$5,000. Bequest. Income for aid to graduate students in Architecture.  
HODGES, Frederick S., 1928, \$57,316.26. Bequest. Appropriated for new dormitories.
- 142 HODGES, Walter W., 1946, \$36,809.70. Bequest. Income only, for general purposes.  
HOLLINGSWORTH, Ellis, 1940, \$10,000. Bequest for unrestricted use. Used for new construction, 1947.
- 440 HOLLINGSWORTH, George, 1916, \$5,000. Bequest of Rose Hollingsworth. Income used for scholarship.
- 441 HOLM, Loren C., 1950, \$5,956. Bequest from the estate of Marie Holm in memory of her father. Income for scholarships.
- 810 HOROVITZ, Oscar H., 1947-49, \$1,500. Gift for special purposes.
- 653 HOSBACH, Ernest R. MEMORIAL, 1948, \$1,000. Gift of Frederick W. Hosbach in memory of his son. For general purposes of Institute.
- 442 HOWE, Elias, Jr., 1950, \$17,600. Bequest from the estate of Julia Howe Stockwell Smith. Income for aiding students of mechanics as recommended by the faculty.

- 559 HUNNEMAN, Roger Defriez, PRIZE, 1927, \$1,050. Gift of W. C. Hunneman in memory of Roger Defriez Hunneman, '23. Income paid as annual award to most meritorious student in Chemical Engineering who has shown most outstanding originality in his work as determined by that Department.
- HUNT, Abby W., 1936-44, \$79,400. Bequest. For general purposes. \$60,000 used for alterations, 1937. \$16,000 for new equipment, 1938. Balance \$3,400, for new construction 1947.
- 443 HUNT, Samuel P., 1946, \$7,496. Gift. For undergraduate scholarships.
- 445 HUNT, T. Sterry, 1894, \$3,000. Bequest. Income to a student in Chemistry.
- 447 HUNTINGTON, William F., 1892, \$5,000. Gift of Susan E. Covell. Income to deserving students. Preference to be given to students in Civil Engineering.
- 611 HYDRODYNAMICS LABORATORY AND TOWING TANK, 1946-50. Gifts used for construction of new building 1950.
- 733 INDUSTRIAL ECONOMICS, 1940-50. Balance \$33,236. Contributions in support of Graduate Program in Economics.
- 737 INDUSTRIAL, 1924-49. This fund succeeded "Tech Plan" Contracts, payments under which went to the Educational Endowment Fund. Now receives surplus from industrially sponsored operations of Division of Industrial Cooperation and Research. Used for purchase of new equipment and support of special research.
- 739 INDUSTRIAL RELATIONS SECTION, 1938-50. Balance \$153,736. Contributions in support of the Industrial Relations Section of the Department of Economics.
- 741 INSTRUMENTATION, 1943-45. Balance \$183,250. For research in the field of instrument design.
- INSURANCE ENGINEERING, 1944, \$835.13. Established by private subscriptions and donated to M.I.T. through the Boston Manufacturers Mutual Fire Insurance Co. Used for new construction 1947.
- JACKSON, Charles C., 1912, \$25,000. Gift. Used for purchase of new site.
- 143 JAMES, 1898-99, \$163,654. Bequest of Julia B. H. James. Income for development of M.I.T.
- 449 JEWELL, David L., 1928, \$25,000. Bequest. Income for tuition of five young men who are worthy of assistance and who, were it not for such assistance, might be unable to pursue their studies at M.I.T.
- 451 JONES, Edward A., 1947, \$41,254. Bequest for scholarships.
- 317 JOSLIN, Rebecca R., 1924-36, \$6,540. Gift and Bequest. Income awarded as a loan to advanced student in Chemical Engineering on recommendation of that Department — restricted to native and resident of Massachusetts. Beneficiary is expected to abstain from using tobacco in any form
- 453 JOY SCHOLARSHIPS, 1886, \$7,500. Gift of Nabby Joy. Income for scholarships for one or more women studying natural science at M.I.T.

- 219 KALES, William R., 1944, \$75,001.48. Gift of Mrs. Kales and family. To establish and maintain Eye Clinic in Medical Department.  
KALES, William R., 1925-27, \$11,000. Gift for new dormitories.
- 659 KELLER, 1948, \$100. Gift of Carl T. Keller. For expenditures under the direction of Doctor Tate. Present balance \$50.27.
- 221 KENNELLY, Arthur E., 1940-44, \$67,058. Bequest. Income only to be used for the study of mathematics directed toward physics or physical applications  
KENNEY, Carrie Belle, 1945, \$1,000. Bequest. Used for new construction, 1947.
743. KENT, A. Norton, 1944-49, \$700. Gift. For research in Physics. \$500 appropriated, 1947.
- 269 KERR, William Hall, 1896, \$2,000. Gift of Alice M. Kerr. Income for the annual purchase of books and drawings in machine design.
- 145 KILBURN, Dale G., 1949, \$68,894. Bequest. Income for general purposes.  
KIMBALL, David P., 1924, \$10,000. Bequest. Used for educational plant, 1926
- 811 KING, Ellen A., MEMORIAL STUDENT, 1949, \$10. Gift for purposes as indicated.
- 454 KNEISNER, Amelia S., SCHOLARSHIP, 1945-49, \$18,000. Gift of the family. Income to provide scholarship aid to meritorious or needy students — preference to students from Danbury (Connecticut).
- 812 KRUEGER, Llorra Culver. Balance \$5,573.75. Principal and interest for scholarship to needy student from Schenectady, N. Y. and vicinity.
- 456 and 813 KURRELMAYER, 1945-46, principal \$2,000. Income for undergraduate scholarship.
- 591 LAMSON-VIRGIN LOAN, 1946-48, \$10,600. Bequest. Income to be used in aiding worthy students, with provision for repayment.
- 814 LEVER BROS. Co. 1949, \$2,500. Income or principal to be used on recommendation of M. I. T. and Lever Bros. Co. presidents.
- 661 LEWIS, Edwin J., Jr., 1950, \$24,303.54. Bequest for general purposes of the Institute.
- 319 LEWIS, Wilfred, 1930, \$5,000. Gift of Emily Sargent Lewis. Income for maintenance of graduate student in Mechanical Engineering.
- 613 LIBRARY BUILDING, 1946, \$1,000. Gift toward new building.
- 799 LIBRARY GROWTH, 1943-47. Balance \$5,113.49. For investment purposes.
- 457 and 577 LICHTER, Jacob and Jennie, 1944-48, \$10,475. Gift. Income for scholarship on approval of donor.
- 458 LITCHFIELD, William, 1910, \$5,000. Bequest. Income for scholarship on competitive examination.

- 223 LITTLE, Arthur Dehon, MEMORIAL, 1937. Balance \$158,675.53. Bequest under will of Dr. Arthur D. Little. Income to be used in Departments of Chemistry and Chemical Engineering. (The accumulated income from 5,543 shares of common stock of Arthur D. Little, Inc., held by Voting Trustees for the benefit of the Institute under declaration of trust dated November 18, 1936, and in force for twenty years, amounted to \$53,756.48 at June 30, 1950.)
- 815 LITTLE, Arthur D., MEMORIAL LECTURESHIP, 1944-50, \$11,600. Gift of Arthur D. Little, Inc., for purpose indicated.
- LOGAN, Hiram H., 1933-46, \$44,195.79. Bequest. Principal and income for general purposes of M.I.T. \$19,455 appropriated for educational plant, 1940. Balance for new construction, 1947.
- LONGYEAR, John M., 1915-16, \$30,000. Gift. Used for land and equipment, 1916.
- 459 LORING, Elisha T., 1890, \$5,000. Bequest. Income for assistance of needy and deserving pupils.
- 461 LOWELL INSTITUTE, 1923, \$2,000. Gift from alumni of Lowell Institute to establish scholarship for its graduates.
- 225 LOWELL, Katharine Bigelow, 1895, \$5,000. Gift of Augustus Lowell in honor of Mrs. Lowell. Income for purchase of books and apparatus for Department of Physics.
- 988 LOWELL, Percival, SCHOLARSHIP, 1949, \$30,000. Fund created by gift of Real Estate to be sold and proceeds to be used for Special Fund, to pay annuity to donor and on her death to create a Scholarship Fund.
- LYMAN, Arthur T., 1913, \$5,000. Bequest. Used for educational plant, 1926.
- McGREGOR, James, 1913, \$2,500. Bequest. Used for educational plant, 1926.
- 816 MACOMBER, John R., 1948, \$3,780. Gift. For general expenses.
- 463 MARDEN, Rupert A., 1933, \$2,000. Gift (anonymous). Income to aid worthy student — Protestant and of American origin — preference to student taking Cooperative Course in Electrical Engineering (Course VI-A).
- 663 MARTIN, Augustus B., Jr., 1950, \$61,000. Bequest of Alice G. Martin in memory of her brother, for the general purposes of the Institute. Bequest includes land at Boothbay Harbor, Maine, carried at no value.
- 464 MARTIN, Waldo A., 1950, \$10,000. Gift. Income for freshman scholarship with restrictions until 1975, and then with preference to graduates of Milton High School, Milton Academy, or residents of Milton.
- 289 MASON, William P., 1868, \$18,800. Bequest. Income to support a professorship in the Institute.
- M.I.T. ALUMNI, 1907. Total subscriptions of alumni to 1924, \$632,500. \$632,000 appropriated for new equipment, Walker Memorial, 1916 Reunion, and Dormitories.



- M.I.T. ALUMNI GYMNASIUM, 1938-42. Total subscription \$400,000. Appropriated for Briggs Field House, for Athletic Field, and for swimming pool.
- 805 and 932 M.I.T. ALUMNI, CLASS OF 1898, 1944-50. Balance \$26,090. Gifts to provide annual contribution to Alumni Fund from earned income.
- 817 M.I.T. ALUMNI, 1940-49. Plan adopted by the alumni of the Institute for the annual raising of funds for support of the Alumni Association and the *Technology Review* — the balance to be applied toward specific purposes other than operating expenses of the Institute. Total \$695,508. In 1947, \$500,000 was applied to the new Senior Dormitory construction, and \$10,000 toward new Tennis Courts. In 1949-50 the balance was applied toward Hayden Library.
- 819 M.I.T. ALUMNI, 1949-50. Net subscriptions to date of the tenth year of operation. Balance \$77,094.39.
- 820 M.I.T. Alumni 1950-51. Net subscription to date, \$1,213.50.
- 932 M.I.T. ALUMNI ASSOCIATION PERMANENT, 1929-49. Balance \$109,194. Deposited with M.I.T. for investment purposes only.
- 465 M.I.T. CLUB OF CHICAGO, 1944-49, \$6,750. Gift. For scholarships.
- 821 M.I.T. TEACHERS' INSURANCE. Refund of premiums paid on Group Insurance under M.I.T. Pension and Insurance Plan held at interest and accumulated, plus unused part of 2% M.I.T. appropriation for Group Insurance annual premium. Appropriated for special pension purposes only. Balance \$224,057.94.
- 960 M.I.T. WOMEN'S DORMITORY, 1948-50, \$1,543.25. Contributions for additional equipment and replacements.
- 467 MATHEWS, Margaret A., 1947, \$111,682. Bequest. For scholarship. For women students who expect to become teachers.
- 749 MAURAN, John Lawrence, 1934, \$10,000. Bequest. Principal and income for benefit of Department of Architecture. Used, in part, toward house projects in Wellesley and Wakefield, 1937-40.
- 227 MAY, George Henry, 1914, \$4,250. Gift. Income for benefit of Chemistry Department.
- 469 MAY, George Henry, 1914, \$5,000. Gift. Income to assist graduates of Newton High School recommended as eligible by superintendent and head masters of Newton High School. Beneficiary to issue a note payable without interest.
- 147 McCAMMON, Thomas, 1930, \$15,000. Bequest in honor of father, James Elder McCammon. Income available for general purposes.
- 561 MEANS, James, 1925, \$2,700. Gift of Dr. James H. Means as a memorial to father. Income for annual prize for essay on an aeronautical subject.
- 592 MEDICAL DEPARTMENT NEEDY STUDENT. Appropriation by M.I.T. to assist needy students in payment of medical and hospital bills.
- MERRILL, Charles E., 1943, \$2,300. Used for new construction, 1947.
- 750 MERRILL FOUNDATION, 1949, \$25,000. For special research in the field of Industrial Relations.

- 615 METALS PROCESSING LABORATORY, 1947-49. Contributions for construction and equipment. Present balance \$11,367.97.  
METALLURGY, SPECIAL, 1938, \$10,000. Subscription (anonymous) used for special equipment for Department of Metallurgy.
- 665 METCALF, Alice Butts, 1945, \$100,000. Bequest for unrestricted use. \$50,000 used for new construction, 1947.
- 666 METCALF, Leonard, MEMORIAL, 1950, \$2,573.48. Bequest of Alice Metcalf in memory of her brother for the general use of the Institute.
- 579 MILLER, Edward F. and Mary R., 1941, \$10,000. Bequest. To be used at discretion of Bursar as a fund in assisting needy students who have been found by the medical director to require special medical or surgical treatment.
- MILLS, Hiram F., 1923, \$10,175. Bequest. Appropriated for educational plant, 1937.
- 471 MILNE, Robert W., 1943, \$75,856. Bequest. Income for assistance of worthy and needy students.
- 751 MINNS, Susan, 1930. Gift of Miss Susan Minns — tract of land on Memorial Drive for use in any way deemed best for benefit of plan regarding construction and maintenance of an hydraulic laboratory. Carried at \$40,000.
- 473 MIRRLEES, James H., 1886, \$2,500. Gift of James Buchanan Mirrlees. Income to such student in third or fourth year Mechanical Engineering most deserving pecuniary assistance.
- 823 MITSCH, John D., MEMORIAL, 1946. Balance \$2,959. Contributions toward memorial to the late Professor Mitsch and education of his children.
- 753 MOORE, Forris Jewett, 1927-31, \$32,000. Gift of Mrs. F. Jewett Moore as a memorial to husband. Income or principal (under special conditions) expendible subject to approval of Executive Committee by a committee of three members of the Department of Chemistry — to make the study of Chemistry more interesting and surroundings of such study more attractive.
- 321 MOORE, 1914-28-29, \$24,200. Gift of Mrs. F. Jewett Moore. Income to help some Institute graduate to continue studies in Europe, especially organic chemistry. Preference to student who has distinguished himself in this subject while an undergraduate. Present balance \$37,137.
- 475 MORRILL, FRED W., 1941, \$2,000. Bequest. Income for financial assistance to students.
- 149 MORSE, Kate M., 1925, \$25,000. Bequest. Income for general purposes of M.I.T.
- 151 MORSS, Everett, 1934, \$25,000. Bequest. Income for general purposes of M.I.T.  
MORSS, Everett, 1916, 1921-25, \$35,000. Gifts. For Walker Memorial murals by E. H. Blashfield.
- 825 MORSS, Henry A., NAUTICAL FUND 1937, \$3,500. Gift for maintenance of sailing activities and sailing pavilion.

- 667 MORSS, John Wells, 1940, \$50,000. Bequest. Principal and income for general purposes.
- 152 MUNCH, Samuel, MEMORIAL, 1950. Gift of Benjamin S. Munch for memorial to his father, income to be used for general educational purposes.
- MUNSELL, Albert H., 1920, \$7,908.28. Bequest. Used for educational plant, 1928.
- MUNSELL, Margaret A., 1920, \$1,105.32. Bequest. Used for educational plant, 1928.
- NASH, Nathaniel C., 1881, \$10,000. Bequest. Appropriated for new dormitories, 1924.
- 477 NICHOLS, 1895, \$5,000. Bequest of Betsy F. W. Nichols. Income for scholarship to student in Chemistry.
- 479 NICHOLS, Charles C., 1904, \$5,000. Bequest. Income for scholarship.
- 478 NICKERSON, William E., 1949, \$9,312. Bequest. Income for undergraduate scholarships.
- 669 NICKERSON, WILLIAM E., 1949-50, \$35,379. Bequest for general purposes.
- NICKERSON, William E., 1928, \$50,000. Gift. Principal and income used to finance chair in Humanics, 1928-40.
- 323 NORRIS, James F., 1949-50, \$59,592. Bequest. Income for graduate fellowships.
- 755 NUCLEAR SCIENCE AND ENGINEERING, 1947-50, \$67,000. For research.
- OLIVER, Moses W., 1921, \$12,870.49. Used for educational plant, 1938.
- ORVIS, Christel, 1942, \$539.42. Bequest. Used for new construction, 1947.
- 271 OSBORNE, George A., 1928, \$10,000. Bequest. Income for benefit of mathematical library.
- 481 OSGOOD, John Felt, 1909, \$5,000. Bequest of Elizabeth P. Osgood in memory of husband. Income for scholarship in Electricity.
- 757 PAINE, F. Ward, 1944, \$10,000. Bequest. For special research in Geology.
- 954 PARK, Charles Francis, MEMORIAL, 1947, \$5,500. For investment purposes.
- 758 PARKER, Theodore B., MEMORIAL, 1945-46, \$3,000. For special graduate scholarships.
- 483 PARMELEE, George L., 1921, \$17,641. Bequest. Income for tuition of either special or regular worthy students.
- PATCH, Emerette O., 1935-38, \$8,240.84. Bequest. \$5,964 used for special expenditures, 1938-40. Balance for new construction, 1947.
- PEABODY, Frank E., 1920, \$51,467.35. Bequest. Used for educational plant, 1921 and 1926.

- 484 PECKER, Frank Stetson, SCHOLARSHIP, 1948, \$59,731.18. Bequest.  
 PERKINS, Frances M., 1912, \$122,569.67. Bequest. Used for educational plant.  
 PERKINS, H. B., 1940 and 1949, \$354. Bequest. Used for new equipment in 1940 and development program in 1949.
- 153 PERKINS, Richard, 1887, \$50,000. Bequest. Income for general purposes.
- 485 PERKINS, Richard, 1887, \$50,000. Bequest. Income for scholarships.
- 325 PERKINS, Willard B., 1898, \$6,000. Bequest. Income to be expended every fourth year for traveling scholarships in architecture.
- 231 PETERS, Edward D., 1924, \$5,000. Bequest of Elizabeth W. Peters. Income for the Department of Mineralogy.  
 PHILBRICK, E. S., 1922, \$36,213.92. Bequest. Used for educational plant, 1926.
- 861 PHOTO SERVICE RESERVE, 1945-49. For equipment and maintenance of Photo Service.  
 PLAYER, Preston, 1933, \$20,000. Bequest. Used for educational plant, 1938.
- 233 PRATT NAVAL ARCHITECTURAL, 1916, \$1,071,000. Bequest of Charles H. Pratt to endow the Department of Naval Architecture and Marine Engineering to be called forever Pratt School of Naval Architecture and Marine Engineering — to erect a building — remainder \$395,676, held in trust. Income to support said school.
- 759 PRATT SPECTROSCOPY, 1950, \$42,000. Gift of John L. Pratt for Spectroscopy Laboratory.  
 PRESCOTT, Charles O., 1935, \$30,640.78. Principal and income used for educational plant, 1938.
- 829 PRESIDENT'S SPECIAL, 1941-44, \$10,500. Gifts. Principal and/or income to be used by President as desired.
- 234 PRICE, Raymond B. MEMORIAL, 1948-50, \$12,000. Gift. Income for research in chemistry or related sciences.
- 487 PRINCE, Florence E., 1943, \$7,689.28. Bequest. Income for aid to worthy students.
- 760 RADIOACTIVITY CENTER, 1945. Balance \$33,987. Appropriation for postwar research.
- 155 RANDALL, J. W. & B. L., 1897, \$83,452. Bequest of Belinda L. Randall as a permanent fund or in erecting a building with those names.
- 489 READ, Thomas Adelbert, 1934-35, \$21,117. Bequest of Julia A. Read to establish scholarship in memory of her brother and their father and mother. Income to be awarded to some worthy and needy student, preferably resident of Fall River, Mass.
- 491 REEVES, Willis Ward, 1946-49, \$2,850. For undergraduate scholarships.
- 493 RICHARDS, Charles A., 1939, \$31,719.32. Bequest. Income only to be used for assistance of poor Protestant students in the Institute.

- 235 RICHARDS, Ellen H., 1912, \$15,076. Income for promotion of research in Sanitary Chemistry, for fellowships to advanced students, for employment of research assistants, and in such other ways as will best promote investigation in that field.
- 761 RICHARDS MEMORIAL, 1929. Balance of subscriptions from friends for portrait of Professor Robert Hallowell Richards available for the Department of Metallurgy.
- 237 RICHARDSON, Charlotte B., 1891, \$30,000. Bequest. Income to support of Industrial Chemical School.
- 495 ROACH, John, SCHOLARSHIP, 1937. Balance \$6,290. Bequest under will of Emeline Roach, income to provide annual scholarship to needy and deserving student in Naval Architecture and Marine Engineering.
- ROBB, Russell, 1928, \$28,750. Bequest. Appropriated for new dormitories, 1930.
- ROCKEFELLER FOUNDATION RESEARCH, 1931-36, \$170,000. Contributed and expended for Research in Science Departments over period of five years.
- 156 ROCKEFELLER, John D., Jr., 1950 \$1,021,475. Unrestricted gift, but functioning as endowment with income for continuing operating needs of the Institute.
- 291 ROGERS, Henry B., 1873, \$25,000. Gift. Income for salaries of one or more professors or instructors.
- 327 ROGERS, Henry Bromfield, 1921, \$20,057. Bequest of Anna Perkins Rogers. Income to establish fellowship or scholarship for women graduates of M.I.T. or other colleges whose graduate work is carried on at M.I.T.
- 593 ROGERS, Minnie Hempel, 1945, \$1,195.04. Bequest for student loans.
- ROGERS, Robert E., 1886, \$7,600. Bequest in memory of his brother, William B. Rogers. Used for new equipment, 1940
- 496 ROGERS, William Barton. Present balance \$36,505. Established by subscriptions of members of Alumni Association through Prof. R. H. Richards for loans to students. By vote of Executive Committee in March 1935, approved by Alumni Council, the income, not now needed for loans, is made available for special scholarship aid in the discretion of the President and Treasurer.
- 157 ROGERS, William Barton, MEMORIAL, 1883-84-85, \$250,225. Contributions from 91 persons. Income for support of Institute.
- 241 ROGERS, William Barton and Emma Savage, 1937, \$102,064.18. Bequest of Dr. Francis H. Williams including unvalued land at Truro, Mass. Income to be added to principal for twenty years — after which 80 per cent of income may be used for research in pure science — balance to be added to fund. Present balance \$201,550.
- 243 ROPER, Francis E., 1936, \$2,000. Bequest. Income for use in Department of Mechanical Engineering.
- 273 ROTCH, Arthur, ARCHITECTURAL, 1895, \$5,000. Bequest. Income for Library or collection for Department of Architecture.

- 245 ROTCH, Arthur, 1895, \$25,000. Bequest. Income for general purposes of Department of Architecture.
- 565 ROTCH, Arthur, 1895, \$5,000. Bequest. Income for annual prize to student in regular course in Architecture graduating highest in class.
- 567 ROTCH, Arthur, SPECIAL, 1895, \$5,000. Bequest. Income for annual prize to student who shall be ranked highest at end of two years' special course in Architecture.
- 329 RUSSEL, Richard Lee, 1904, \$2,000. Gift of Theodore E. Russel. Income to assist worthy student of high standing in Department of Civil Engineering either undergraduate or postgraduate.
- 497 RYAN, William Patrick, MEMORIAL, 1935, \$3,557. Contributed by friends of Professor Ryan. Income for scholarship in Chemical Engineering
- 831 RYAN, William Patrick, SPECIAL, 1933. Appropriation. Educational fund for three children of late Prof. W. P. Ryan.
- 569 SALISBURY, Henry Webb, 1941, \$1,000. Gift. Income for award to outstanding student in Aeronautics — initially in form of reference books in Aeronautics. (\$100 of gift to be considered as income.)
- 159 SALTONSTALL, 1901, \$40,000. Bequest of Henry Saltonstall. One-fourth income each year added to principal and remaining three-fourths expended for benefit of Institute. Present balance \$69,608.
- 331 SALTONSTALL, Henry, 1901, \$10,000. Bequest. Income to aid one or more needy students.
- 160 SARGENT, Homer E., 1950, \$2,416. Gift. Income for general purposes.
- 333 SAVAGE, James, 1873, \$10,000. Bequest. Income for scholarships in institution "where my son-in-law, William B. Rogers, is President."
- 161 SAWYER, Samuel E., 1895, \$4,764. Bequest. Income to be used in such a manner as will best promote interests of M.I.T.
- 499 SCHENKL, John P., 1922, \$43,821. Bequest of Johanna Pauline Schenkl in memory of father. Income for scholarships in Department of Mechanical Engineering.
- SCHWARZ, Theodore Edward, MEMORIAL, 1937-38, \$4,391.86. Gift. Used for equipment of a room for map collection.
- 833 SEDGWICK MEMORIAL LECTURE, 1930-49. Bequest of Mary Katrine Sedgwick in memory of husband. Proceeds of interest in copyrights and from contracts with publishers for benefit of Department of Biology.
- 763 SEDGWICK, W. T., 1928, \$69,500. Received from Trustees of the Estate of W. T. Sedgwick under Agreement and Declaration of Trust following decease of Mary Katrine Sedgwick for Department of Biology.
- 500 SEGHERS, Paul D., Jr., SCHOLARSHIP, 1948, \$4,800. Bequest. Income for annual scholarship.
- SENIOR HOUSE, 1947, \$500,000. Gift of Alumni Association from accumulated Alumni Fund, for new dormitory unit. Used for new dormitory, 1948.

- 765 SERVOMECHANISMS LABORATORY, 1943. Appropriation from Industrial Fund for postwar research.
- 767 SERVOMECHANISMS RESEARCH. Proceeds from royalties for research.  
SEWALL, Richard B., 1919, \$30,000. Bequest. Used for educational plant, 1924.
- 501 SHERMAN, Frank Arnold, 1947, \$10,000. Bequest. For scholarships with preference to Westerly, R. I., students.
- 503 SHERWIN, Thomas, 1871, \$5,000. Gift of Committee on Sherwin Memorial Fund for free scholarship to graduate of English High School.
- 293 SLOAN, Alfred P., PROFESSORSHIP, 1945-49, \$350,000. For endowment of Professorship in Industrial Management
- 619 SLOAN, Alfred P., Metals Processing Laboratory 1950, \$250,000. Gift. For building and equipment.
- 769 SLOAN AUTOMOTIVE LABORATORY, 1929-48, \$165,000. Gift. Expended for automotive laboratory.  
SLOAN FOUNDATION, 1946-49, \$215,000. Expended for Automotive Laboratory.  
SLOAN, George A., 1945, \$500. Gift. Used for new construction, 1947.
- SMITH, Ellen Vose, 1930, \$25,000. Bequest. Used for new equipment.
- 505 SMITH, G. H. Miller, 1946, \$10,000. For undergraduate scholarships.
- 507 SMITH, Horace T., 1930, \$33,019. Bequest. Income for scholarships. Preference to graduates of East Bridgewater (Mass.) and Bridgeport (Conn.) High Schools.
- 955 SMITH, Lillie C., 1937, \$4,800. Bequest to M. I. T. Women's Association for purposes of the Association.
- 957 SNOW, Walter B., 1938-49. Reserve funds of Technology Christian Association Advisory Board. Deposited for investment purposes.
- 251 SOLAR ENERGY, 1938, \$643,511.63. Gift of Dr. Godfrey L. Cabot. Principal to be held for fifty years — income to be used in development of the art of converting energy of the sun to use of man by mechanical, electrical, or chemical means. After fifty years, fund becomes part of general unrestricted endowment of the Institute.
- 509 SONS AND DAUGHTERS OF NEW ENGLAND PURITAN COLONY SCHOLARSHIP, 1931, \$600. Gift. Income for scholarship aid to a boy of New England ancestry.
- 771 SPECIAL RESEARCH (PADEFORD). Balance \$2,950. For research.
- 511 SPOONER, Anna, 1939-41, \$10,896. Bequest. Income to be used in assisting meritorious students.
- 163 SPRING, Andrew Hastings, 1921, \$50,000. Bequest of Charlotte A. Spring in memory of nephew as a permanent fund. Income for general purposes.  
STONE, Charles A., 1912-24, \$15,000. Gift for land. 1928, \$25,023.59. Gift for dormitories.  
STONE, Galen L., 1912, \$10,000. Gift for land. 1916, \$10,000. Gift for Mining Building.

- 165 STONE, George G., 1939, \$4,677.35. Bequest by will of Eliza A. Stone as memorial to brother, a graduate in Mining Engineering in 1889. Income to be used in manner most useful to Institute as well as a most fitting memorial.
- 571 STRATTON, Samuel W., PRIZE, 1933, \$1,880. Contributed by friends of the late Dr. S. W. Stratton for competition prizes in the presentation of scientific papers.
- 773 SUBMARINE SIGNAL COMPANY, 1945, \$25,000. Gift. To be used for fundamental studies relating to application of ultrasonics to biological problems.
- 595 SUMMER SURVEYING CAMP LOAN, 1927, \$500. Gift of Lamot du Pont as a revolving loan fund to help students in Civil Engineering attend summer surveying camp.
- 671 SUMNER, Edward A., 1950, \$10,694.44. Bequest for general purposes of the Institute.
- 775 SWEET, Henry N., 1936, \$8,036.50. Bequest. For industrial research.
- 167 SWEETSER, Seth K., 1915, \$25,061. Bequest as a permanent fund. Income for general purposes.
- 335 SWETT, Susan H., 1888, \$10,000. Bequest. Income to support a graduate scholarship.
- 777 SWIFT AMINO ACID, 1947. Balance \$4,265. For research.
- 779 SWIFT PROTEIN RESEARCH, 1944, \$20,000. Gift. For research.
- 337 SWOPE, Gerard, GRADUATE FELLOWSHIPS, 1945, \$100,050. Gift. Income annually or from time to time to be granted as Gerard Swope Fellowships under certain conditions and with certain preferences. Principal to be maintained except under conditions presented.
- 673 TAMKIN, Herman W., 1948-49, \$14,860.13. Bequest. For general purposes.
- 168 TALBOT, Henry P., 1949, \$45,243. Bequest. Income for general purposes.
- 835 TAU BETA PI MEMORIAL SCHOLARSHIP, 1948-49, \$2,589.85. Contributions. For special scholarship purposes.
- 580 TEACHERS', 1899-1900. Gifts of \$50,000 each from Augustus Lowell and A. Lawrence Lowell to establish fund, the income of which is for use in case of retirement, disability, or death of members of instructing staff.
- 958 TECHNOLOGY CHRISTIAN ASSOCIATION, 1949. Deposited for investment purposes.
- 597 TECHNOLOGY LOAN, 1930-41. Present balance \$2,085,238. Contributed by eighteen alumni to provide loans for students.
- 959 TECHNOLOGY MATRONS' TEAS, 1916-22-31, \$8,500. Gifts of Mrs. F. Jewett Moore. Income for social activities of Technology Matrons.
- 839 TECHNOLOGY PRESS, 1946-49. Royalties on books published. For special expense.



- 962 TECH SHOW TRUST, 1950. Deposit for investment.  
THAYER, NATHANIEL, 1906, \$25,000. Gift. Used for educational plant.
- 295 THAYER, Nathaniel, 1868, \$25,000. Gift. Income for professorship of Physics.
- 581 THOMAS, W. B. S., 1935-50, \$4,002.50. Gift of parents of W. B. S. Thomas '29, the income only to be expended, one-half for the benefit of the M. I. T. Crew and one-half to other activities of the M. I. T. A. A.
- 297 THOMSON, Elihu, 1933-49, \$23,700. Contributed toward fund for Professorship in Electrical Engineering.  
THOMSON, Elihu, 1912, \$25,000; 1924, \$5,000. Gift. Used for purchase of land.  
THORNDIKE, Sturgis H., 1928, \$15,000. Bequest. Appropriated for new dormitories, 1930.
- 339 THORP, Frank Hall, 1932, \$10,000. Anonymous gift. Income for fellowship in Industrial Chemistry.
- 340 TILLOTSON FELLOWSHIP, 1948, \$1,900. Gift. For Graduate Fellowship in Electrical Engineering.
- 598 TIMBIE, William H., LOAN, 1948, \$4,860.50. Contributions to assist needy students in the Cooperative Course in Electrical Engineering.
- 513 TINKHAM, Samuel E., 1924, \$2,338. Gift of Boston Society of Civil Engineers. Income to assist worthy student in Civil Engineering.
- 275 TOD, John Hume, 1913, \$2,500. Gift of Mrs. F. Jewett Moore. Income for purchase of books of a humanistic character for General Library.
- 515 TOUGH, F. B., 1924, \$465. Gift to extend financial assistance to worthy students in mining or oil production.
- 675 TOWLE, 1944-46, \$10,500. Gift. For general purposes.
- 841 TOWLE LECTURE, 1947, \$1,000. Gift. For special lectures.
- 781 TREAT, Nellie Florence, 1944, \$609. Bequest. For use in the field of Food Technology.
- 677 TRIPP, Charles A., 1943, \$100,000. Bequest. For dormitory construction — or such other use of all or part as may seem advisable.
- 830 TUBBY ROGERS, 1949-50, \$1,298. Contributions for special Fund as memorial to Professor Rogers.
- 255 TURNER, Edmund K., 1915-41, \$206,814. Bequest. Income, three-quarters for Department of Civil Engineering and one-quarter to be added annually to principal. Present balance \$294,196.26.  
TUTTLE, Lucius, 1916, \$50,000. Bequest. Used for educational plant, 1918.
- 783 TWENTIETH-CENTURY-FOX FILM RESEARCH CORPORATION, 1947, \$2,500. For research.
- 582 TYLER, Alice Brown, 1937-41, \$1,559.64. Gift of Prof. and Mrs. H. W. Tyler. Income to be used for benefit of women students at the Institute.

- 963 UNDERGRADUATE ACTIVITIES TRUST, 1935. Established by 1915 Technique Board from which recognized student activities may borrow, if deemed necessary and desirable, at a low rate.
- 967 UNDERGRADUATE DUES RESERVE, ATHLETICS. Transferred from Undergraduate Dues (current operating account) to secure investment income.
- 969 UNDERGRADUATE DUES RESERVE, CONTINGENT. Transferred from Undergraduate Dues (current operating account) to secure investment income.
- 965 UNDERGRADUATE PUBLICATIONS TRUST, 1935. Deposited by Alumni Advisory Council on Publications for investment purposes only.
- 785 UNDERWOOD, William Lyman, 1932, \$16,252. Bequest. For benefit of Biology Department or otherwise for general purposes.
- 786 UNION CARBIDE & CARBON CORPORATION, 1948-49, \$40,000. Gift for research in the fields of gas turbine research, nuclear science and engineering, and heat transfer and fluidized powder research.
- 256 UNITED FRUIT COMPANY, 1950. Grant functioning as endowment.
- 517 UPHAM, Susan, 1892, \$1,000. Gift. Income to assist students deserving financial aid.
- 341 UPHAM, Thomas, 1939-46. Balance \$409,019. Bequest of Marcella B. Upham. Principal to be held as a permanent trust fund, the income to be used in assisting poor and deserving students or graduates of the Institute.
- 519 URBINO, Samson R., 1927, \$1,000. Bequest. Income for students who need assistance, Germans preferred.
- 863 USE OF FACILITIES RESERVE, 1945-49. Appropriated from research contract overhead revenues as applicable to use of physical plant and equipment.
- 277 VAIL, Theodore N., 1925-49, \$68,072.34. Bequest. For benefit of Vail Library.
- 343 VERGES, Luis Francisco, 1924, \$10,000. Gift from Caroline A. Verges. Income for graduate students doing research work in sugar industry or, if no such candidate, undergraduate student in Civil Engineering.
- 521 VERMONT SCHOLARSHIP, 1924-37, \$25,000. Gift of Redfield Proctor, '02, in memory of Vermonters who, having received their education at the Institute, served as engineers in the armies of the Allies in the first World War. Income to students preferably from Vermont. Mr. Proctor reserves right to designate recipients as long as he lives.
- 523 VOSE, Ann White, 1896, \$60,718. Bequest. Income for free scholarships for young men of American origin.
- WADLEIGH, Horace W., 1916-20, \$22,143.14. Bequest. Appropriated for new buildings, 1924.
- 525 WAITT, Arthur M., 1925, \$9,761. Bequest. Income for deserving students in second-, third-, and fourth-year classes in Mechanical Engineering.

- 679 WALKER, Grant, 1943-47, \$75,500. Bequest. For general purposes. \$50,000 used 1949. Present balance \$25,500.
- 527 WALKER, Grant, 1944, \$55,000. Bequest. Income for scholarships.
- 169 WALKER, William J., 1915-17, \$23,613. Bequest. Income for general purposes.
- 865 WALKER MEMORIAL RESERVE. For purposes of repair and renovation of the building.
- 867 WALKER MEMORIAL DINING SERVICE RESERVE. For repair and replacement of Dining Service Equipment.
- 257 WARE, William R., 1939, \$15,000. Gift of Mr. and Mrs. William Emerson, the income to be at the disposal of the Dean of the Architectural School for extra budgetary purposes.
- 621 WATERBURY, Charles D., 1941. Present balance \$18,644.65. Bequest. For erection of a building as a memorial to above-named at such time as M. I. T. shall decide.
- 171 WATSON, Horace Herbert, 1930-48, \$36,057.19. Bequest of Elizabeth Watson Cutter as a permanent fund. Income for general purposes.
- 172 WATT, Arthur P., MEMORIAL, 1949, \$1,500. Bequest. Income for general purposes.
- 529 WATT, James, SCHOLARSHIP, 1942, \$13,259.72. Bequest under will of Jennie A. Douglas. For scholarships in Mechanical Engineering.
- 681 WEBSTER, Edwin S., 1950, \$25,217.50. Gift for unrestricted use of the Institute.
- WEBSTER, Edwin S., 1912-24, \$15,000. Gift. Used toward purchase of land.
- WEBSTER, FRANK G., 1931, \$25,000. Bequest. Used for new construction, 1947.
- 531 WEISBEIN, Louis, 1915, \$4,000. Bequest. Income for scholarship for student in Architectural Department, preference to be given to a Jewish boy.
- 173 WELCH, Albion B. K., 1871, \$5,000. Bequest as a permanent fund. Income for general purposes.
- WELD, Charles G., 1907, \$15,000. Gift. Used for educational plant, 1924.
- 175 WESTCOTT, Everett, 1935-50, \$172,194. Bequest as a permanent fund. Income for general purposes.
- 177 WESTCOTT, Marion, 1938-50, \$246,981. Bequest for endowment. Income for general purposes.
- 533 WESTON, Frances Erving, 1912-31, \$5,000. Bequest. Income to aid a native-born American Protestant girl of Massachusetts.
- 535 WESTON, Samuel Martin, 1912-31, \$5,000. Bequest of Frances E. Weston in memory of husband. Income to aid a native-born American Protestant boy; preference to be given one from Roxbury.

- WHEELER, Alexander S., 1907-16, \$30,000. Contributed by friends. Used for new dormitories, 1924
- 989 WHEELER, Knight W., 1950, \$20,000. Subject to life annuity provisions.
- WHITE, George R., 1912, \$10,000. Gift. Used toward purchase of new site.
- 537 WHITING, Amasa J., 1927, \$4,515. Bequest of Mary W. C. Whiting. Income as scholarship to deserving students; preference to students from the town of Hingham, Massachusetts.
- WHITNEY, Edward, 1910, \$37,171. Bequest as a memorial to him and his wife, Caroline. Principal and interest used (1930-38) for conduct of research in geophysics.
- 345 WHITNEY, Jonathan, 1912. Present balance \$516,197. Bequest of Mrs. Francis B. Green. Income to assist poor and deserving young men and women in obtaining an education at M. I. T.
- 683 WIESS, Harry C., 1947-49, \$135,800. Gift. For unrestricted purposes. Income to be added to Fund. Present balance \$151,229.50.
- 179 WIGGLESWORTH, George, 1931, \$25,000. Bequest. Ten per cent of gross annual income to be added to principal, balance of income for general purposes of the Institute. Present balance \$26,980.
- WIGGLESWORTH, George, 1917-24, \$65,000. Gift. Used for additional land purchase, 1924.
- WILKS, H. Sylvia A. H. G., 1948, \$175,000. Round Hill property, Dartmouth, Massachusetts.
- 684 WILLISTON, Belle A., 1948, \$17,118.68. Bequest for general purposes.
- 539 WILLMANN, Elizabeth Babcock, 1935, \$5,065. Bequest. Income to be used toward tuition of young women students taking Chemistry courses.
- 990 WITMER, George S., 1938-50. Balance \$80,999.40. In Trust, subject to special annuity provisions.
- 685 WOOD, Edwin J., 1949, \$5,000. Bequest for general purposes.
- WOOD, Kenneth F., 1926, \$25,000. Bequest. Appropriated for new dormitory, 1930.
- WRIGHT MEMORIAL WIND TUNNEL, 1937-41, \$95,795. Contributed by friends toward construction of wind tunnel.
- 181 WYETH, Edwin A., 1913-35, \$254,704. Balance of Trust Fund held by M. I. T. from 1913 for itself and five other beneficiary institutions subject to annuity. Distributed January, 1935. Fund separately invested until June 30, 1943. Net income available for general purposes of the Institute.
- 541 WYMAN, Morrill, 1915-16, \$66,538. Bequest. Income to aid deserving and promising students upon understanding that if in after life the person receiving aid shall find it possible, he shall reimburse said fund — not a legal obligation.

LIST OF  
PERIODICAL PUBLICATIONS, BOOKS AND REVIEWS  
BY MEMBERS OF THE STAFF

*(Persons desiring reprints of articles should apply to the Department concerned.  
Photostat or microfilm copies may be obtained from the Reference Librarian.)*

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#### DOCTOR OF PHILOSOPHY

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#### DOCTOR OF SCIENCE

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DOCTOR OF PHILOSOPHY

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*DEPARTMENT OF CIVIL AND SANITARY ENGINEERING*

## DOCTOR OF SCIENCE

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DOCTOR OF PHILOSOPHY

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DOCTOR OF SCIENCE

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 Temiskaming-Grenville Contact. June, 1950.  
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 1949.  
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 Heat Flow Problems. June, 1950.  
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DOCTOR OF SCIENCE

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 Layer on a Flat Plate. January, 1950.  
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 1950.  
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 of Boundary Layers. June, 1950.  
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 Methacrylate. June, 1950.  
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 Lattices. June, 1950.  
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 Linear Differential Equations. June, 1950.  
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 of Metals. June, 1950.  
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 ing. June, 1950.  
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 crylate. June, 1950.

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DOCTOR OF SCIENCE IN CERAMICS

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DOCTOR OF SCIENCE

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DOCTOR OF PHILOSOPHY

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376      THESE PRESENTED FOR DOCTOR'S DEGREES

- HILLGER, RICHARD EMMETT. Microwave Spectrum of Isotopic Hydrogen Sulphide. June, 1950.
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- WRIGHT, WILLIAM ERSKINE. Study of Radioactive Decay Schemes by the Use of Fast Detectors. June, 1950.

## INDEX OF AUTHORS OF STAFF PUBLICATIONS

- Adams, D. P.: 351  
 Addoms, J. N.: 336  
 Adelman, M. A.: 342  
 Ahrens, L. H.: 350  
 \*Alger, R. S.: 347  
 Allis, W. P.: 361  
 \*Altschule, M. D.: 334  
 Amdur, I.: 336  
 Apostol, T. M.: 351  
 Archer, J. E.: 366  
 Arguimbau, L. B.: 343  
 Armistead, F. C.: 361  
 \*Armstrong, R.: 339  
 \*Armstrong, S. H., Jr.: 339  
 Ashdown, A. A.: 337  
 Atchley, R. D.: 345  
 Austin, J. M.: 360  
 \*Austin, P. M.: 360  
 Averbach, B. L.: 356, 364  
 \*Bailey, D. Z.: 353  
 Bailey, W. S.: 353  
 \*Banus, M. D.: 340  
 \*Bareis, D.: 336  
 \*Barer, R. D.: 356  
 Barnes, F. A.: 343  
 Barry, F. W.: 353  
 Bear, R. S.: 332  
 Beattie, J. A.: 337  
 Beckett, J. A.: 335  
 Beckwith, H. L.: 331, 346  
 Bemis, A. C.: 360  
 Beranek, L. L.: 343, 344  
 Bever, M. B.: 340, 356, 359  
 \*Billmeyer, F. W., Jr.: 341  
 Bird, F. F.: 333  
 Bishop, R. L.: 342  
 Bisplinghoff, R. L.: 331  
 Bitter, F.: 361  
 Blake, C. H.: 332  
 \*Blasingame, B. P.: 331  
 \*Blickwede, D. J.: 357  
 \*Bloecher, F. W., Jr.: 358  
 Bloom, D. S.: 356  
 Blum, J. M.: 348  
 \*Blumenthal, H.: 358  
 \*Bogert, B.: 352  
 \*Bohr, A.: 365  
 \*Bolduan, O. E. A.: 332  
 Bolhofer, W. A.: 340  
 Bolt, R. H.: 361, 362  
 Booton, R. C., Jr.: 344  
 Boyajian, A.: 344  
 \*Bragg, S. L.: 354  
 Brasunas, A. de S.: 357  
 Breger, I. A.: 350, 351  
 Brenton, V. K.: 345  
 Brightsen, R. A.: 337  
 \*Brindley, C. O.: 334  
 Brossel, J.: 361  
 Broughton, D. B.: 360  
 \*Brown, B. F.: 359  
 Brown, D. V.: 335  
 Brown, E. C.: 342  
 Brown, G. S.: 344  
 Brown, J. H.: 347  
 Brown, S. C.: 362  
 Bryan, J. G.: 353  
 Buckley, E. F.: 344  
 \*Bucklin, A. G.: 358  
 Buechner, W. W.: 362, 364  
 Burbank, R. D.: 344  
 Burchard, J. E.: 365  
 Burg, M.: 337  
 Burton, V. L.: 350  
 Burwell, J. T., Jr.: 353  
 \*Callejas, P.: 342  
 \*Cameron, R. H.: 352  
 Campbell, D. P.: 344  
 Campling, L. M.: 350  
 \*Carney, D. J.: 357  
 \*Carrus, P.: 345  
 Caspari, M. E.: 344  
 Castleman, L. S.: 356  
 Chalker, W. R.: 360  
 \*Chapman, E. M.: 362  
 \*Chatfield, C. H.: 355  
 Cheatham, T. P., Jr.: 345  
 \*Chertow, B.: 336  
 Chipman, J.: 357, 358, 359  
 \*Chow, W. M.: 336

\* Not on Institute Staff, 1949-1950.

- Clark, J. A.: 353  
 \*Clarke, A. M.: 347  
 Clarke, J. T., Jr.: 332  
 \*Clementson, G. C.: 331  
 Coddington, E. A.: 351  
 Cohen, I. S.: 351  
 Cohen, M.: 356, 357, 359  
 \*Comstock, G. F.: 357  
 \*Conwell, E.: 365  
 Cope, A. C.: 337  
 Coryell, C. D.: 338  
 \*Costa, E.: 336  
 Costas, J. P.: 344  
 \*Coughanour, L. W.: 358  
 Crawford, G. M.: 355  
 Cross, J. S.: 335  
 \*Cross, P. C.: 363  
 Crossley, H. E., Jr.: 341  
 Crout, P. D.: 351  
 \*Cullity, B. D.: 359  
 Czapek, E. L.: 334  
 \*Danser, H. W.: 354  
 \*Dastur, M. N.: 357, 358  
 \*Davenport, D. E.: 336  
 David, E. E., Jr.: 344  
 \*Davis, L., Jr.: 365  
 \*Dawson, J. H.: 341  
 de Bruyn, P. L.: 358  
 DeFrate, L. A.: 353  
 \*De Robertis, E. D.: 333  
 Deutsch, K. W.: 348  
 Dickinson, W. C.: 362  
 Dietz, A. G. H.: 334, 335  
 Doak, P. E.: 362  
 Douglass, R. D.: 351  
 Draper, C. S.: 331  
 Dudley, B.: 365  
 \*Duggins, W. E.: 340  
 Dunn, C. G.: 348, 349  
 Dwight, H. B.: 344  
 Dyson, G. M.: 361  
 Edgerton, H. E.: 344  
 \*Edwards, C. M.: 345  
 \*Edwards, D. G.: 337  
 Eliassen, R.: 341  
 \*Elliott, J. F.: 357  
 \*Elmore, W. C.: 364  
 \*Elvander, H. I.: 359  
 \*Elwell, F. S.: 344  
 \*Estes, L. L., Jr.: 337  
 Evans, R. D.: 362, 363  
 \*Everhart, E.: 362  
 Fano, R. M.: 344  
 Farnsworth, D. L.: 355  
 \*Fawcett, D. W.: 334  
 Feld, B. T.: 363, 365  
 Feshback, H.: 363  
 \*Field, L.: 337  
 Fishel, L. H., Jr.: 348  
 Fisher, J. C.: 357, 358  
 Flanagan, J. L.: 345  
 Floe, C. F.: 356, 359  
 Floyd, G. F., Jr.: 345  
 \*Forstall, W., Jr.: 355  
 \*Foster, T. T.: 337  
 \*Fram, H.: 349  
 Frame, J. D.: 341  
 \*Frank, V. S.: 340  
 Franklin, P.: 351  
 Frazier, R. H.: 345  
 Gailus, W. J.: 334  
 Gainer, J. M.: 349  
 Gamble, E. L.: 337, 340  
 Gaudin, A. M.: 358  
 Geren, B. B.: 333  
 Gilliland, E. R.: 336  
 \*Gilmore, F. R.: 341  
 Gokcen, N. A.: 358  
 Goldblith, S. A.: 349, 350  
 \*Goldman, H. M.: 332  
 \*Golibersuch, E. W.: 341  
 Goodman, C.: 363  
 \*Gordon, P.: 358  
 Gould, B. S.: 332, 333  
 Granlund, J.: 343  
 Grant, N. J.: 356, 357, 358, 359  
 Greenberg, A. E.: 342  
 Gregory, B. P.: 363  
 Gross, J.: 332  
 Grossman, N.: 353  
 Guild, L. P.: 349, 350  
 \*Hainer, R. M.: 363  
 Hall, A. C.: 345  
 Hall, C. E.: 332  
 \*Hamilton, A.: 355  
 Hansen, R. J.: 342  
 Hardy, H. L.: 355, 356  
 Harleman, D. R.: 341  
 Harris, L.: 338  
 Harris, R. S.: 349, 350  
 Harrison, G. R.: 365, 366  
 Hartman, J. F.: 333  
 Hastings, R. J.: 332  
 Hauser, E. A.: 335

\* Not on Institute Staff, 1949-1950.

- Hawthorne, W. R.: 354  
 Heidt, L. J.: 338  
 Henri, V. P.: 363  
 Herlin, M. A.: 363  
 \*Herrick, E. C.: 337  
 Hershenson, H. M.: 340  
 \*Heverly, J. R.: 360  
 \*Hitchcock, W. J.: 365  
 Hoch, F. L.: 333  
 Hockett, R. C.: 338  
 \*Hoffman, W. H.: 336  
 Hofstaetter, P. R.: 342  
 \*Hogness, J. R.: 349  
 \*Hollomon, J. H.: 357  
 \*Hopkins, A. E.: 366  
 Horton, J. P.: 341  
 Horwood, M. P.: 341  
 Houghton, H. G.: 360  
 Hume, D. N.: 338  
 Hunsaker, J. C.: 331  
 Hunter, D.: 366  
 Huntress, E. H.: 338  
 Hurley, P. M.: 350, 351  
 \*Intengan, C. Ll.: 350  
 Ippen, A. T.: 341  
 Irvine, J. W., Jr.: 338  
 \*Isakson, G.: 331  
 \*Izzo, P. T.: 340  
 Jacchia, L. G.: 345  
 \*Jacobsen, E.: 365  
 Jaggi, M. P.: 333  
 \*Jeffries, D.: 338  
 Jetter, W. W.: 349, 350  
 \*Jeydel, A. K.: 339  
 Johnson, E. C., Jr.: 345  
 Johnson, J. C.: 360  
 \*Jovellanos, J. U.: 331  
 Kaufmann, A. R.: 358  
 Kaye, J.: 337, 354  
 Keenan, J. H.: 354  
 \*Kells, M. C.: 336  
 Kennedy, R. W.: 331  
 \*Kennel, W. E.: 336  
 \*Kent, L.: 341  
 Kenyon, E. M.: 350  
 Keyes, F. G.: 338  
 \*Kiess, C. C.: 365  
 Killian, J. R., Jr.: 366  
 Kindleberger, C. P.: 342, 343  
 King, G. W.: 363  
 Kingery, W. D.: 338  
 Kingston, R. H.: 363  
 Kintner, M. R.: 337  
 \*Klein, M. J.: 364  
 Koch, R. F.: 361  
 Kochenburger, R. J.: 345  
 Kopal, Z.: 345  
 \*Kovacic, P.: 337  
 \*Kowalski, H. J.: 340  
 Kraushaar, W. L.: 363  
 \*Kretzmer, E. R.: 345  
 Lamb, R. K.: 348  
 Lamen, M. P.: 349  
 \*Lamphere, R. W.: 339  
 \*Langham, W. H.: 349  
 Latta, H.: 333  
 Laubach, G. D.: 340  
 Lawrance, R. B.: 364  
 \*Lax, B.: 362  
 \*Lax, M.: 363  
 Leary, W. A.: 331  
 Leavitt, W. Z.: 358  
 le Beau, D. S.: 335  
 Lebow, I. L.: 363  
 Lee, Y-W.: 345, 346, 347  
 \*Leeper, R. W.: 355  
 Lephakis, A. J.: 346  
 Lessells, J. M.: 354  
 \*Levin, E.: 333  
 \*Levine, L.: 347  
 Levinson, N.: 351, 352  
 Lewis, C. R.: 355  
 \*Lewis, W. B.: 338  
 Lewis, W. K.: 336  
 Li, Y. T.: 331  
 Licklider, J. C. R.: 346  
 \*Licklider, L. C.: 346  
 \*Lillie, D. W.: 358  
 Lin, C-C.: 352  
 Linvill, J. G.: 346  
 Lion, K. S.: 333  
 Livingston, M. S.: 363  
 Livingstone, B. J.: 334  
 Lobdell, H. E.: 366  
 Locke, W. N.: 361  
 Lockhart, E. E.: 349  
 Loewen, E. G.: 354  
 Loofbourow, J. R.: 333, 334  
 Loomis, C. C.: 364  
 Lord, R. C.: 338  
 Lustwerk, F.: 354  
 \*Lynch, M. L.: 338  
 McAdams, W. H.: 336  
 \*MacDonald, A. D.: 361, 362

\* Not on Institute Staff, 1949-1950.

- \*McElhill, E. A.: 339  
 MacGregor, C. W.: 353  
 McKinney, R. E.: 341  
 \*MacLean, A. L.: 339  
 McMahan, H. O.: 363  
 McMahan, J. H.: 358  
 Machlin, E. S.: 357  
 Maclaurin, W. R.: 343  
 Mahoney, T. H. D.: 348  
 \*Maisel, D. S.: 366  
 \*Malm, R.: 362  
 \*Maloof, C. C.: 356  
 \*Manley, J. C.: 344  
   Mann, A.: 348  
 \*Marcus, P. M.: 364  
 \*Marcy, H. T.: 344  
 \*Maroni, C.: 362  
 \*Marple, S., Jr.: 337  
   Martin, W. T.: 352  
   Mattill, J. I.: 366  
   Maurer, R. D.: 363  
 \*Maxwell, E.: 364  
 \*Mead, L. W.: 361  
   Meissner, H. P.: 336  
   Melcher, N. B.: 351  
   Michaels, A. S.: 336  
   Mickley, H. S.: 336  
 \*Miller, G. A.: 346  
 \*Miller, R. E.: 338  
   Miller, R. H.: 331  
   Millikan, M. F.: 343  
 \*Milliken, W.: 336  
 \*Millman, P. M.: 345  
 \*Minch, V. A.: 341  
   Moon, P.: 331, 346  
 \*Moore, M.: 342  
   Morison, E. E.: 348  
 \*Morrison, D. E.: 337  
   Morse, P. M.: 363, 364  
 \*Mumaw, C. E.: 340  
 \*Munsell, H. E.: 349, 350  
 \*Murray, S. F.: 353  
   Myers, C. A.: 343  
 \*Nace, H. R.: 337  
 \*Nagle, D. E.: 365  
   Neumann, E. P.: 353, 354  
   Newman, R. B.: 332, 361, 362  
   Newton, G. C., Jr.: 346  
   Nickerson, J. T. R.: 350  
 \*Nizel, A. E.: 349  
 \*Nolle, A. W.: 365  
   Norris, C. H.: 342  
   Norton, F. H.: 358  
 \*Norton, G. A.: 363  
   Norton, J. T.: 358, 359  
 \*Noss, O. F.: 360  
   Nottingham, W. B.: 364  
   Ober, S.: 355  
   Ofjord, A.: 342  
 \*O'Keefe, J.: 359  
   Orowan, E.: 354  
   Osborne, L. S.: 363  
   Padelford, N. J.: 343  
   Paranjpe, V. G.: 357, 358, 359  
   Parks, R. D.: 351  
 \*Peacock, A. C.: 349  
   Pease, W. M.: 347  
 \*Pellam, J. R.: 364  
 \*Pennock, J. C.: 361  
   Penzien, J.: 342  
   Perry, J. W.: 361  
   Peterson, C. M. F.: 331, 346  
   Phillips, J. W.: 335  
   Pian, T. H. H.: 331  
 \*Plesset, M. S.: 341  
 \*Powsner, E. R.: 333  
 \*Prakash, B.: 359  
   Prescott, S. C.: 348  
 \*Priest, G. L.: 347  
   Proctor, B. E.: 349, 350  
   Quinby, W. C., Jr.: 333  
 \*Radtke, S. F.: 340  
   Rae, J. B.: 348  
 \*Raymond, E.: 359  
 \*Redheffer, R. M.: 352  
 \*Register, C. L.: 359  
   Reissner, E.: 352  
 \*Rengstorff, G. W. P.: 356  
 \*Reynolds, C. A.: 339  
   Richter, H.: 339  
   Rightmire, B. G.: 354  
   Roberts, J. D.: 339  
 \*Roberts, J. P.: 344  
 \*Roberts, W. O.: 345  
 \*Robertson, W. D.: 360  
   Rocca, R.: 359  
   Rodwin, L.: 341  
   Rogers, L. B.: 338, 339  
   Rogowski, A. R.: 354  
   Rohsenow, W. M.: 353  
 \*Roop, R. W.: 362  
   Rossi, B.: 363  
 \*Sagalyn, P.: 361  
   Salem, R.: 352

\* Not on Institute Staff, 1949-1950.

- Samuelson, P. A.: 343  
 Sands, M. L.: 364  
 \*Sauer, C. W.: 339  
 Savage, R. E.: 359  
 Sawyer, C. N.: 342  
 Scatchard, G.: 339  
 Scattergood, A.: 338, 339, 340  
 Scheinberg, I. H.: 339, 340  
 Schell, E. H.: 335  
 Schmitt, F. O.: 333  
 \*Schramm, C. H.: 358  
 Schuhmann, R., Jr.: 359  
 Schumb, W. C.: 338, 340, 347  
 Schwarz, E. R.: 355  
 Scott, J. F.: 334  
 Seamans, R. C., Jr.: 331  
 \*Senftle, F. E.: 358  
 \*Shaffer, L. H.: 338  
 Shaler, A. J.: 359  
 Shank, M. E.: 355  
 Shapiro, A. H.: 353, 355  
 \*Shapley, M. B.: 345  
 Shaw, M. C.: 354, 355  
 Sheehan, J. C.: 340  
 Sherman, C. W.: 359  
 Sherman, H.: 349, 350  
 Sherwood, T. K.: 366  
 Shrock, R. R.: 351  
 Shultz, G. P.: 343  
 \*Siegel, B. M.: 338  
 Siegel, L. A.: 338, 364  
 Simpson, H.: 335  
 \*Sindeband, S. J.: 358  
 Singleton, H. E.: 347  
 \*Sinsheimer, R. L.: 334  
 Sizer, I. W.: 333, 334  
 Slater, J. C.: 364  
 \*Slowinski, E. J.: 338  
 Smith, D. O.: 347  
 \*Smith, M.: 346  
 \*Soule, M. H.: 334  
 Southam, F. W.: 338  
 \*Spencer, D. C.: 352  
 \*Spencer, D. E.: 346  
 \*Sperduto, A.: 362  
 \*Stanley, H. E.: 341  
 Stanley, W. E.: 342  
 Statton, W. O.: 347  
 \*Stein, E. W.: 362  
 Stockbarger, D. C.: 364  
 Stockmayer, W. H.: 340, 341  
 Strait, E. N.: 362, 364  
 Strandberg, M. W. P.: 364  
 Strang, C. D., Jr.: 355  
 Struik, D. J.: 352, 353  
 Stutt, C. A.: 346  
 \*Sugarman, N.: 339  
 Sunwalt, R. L., Jr.: 342  
 Swain, C. G.: 341  
 Tate, V. D.: 365, 367  
 Taylor, C. F.: 331, 344, 355  
 Taylor, E. S.: 331, 355  
 Taylor, H. F.: 354, 359  
 Telkes, M.: 359  
 Templeton, R. G.: 348  
 Terrall, J. R.: 364  
 \*Thimann, K. V.: 349  
 Thomas, G. B., Jr.: 353  
 Thomas, J. E., Jr.: 363  
 \*Tinlot, J. H.: 363  
 Tisza, L.: 364  
 Tom, A. Q. Y.: 342  
 \*Towle, P. H.: 337  
 Trump, J. G.: 347  
 Uhlig, H. H.: 360  
 \*Urban, S. F.: 357  
 \*Urbanek, L.: 339  
 Vallee, B. L.: 333, 334  
 Van Patter, D. M.: 364  
 \*Varnerin, L. J.: 362  
 Verzuh, F. M.: 347  
 von Hippel, A. R.: 347  
 \*von Karman, T.: 352  
 Voss, W. C.: 335  
 Wadsworth, G. P.: 353  
 Wagley, P. F.: 333, 334  
 Warren, B. E.: 356, 364  
 Waugh, D. F.: 333, 334  
 \*Webb, R. L.: 339  
 \*Webster, J. C.: 346  
 \*Weinberger, L. W.: 342  
 Weiss, M. T.: 364  
 Weisskopf, V. F.: 363, 365  
 Wells, W. M., Jr.: 342  
 Westervelt, P. J.: 362, 365  
 Whitehead, G. W.: 353  
 Whitehead, W. L.: 350, 351  
 Whitman, W. G.: 336  
 Wiesner, J. B.: 345, 346, 347  
 Wilbur, J. B.: 342  
 Willett, H. C.: 360  
 Williams, G. C.: 336  
 Williams, H. A.: 342  
 Williams, L. O.: 349, 350

\* Not on Institute Staff, 1949-1950.

\*Wilson, K. W.: 339  
Wilson, W. A.: 355  
\*Winter, D. F.: 333  
\*Wintner, A.: 35<sup>1</sup>  
Wise, C. S.: 36<sup>1</sup>  
\*Work, G. A.: 343  
Wright, C. C.: 34<sup>8</sup>  
\*Wright, K. A.: 347  
Wulff, J.: 355

\* Not on Institute Staff, 1949-1950.

Young, R. C.: 34<sup>0</sup>, 34<sup>1</sup>  
\*Young, W. G.: 339  
Yurenka, S.: 334  
\*Zabel, C. W.: 365  
Zacharias, J. R.: 365  
Zeldin, S. D.: 35<sup>1</sup>  
\*Zimm, B. H.: 34<sup>0</sup>  
Zimmermann, H. J.: 347



## INDEX OF AUTHORS OF DOCTORS' THESES

- Acheson, L. K., Jr.: 375  
 Archer, J. E.: 375  
 Archer, J. S.: 371  
 Armstrong, W. R.: 369  
 Backofen, W. A.: 374  
 Baldauf, G. H.: 368  
 Balluffi, R. W.: 374  
 Banus, M. D.: 369  
 Barriault, R. J.: 369  
 Barry, F. W.: 373  
 Bart, R.: 368  
 Bhatia, D. S.: 372  
 Bickford, L. R., Jr.: 375  
 Biedenharn, L. C., Jr.: 375  
 Blasingame, B. P.: 368  
 Bolhofer, W. A.: 369  
 Bose, A. K.: 371  
 Boyer, K.: 375  
 Breger, I. A.: 373  
 Bridge, H. S.: 375  
 Brierley, J. S.: 369  
 Brownell, G. L.: 375  
 Burbank, R. D.: 369  
 Byrne, J.: 368  
 Campbell, D. P.: 372  
 Cannan, C. M. M.: 368  
 Cannon, R. H., Jr.: 373  
 Capozzoli, L. J., Jr.: 371  
 Carney, D. J.: 374  
 Castleman, L. S.: 374  
 Chang, C-H.: 369  
 Clementson, G. C.: 368  
 Colyer, D. M.: 372  
 D'Addieco, A. A.: 370  
 Davenport, W. B., Jr.: 372  
 David, E. E., Jr.: 372  
 Davison, M. A. S.: 370  
 DeFrate, L. A.: 373  
 Dickinson, W. C.: 375  
 Dryden, H. L., Jr.: 370  
 East, W. H.: 374  
 Ensio, P. J.: 374  
 Fax, B. J.: 370  
 Fenton, S. W.: 370  
 Finch, R. B.: 374  
 Finkelstein, N. A.: 375  
 Fitzsimmons, E. S.: 375  
 Fleisher, A.: 375  
 Floyd, G. F., Jr.: 372  
 Foster, T. T.: 370  
 Frey, E. J.: 373  
 Gabites, J. F.: 375  
 Gailus, W. J.: 373  
 Giraud, F. L.: 373  
 Gleason, A. H.: 372  
 Glendenin, L. E.: 370  
 Gold, N. I.: 368  
 Goldring, L. S.: 370  
 Gordon, P.: 374  
 Goring, G. E.: 369  
 Gove, H. E.: 375  
 Graham, E. S.: 370  
 Gregory, B. P.: 375  
 Haas, W. J.: 368  
 Hahn, T. M., Jr.: 375  
 Harleman, D. R. F.: 371  
 Harrison, R. J.: 375  
 Harvey, J. A.: 375  
 Hillger, R. E.: 376  
 Holt, F. S.: 373  
 Howe, R. M.: 376  
 Hurlburt, H. Z.: 369  
 Ingard, K. U.: 376  
 Jex, V. B.: 370  
 Johnston, W. G.: 373  
 Jones, R. T.: 376  
 Kallal, R. J.: 369  
 Kelly, E. J., Jr.: 376  
 Keown, E. R.: 373  
 Kerr, D. E.: 376  
 Klein, J. H.: 369  
 Kling, H. P.: 374  
 Kraichnan, R. H.: 376  
 Kreuchunas, A.: 370  
 Krulee, G. K.: 372  
 Lane, J. R.: 374  
 Langsdorf, W. P., Jr.: 370  
 Larson, W. L.: 374

- Laubach, G. D.: 370  
 Lawrance, R. B.: 376  
 Lax, B.: 376  
 Lement, B. S.: 374  
 Leonard, G. W., Jr.: 370  
 Linnell, R. D.: 368  
 Loh, Y.-C.: 368  
 Luce, R. D.: 373  
 Lynch, M. A., Jr.: 370  
 Mack, L. M.: 368  
 Madwed, A.: 373  
 Maier, L. C., Jr.: 376  
 Malm, R. E.: 376  
 Marinsky, J. A.: 370  
 Marlowe, G. J.: 369  
 Mason, E. A.: 369  
 Maxfield, M.: 368  
 Moles, O. W.: 374  
 Morrow, J. C., 3d: 370  
 Mumaw, C. E.: 370  
 Mutter, W. E.: 376  
 Newton, G. C., Jr.: 372  
 Nielsen, E.: 370  
 O'Neill, R. C.: 370  
 Orden, A.: 373  
 Osborne, L. S.: 376  
 Outwater, J. O.: 373  
 Paranjpe, V. G.: 374  
 Patterson, E. E.: 369  
 Paxton, R. R.: 369  
 Pease, R. L.: 376  
 Penner, H. P.: 370  
 Penzien, J.: 371  
 Perlis, A. J.: 373  
 Philoon, W. C., Jr.: 369  
 Plank, H. F.: 371  
 Pomeroy, J. H.: 371  
 Potter, R. D.: 374  
 Pullen, R. W.: 372  
 Rachford, H. H., Jr.: 369  
 Radd, F. J.: 374  
 Rediker, R. H.: 376  
 Register, C. L.: 373  
 Rengstorff, G. W. P.: 374  
 Robinson, C. A.: 371  
 Rugo, H. J.: 368  
 Russell, J. B., Jr.: 372  
 Sandell, D. J., Jr.: 371  
 Savage, R. E.: 374  
 Sayles, L. R.: 372  
 Schecter, H.: 376  
 Scott, R. E.: 372  
 Shen, S.-F.: 368  
 Shepard, H. A.: 372  
 Slowinski, E. J., Jr.: 371  
 Smith, D. R.: 371  
 Smith, M. E.: 371  
 Southam, F. W.: 371  
 Spencer, C. F.: 371  
 Stanley, H. E.: 371  
 Statton, W. O.: 371  
 Stavrolakis, J. A.: 375  
 Stevenson, D. T.: 376  
 Sweeney, M. P.: 369  
 Terrall, J. R.: 376  
 Thompson, J. B., Jr.: 373  
 Thurston, J. N.: 372  
 Trilling, C. A.: 369  
 Van Patter, D. M.: 376  
 Van Tassel, B. F. V.: 371  
 Varnerin, L. J., Jr.: 376  
 Wahl, D.: 376  
 Waymouth, J. F., Jr.: 376  
 Wells, W. M., Jr.: 371  
 White, R. M.: 375  
 Wright, W. E.: 376  
 Wu, P. C.: 369  
 Yurenka, S.: 373