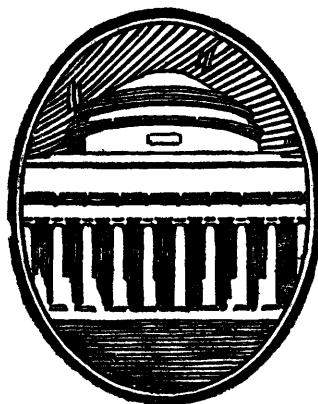


MASSACHUSETTS INSTITUTE  
OF TECHNOLOGY BULLETIN

PRESIDENT'S REPORT  
ISSUE

VOLUME 84

NUMBER 1



OCTOBER, 1948

Published by  
Massachusetts Institute of Technology  
Cambridge, Massachusetts

Entered July 3, 1933, at the Post Office, Boston, Massachusetts, as second-class matter under Act of Congress of August 24, 1912.

Published by the Massachusetts Institute of Technology, Cambridge Station, Boston, Massachusetts in March, June, October, and November.

Issues of the BULLETIN include the reports of the President and of the Treasurer, the General Catalogue, the Summer Session, and the Directory.

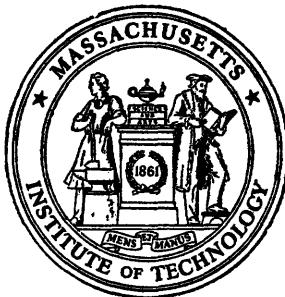
MASSACHUSETTS INSTITUTE  
OF TECHNOLOGY  
BULLETIN

President's Report Issue

1947-1948

VOLUME 84

NUMBER 1



OCTOBER, 1948

PUBLISHED BY THE INSTITUTE, CAMBRIDGE

# THE CORPORATION, 1948-1949

## *President*

KARL T. COMPTON

## *Secretary*

WALTER HUMPHREYS

## *Vice President*

JAMES R. KILLIAN, JR.

## *Treasurer*

HORACE S. FORD

## LIFE MEMBERS

W. CAMERON FORBES

EDWIN S. WEBSTER

PIERRE S. DU PONT

HARRY J. CARLSON

GERARD SWOPE

FRANKLIN W. HOBBS

JOSEPH W. POWELL

WALTER HUMPHREYS

VICTOR M. CUTTER

ALBERT H. WIGGIN

JOHN R. MACOMBER

ALFRED L. LOOMIS

HARLOW SHAPLEY

ALFRED P. SLOAN, JR.

LAMMOT DU PONT

FRANK B. JEWETT

REDFIELD PROCTOR

GODFREY L. CABOT

WILLIAM C. POTTER

BRADLEY DEWEY

HENRY E. WORCESTER

FRANCIS J. CHESTERMAN

WILLIS R. WHITNEY

VANNEVAR BUSH

WILLIAM EMERSON

RALPH E. FLANDERS

JAMES M. BARKER

THOMAS C. DESMOND

J. WILLARD HAYDEN

LOUIS S. CATES

MARSHALL B. DALTON

WILLIAM S. NEWELL

CHARLES E. SPENCER, JR.

ROBERT E. WILSON

## SPECIAL TERM MEMBERS

*Term expires June, 1949*

GEORGE A. SLOAN

*Term expires June, 1951*

THOMAS D. CABOT

*Term expires June, 1952*

BEAUCHAMP E. SMITH

*Term expires June 1953*

WILLIAM A. COOLIDGE

## PRESIDENT OF THE ALUMNI ASSOCIATION

C. GEORGE DANDROW

## ALUMNI TERM MEMBERS

*Terms expire June, 1949*

HAROLD B. HARVEY

DR. W. JASON MIXTER

ELLIS W. BREWSTER

*Terms expire June, 1950*

RAYMOND STEVENS

EDWARD S. FARROW

HORACE W. McCURDY

*Terms expire June, 1951*

A. WARREN NORTON

FREDERICK S. BLACKALL, JR.

*Terms expire June, 1952*

HAROLD BUGBEE

C. GEORGE DANDROW

JAMES McGOWAN, JR.

*Terms expire June, 1953*

THOMAS D'A. BROPHY

RAYMOND H. BLANCHARD

THOMAS H. WEST

## REPRESENTATIVES OF THE COMMONWEALTH

HIS EXCELLENCY, ROBERT F. BRADFORD, *Governor*

HONORABLE STANLEY E. QUA, *Chief Justice of the Supreme Judicial Court*

JOHN J. DESMOND, *Commissioner of Education*

## TABLE OF CONTENTS

	PAGE
<b>REPORT OF THE PRESIDENT</b>	
Committee on Financing Development . . . . .	7
Assistance by Industry . . . . .	11
The Progress of Our Building Program . . . . .	13
Operations Outside of Cambridge . . . . .	15
Special Educational Projects . . . . .	18
Salaries and Wages . . . . .	20
Statistics of the Year . . . . .	21
Finances . . . . .	21
Enrollment . . . . .	22
Student Aid . . . . .	23
Changes in Personnel . . . . .	23
<b>REPORTS OF ADMINISTRATIVE OFFICERS</b>	
Dean of Students . . . . .	27
Dean of the Graduate School . . . . .	36
Registrar . . . . .	40
Director of Admissions . . . . .	62
Director of Libraries . . . . .	64
Director of the Division of Industrial Coöperation . . . . .	73
Adviser to Foreign Students . . . . .	74
Placement Officer . . . . .	76
Personnel Officer . . . . .	78
Medical Director . . . . .	80
Executive Vice-President of the Alumni Association . . . . .	83
<b>SCHOOL OF ENGINEERING</b>	
Aeronautical Engineering . . . . .	86
Building Engineering and Construction . . . . .	93
Business and Engineering Administration . . . . .	97
Chemical Engineering . . . . .	101
Civil and Sanitary Engineering . . . . .	104
Electrical Engineering . . . . .	109
Graphics . . . . .	115
Mechanical Engineering . . . . .	116
Metallurgy . . . . .	123
Meteorology . . . . .	127

## TABLE OF CONTENTS

	PAGE
Military Science and Tactics . . . . .	129
Naval Architecture and Marine Engineering . . . . .	130
 SCHOOL OF SCIENCE	
Biology . . . . .	133
Chemistry . . . . .	135
Food Technology . . . . .	136
Geology . . . . .	137
Mathematics . . . . .	138
Physics . . . . .	141
 SCHOOL OF ARCHITECTURE AND PLANNING	
Architecture . . . . .	144
City and Regional Planning . . . . .	146
 DIVISION OF HUMANITIES	
Economics and Social Science . . . . .	149
English and History . . . . .	151
Modern Languages . . . . .	152
 INTERDEPARTMENTAL LABORATORIES	
Acoustics . . . . .	155
Electronics . . . . .	158
Nuclear Science and Engineering . . . . .	160
Cosmic Terrestrial Research . . . . .	165
 REPORT OF THE TREASURER	
AUDITORS' CERTIFICATE AND REPORT OF AUDITING COMMITTEE	
TREASURER'S STATEMENT . . . . .	
Gifts and Bequests Received During Year . . . . .	179
Report of the Trustees of the M. I. T. Pension Association . . . . .	184
M. I. T. Pension Association Investments . . . . .	185
Report of the Technology Loan Fund Committee . . . . .	186
 BURSAR'S STATEMENT . . . . .	
Balance Sheet . . . . .	Schedule A 188
Income and Expense Statement . . . . .	Schedule B 190
Surplus from Operations . . . . .	Schedule C 192

## TABLE OF CONTENTS

5

<b>BALANCE SHEET — SUPPORTING SCHEDULES:</b>	<b>PAGE</b>
General Investments . . . . .	A-1 193
Investments of Funds Separately Invested . . . . .	A-2 200
Endowment Funds, Income for General Purposes . . . . .	A-3 204
Endowment Funds, Income for Designated Purposes . . . . .	A-4 206
Student Loan Funds . . . . .	A-5 216
Building Funds . . . . .	A-6 216
 Other Invested Funds:	
General Purposes . . . . .	A-7 216
Departments and Research . . . . .	A-8 218
Library . . . . .	A-8 220
Miscellaneous . . . . .	A-8 220
Reserves . . . . .	A-8 222
Deposits and Advances Held for Investment . . . . .	A-9 222
Conditional Gifts . . . . .	A-10 224
Accumulated Net Gain on General Investments . . . . .	A-11 224
Summary of Funds . . . . .	226
Students' Notes Receivable . . . . .	A-12 227
Accounts Receivable . . . . .	A-13 227
Contracts in Progress . . . . .	A-14 228
 Inventories, Prepaid Expenses and Deferred	
charges . . . . .	A-15 229
Students' Advance Fees and Deposits . . . . .	A-16 230
Federal Tax Withholdings, Savings Bond and Other	
Deposit Accounts . . . . .	A-17 230
Unexpended Balances of Gifts and Other Receipts	
for Current Purposes . . . . .	A-18 231
Educational Plant Assets . . . . .	A-19 240
Principal Gifts and Appropriations for Educational	
Plant . . . . .	A-20 241
 <b>INCOME AND EXPENSE STATEMENT — SUPPORTING SCHEDULES:</b>	
Students' Fees . . . . .	B-1 243
Gifts and Other Receipts for Current Expenses . . . . .	B-2 244
Research Contracts . . . . .	B-3 245
Rentals and Other Income . . . . .	B-4 246
Salaries and Wages of Staff, Accessory to Teaching	
and Laboratory Service . . . . .	B-5 247
Departmental Expenses . . . . .	B-6 248

## TABLE OF CONTENTS

	PAGE	
Library and Museum Expenses . . . . .	B-7	250
Clerical and Office Expense — Administration . . . . .	B-8	250
General Administrative Expense . . . . .	B-9	251
Department of Buildings and Power . . . . .	B-10	252
Medical Department . . . . .	B-11	253
Undergraduate Budget Board . . . . .	B-12	253
Auxiliary Activities — Summary . . . . .	B-13	254
Dormitories — Graduate and Undergraduate . . . . .	B-13A,B	255
Walker Memorial Dining Service . . . . .	B-13C	256
Graduate House Dining Service . . . . .	B-13D	256
Barracks Dormitory . . . . .	B-13E	257
Women's Dormitory . . . . .	B-13F	257
Westgate . . . . .	B-13G	258
Westgate West . . . . .	B-13H	258
 A BRIEF DESCRIPTION OF THE ENDOWMENT AND OTHER FUNDS . . . . .		259
 LIST OF PERIODICAL PUBLICATIONS, BOOKS AND REVIEWS BY MEMBERS OF THE STAFF . . . . .		285
Index of Authors . . . . .		321
 THESES PRESENTED FOR DOCTOR'S DEGREES . . . . .		314
Index of Authors . . . . .		325

## REPORT OF THE PRESIDENT

TO THE MEMBERS OF THE CORPORATION:

THREE years ago I had the privilege of reporting to you on the war record of the Institute. Two years ago I discussed problems of reconversion from a wartime to a peacetime footing and various aspects of the resulting redeployment of our facilities and energies. Last year I discussed some aspects of the status and trends of higher education which bear on our planning for the future and called attention to the urgent need for capital funds and facilities to enable us to continue as an effective and progressive institute of technology in these days of important new technological developments.

This year there is again a major theme for my report, which is a sequel to the previous three. It is the report and recommendations made by the Corporation's Survey Committee headed by John R. Macomber, and the steps which are being taken to implement that report. It is the fact that we are actually launching an organized effort to acquire the funds and facilities which were urged in my report a year ago, with the modifications and additions recommended by the Survey Committee. It is the fact that this report was unanimously approved by the Corporation and action on its recommendations unanimously ordered by the Executive Committee.

### COMMITTEE ON FINANCING DEVELOPMENT

The Survey Committee was a large and representative group of the Corporation, aided by several alumni and outside consultants. It made a thorough study of the financial resources of the Institute and of the administration's tentative list of high priority needs for additional capital facilities and resources, and it recommended the creation of a Committee on Financing Development with a "Program to Increase the

Endowment and Plant of M. I. T. [which] should be a planned, scheduled and organized effort to bring the Institute to maximum effectiveness. The short range objective is to secure [an additional] \$20,000,000 over a reasonable period for immediate application to the several projects and endowment but the Committee on Financing Development should also arrange for a continuous directed effort to finance new or changed requirements as they arise in the future."

The Survey Committee then went on to suggest a proposed organization for securing these funds, as a result of its study of various tested plans and methods. It recommended a large standing committee, reporting to the Corporation, to be called the "Committee on Financing Development." It recommended the appointment of a General Chairman, a Steering Committee, a Development Office, a Committee on Projects, a Committee on Public Information, a Committee on Alumni Participation, a Committee on Resources, a Committee for Special Gifts, a Committee on Business Corporations, and a group of local committees. It also suggested the form and duties of these committees and considered the desirability of engaging the assistance of a professional fund-raising organization. The Committee's report closed with the following paragraph:

"The Survey Committee approves in principle the broad organizational outline as described here, recognizing that the complete organization will need to be devised later. This outline is intended to serve only as a preliminary guide to the chief executive of the organization. Carefully detailed preparation and organization should precede the opening of active solicitation. While the immediate effort will not be a 'campaign' or a 'drive', the organization needs to operate with a sense of urgency and with effective publicity. All members of the M. I. T. constituency should be given an organized opportunity to contribute, even though the primary source of funds will be found in a limited number of donors." In interpreting this

last sentence, we expect that this financial operation will stimulate rather than compete with contributions to the alumni and class funds within the normal scope of these funds.

Following the Corporation's approval of the recommendations in this report, the Executive Committee moved promptly to start the operation. Its first and most important move was to select the General Chairman, and the immediate approval of the selection of Marshall B. Dalton has been well justified by the vigor with which he is undertaking the organizational steps. He himself will report to you this afternoon on the present status and future plans of the Committee on Financing Development, so I shall make no further comments about it at this time except to request that all of us give him every help and support in the difficult but very significant task which he has undertaken on behalf of the institution which is the joint responsibility of all of us.

There are a few general comments which I would make with reference to our fund-raising program. The first is that we are talking about postwar additions involving \$30,000,000, of which approximately \$10,000,000 has already been secured, leaving \$20,000,000 still needed. So far as we can ascertain, this is the largest amount of money which any educational institution, with the exception of one, has ever set out to raise in an organized intensive effort, though it is far from the largest amount of money which institutions have stated to describe their needs and opportunities.

The second point is that every one of the objectives listed has been checked and studied in detail and stands every test which we can give it as being essential to our position of leadership in technological education.

The third comment bears on a rather anomalous situation in which privately supported educational institutions are found in one particular aspect of fund raising. I refer to the general attitude of the philanthropic foundations. There was a time

a score or two score years ago when the foundations gave generously to the creation of needed new facilities of laboratories, libraries, and the like. Then came a reaction against "brick and mortar" and emphasis was placed on support of projects and programs, with emphasis shifting from endowment or long-term support to short-term support and with the formula that "if the project proves to be good, some other means will surely be found to continue it". Simultaneously emphasis was coming to be placed on men, rather than on either projects or facilities.

In many ways this trend has much to commend it, but at the present time it is out of step with the urgent needs of most of the private educational institutions. By dint of much scratching and sometimes of more or less warping of desirable programs, it has been found possible to secure rather large funds for current operations in research and advanced education. The desperate need, for which funds are proving much harder to find, is for the capital facilities of new laboratories and expensive equipment, required to handle scientific and engineering work of types whose importance has only recently become pronounced. A common foundation argument is that "needs for facilities are too large even for the funds of great foundations, so we will concentrate on men and exploratory projects." While this makes sense it is not, in my judgment, convincing because it could equally logically be argued that "there are so many men and programs deserving of support that even the funds of the great foundations cannot handle them, so we will concentrate on providing capital facilities for some of the most promising situations." The enormous effect on American aviation of the group of Guggenheim laboratories is an outstanding example of the long-term value of this alternative policy.

This dilemma is not felt so severely by tax-supported institutions, many of them having very large building programs under way at the present time, ranging in individual cases from \$10,000,000 to more than \$90,000,000 in this year's budget for many state universities. State universities have certain finan-

cial problems of other types, but by and large they are finding it increasingly possible to obtain plant facilities for lack of which private institutions are being more and more throttled. This particular situation is one which threatens the continued leadership and even the continued relative effectiveness of privately supported institutions. I have found complete unanimity of opinion on these points as I have had occasion from time to time to discuss them with the administrative officers of other private institutions.

Government has not found a legitimate way to provide private institutions with new capital facilities, except in certain very special cases, and industry is just beginning to justify grants for capital purposes. Foundations themselves have as great a stake as anyone in the prosperous development of industry, for they are among the largest stockholders in free enterprise. In regard to major social problems — like natural resources versus population, national security, ability to maintain social security and standards of living and health — science and technology play roles certainly comparable to social planning or controls in any long-range view, and are clearly subordinate in importance only to ethics and religion.

For reasons like these, the fund-raising effort on which M. I. T. is now engaging will be a test case to determine whether privately supported institutions in the free enterprise system will continue their effectiveness and leadership. No institution can present a stronger case than M. I. T. for its contributions to public welfare. The nature of the public response to this effort, especially by men of wealth, industrial organizations, and foundations, will be a powerful factor in determining the future significance of free enterprise and private initiative in higher education.

#### ASSISTANCE BY INDUSTRY

Decidedly encouraging has been the response during the past year by several industrial organizations which we have

approached for financial support of programs of research and advanced education along lines believed to be of mutual interest. A group of companies were selected as test cases to help us to evaluate possibilities along this line and to develop, in cooperation with these industries, some common ground of mutual assistance which would on our side be wholly consistent with our free educational objectives and on their side be consistent with the long-term interests of their stockholders. I am happy to say that we have had everywhere a very friendly reception and we have had more successes than failures, though quite a number of proposals are still in the exploratory stage.

Outstanding has been the reaction of a group of oil companies of which Standard of Indiana, Standard of New Jersey, Texas, Socony-Vacuum, and Cities Service have each agreed to contribute \$50,000 a year for five years, while Humble is contributing \$25,000 a year for five years. Several other oil companies have similar proposals under consideration and in the entire group we have thus far had only one unfavorable decision.

In general the arrangements with the oil companies provide for support of research in the fields of nuclear science, physics, chemistry, or chemical engineering. In all cases, there is recognition of the fact that scientific progress and the training of scientists and engineers in these fields will constitute future assets for the oil industry. Also implicit in the agreements is recognition of the fact that our educational and research activities have already in the past proved to be of great value to the industry. The more specific uses of the funds will be mutually agreed upon from time to time during the course of the agreement. The problem of patents, so often an embarrassment, is being handled easily within the policies which we adopted some years ago and which have proved very satisfactory to all concerned. The arrangement is definitely a cooperative one at a high level of understanding of the requirements for long-term success in research and development.

Many other industries have made similar substantial grants-in-aid to the Institute in order to aid our educational and research program. A list of contributing industries includes the following: chemical manufacturing, copper mining, electrical engineering, manufacturers of machinery and equipment, and shipbuilding. A large number of others have given generous support by means of granting fellowship and scholarship aid. It has been most encouraging to note the continued increase in the total amount received from the numerous modest contributors including individuals as well as industries.

In order that the Institute may live generously up to its obligations for keeping the contributing companies informed of progress, for welcoming and aiding the objectives of their visitors, and in general facilitating whatever *quid pro quo* the Institute can offer in the spirit of the agreements with these companies, we have appointed Robert V. Bartz, who is an experienced executive aide in the Laboratory for Nuclear Science and Engineering, to make these contacts and obligations his primary responsibility.

#### THE PROGRESS OF OUR BUILDING PROGRAM

Last Alumni Day we dedicated the new John A. Rockwell Athletic Cage, a major addition to our athletic facilities. This building was made possible largely through the assistance of the Federal Government. Based upon a finding of need by the United States Office of Education that the facility is necessary to provide education and training to veterans, the Bureau of Community Facilities of the Federal Works Agency made available to the Institute a large drill shed which the Navy had declared surplus. The total cost of the facility to the Institute, not including materials and funds provided by the government, is about \$225,000, and for this amount we have a handsome structure providing 33,000 square feet of space for athletic purposes. The building also can be used for meetings and convocations, it being possible to seat 4,000 people or more. Thus

for the first time we have a building where we may have graduation exercises, large alumni gatherings, and student meetings.

The new Senior House, made possible by investment of endowment funds plus a generous half million dollars from the Alumni Fund, has made its mark on the Charles River skyline. It is a striking structure and arousing a great deal of favorable interest. There have been delays in procurement of materials so that it is now barely possible that it will be ready for occupancy in time for the second term of this academic year. It is a building of which we shall be very proud.

The Charles Hayden Memorial Library is still below ground and has been delayed by very difficult foundation conditions. These difficulties have now been surmounted, and construction should proceed rapidly. In connection with the inter-university study of library plans, the description of the Charles Hayden Memorial Library has been widely circulated and has received universally favorable comment, not only because of the very convenient arrangement of its working facilities, but also because of the unusually attractive features of its architecture and planned use.

The building to house the Supersonic Wind Tunnel, provided under a contract with the Bureau of Ordnance of the Navy, has been completed and the office section has been in use since the beginning of the summer. The heavy instrumental equipment is now in process of installation and we expect test runs of this equipment to be made this fall.

Contracts have been let for a small building to house a twelve-million-volt Van de Graaff electrostatic generator designed especially for certain very significant investigations in nuclear science for which this instrument is uniquely adapted. The funds for the high-voltage equipment come principally from the Office of Naval Research, with M. I. T. providing the laboratory building.

As this report is written we are completing arrangements

with the Federal Public Housing Authority to take title to Westgate West, the housing project provided by the government for married veterans who are students at the Institute. Under Public Law 796, projects of this kind can be acquired by educational institutions provided the local municipality approves. The City of Cambridge has formally approved and the Institute expects that it will soon have title to this group of temporary buildings and that it may apply that portion of the rental revenues which formerly went to the government — about \$27,000 a year — toward amortizing the \$150,000 which the Institute invested in preparing the site.

#### OPERATIONS OUTSIDE OF CAMBRIDGE

We do not always stop to remember that a decidedly significant portion of M. I. T. educational and research activities proceeds outside of Cambridge. Most impressive of these is the Brookhaven National Laboratory on Long Island, operated under contract with the Atomic Energy Commission by a membership corporation composed of M. I. T., Harvard, Yale, Columbia, Princeton, Pennsylvania, Johns Hopkins, Rochester, and Cornell universities. This great laboratory is devoted primarily to nuclear science as distinguished from atomic weapons. It provides certain research facilities which are far too costly for any one university, and makes them available to qualified students and staff from all these nine institutions, and others. Several members of our staff, on leave of absence from the Institute, have been working at Brookhaven in the planning and construction phase of these new facilities, including our Professor Philip M. Morse, who has just completed a tour of duty as the laboratory's first director. Vice President James R. Killian, Jr., is the Institute's administrative representative on the board of trustees of this Associated Universities corporation, and Professor J. R. Zacharias is our scientific representative.

In addition to the older chemical engineering practice schools at the Buffalo Station in the Lackawanna plant of the Bethlehem Steel Company, at the Bangor Station in the plants of the Eastern Corporation and the Penobscot Chemical Fibre Company, and at the Parlin Station in the cellulose products plant of the Hercules Powder Company, we this summer began a practice school for engineers in the various interested departments at the atomic energy laboratories and production plants at Oak Ridge, Tennessee, through an arrangement with the Carbide and Carbon Chemicals Corporation. These practice schools all take students at the postgraduate level, who utilize the great industrial plants as laboratories under the supervision of resident staffs of instructors.

We operate cooperative courses in electrical engineering with A. T. and T. in Boston, Haverhill, New York, Long Island, and Kearny, New Jersey; with General Electric at Schenectady, Lynn, Pittsfield, Bridgeport, Philadelphia, Erie, Syracuse, and Milwaukee; with Philco in Philadelphia; with General Radio in Cambridge; with Boston Edison; with American Gas and Electric Service Corporation in New York, in Canton, Brilliant and Philo, Ohio, and in Mishawaka, Indiana. Similar cooperative courses have been authorized in mechanical engineering which are expected soon to go into operation, notably with the Westinghouse Electric Corporation. The students in cooperative courses are employed by the company and carry an overtime program of studies under instructors. The students in the practice schools are full-time students.

Similarly, we have the Civil Engineering Summer Surveying Camp near East Machias, Maine, and the newly acquired Geology Summer School operated in cooperation with the Department of Mines of the Province of Nova Scotia, at Antigonish, Nova Scotia.

Finally, we have several field stations: one at Fort Devens; one at the Bedford Airport; one on top of Mount Evans,

Colorado, operated jointly with several other universities; one near Lexington, Massachusetts, having quite remarkable facilities for certain special kinds of work and providing the location this summer for an exceedingly important study on a problem of great national concern; and the newly acquired property of the late Colonel E. H. R. Green at Round Hill, South Dartmouth, Massachusetts, which was given to the Institute by Colonel Green's sister, Mrs. Matthew Astor Wilks, on July 1 of this year.

On this Round Hill estate, where the Institute was conducting some very significant research projects during the later years of Colonel Green's lifetime, we are now in the process of setting up the first of a group of research projects of a type for which that location is peculiarly well fitted. We still have the problem of deciding on an adequate use for the very large and magnificent stone house. Between 150 and 200 people could easily be given bedroom space on the two upper floors, leaving the first floor free for classrooms, laboratories, conferences, or what not. Thus far our activities have been limited to the use of some of the smaller outbuildings or cottages on the estate. We have envisaged several uses of very real value and unique character befitting the location, but substantial operating funds would be required, which we do not have because of the more pressing needs of those projects, already under way, which are the special targets of our present fund-raising effort.

Summing up these outside operations, we have them going on in twenty-seven places in eleven states and Canada. Each of these field stations is located where it is for a very definite reason, and permits us to carry on work of an important type which could not be done in Cambridge. With the exception of the very new Round Hill station, all these outside operations are practically either self-supporting or financed by funds provided for the special purpose.

**SPECIAL EDUCATIONAL PROJECTS**

I had originally hoped to discuss at this time the report of our faculty committee on its two years' intensive study of our educational objectives and procedures. However, because of the magnitude and importance of the task, the decision was reached to postpone the report until some time in the coming year, it being felt that soundness of conclusions was far more important than a few months more or less in their timing. When this study shall have been completed we shall all feel an increased sense of confidence and enthusiasm, whether or not the committee recommends substantial changes in our operations.

With renewed generous financial support by Mr. Alfred P. Sloan, Jr., through his foundation, the Alfred P. Sloan Foundation Fellowship Program in industrial management has been reauthorized for a period of years, after having been abandoned during the war because the men who would have been involved in it were too urgently needed for war service. We are convinced, by testimony and results, that this has been the outstanding program in the country for expediting the development of promising young executives. A group of fellows will be selected during the coming months to begin their active program next summer, under the executive supervision of Professor Gerald B. Tallman. In conducting this program, our Department of Business and Engineering Administration has always had the very generous cooperation of the top executives of many business concerns in the selection of candidates and participation in seminars, plant visits, and thesis studies.

A unique program, called the M. I. T. Foreign Student Summer Project, was carried on during the past summer term under the auspices of a group of regular M. I. T. students. It brought to the Institute sixty-two students from fifteen foreign countries, with guest privileges at the Institute to use library and laboratory facilities and attend classes as listeners.

These foreign students were selected from among a great number of applicants with the very able assistance of representatives of our State Department in the various countries and with the final selection being made by our M. I. T. student committee with advice from our Admissions Office. In a variety of ways and by ingenuity and hard work, our student committee succeeded in essentially financing the project to the extent of some \$90,000 in funds and services. The Institute gave tuition fee privileges as guests, of course without any academic credit involved. The fraternity houses provided rooming accommodations. A majority of the foreign countries provided transportation in their own steamship lines. Funds for food and incidental expenses and also arrangements for a variety of plant visits and entertainment were raised by our student group, by their own contributions and sympathetic individuals and organizations. The project has won wide acclaim in the press and among the student groups of other institutions, and our State Department officials have told us that it created an excellent reaction in the countries from which these students were selected. These foreign students were all at the post-graduate level and therefore mature enough to profit well by the experience.

This Foreign Student Summer Project was probably more effective as a demonstration of international friendship and help than as a plan for education. So far as our educational program with foreign students is concerned, the Institute last year had three hundred and two students from forty-seven foreign countries, not including Puerto Rico, Hawaii or Alaska. The largest contingents were from Canada, China, Norway, India, Cuba, France, Brazil, Mexico, and England, in that order. There were none from the U. S. S. R., Yugoslavia, Rumania, Bulgaria, or Japan.

Also of real educational significance is the new program of intramural and undergraduate athletics which has been

instituted under the regime of our first Director of Athletics, Ivan J. Geiger, and the new Athletic Administrative Board appointed by the President. With retention as before of the essential feature of undergraduate management of their activities, but with the experience and advice of Mr. Geiger, emphasis has been placed on two factors: first, the attempt to interest every student in some type of athletics, and, second, substitution for the pre-war freshman compulsory physical training of a program whereby every freshman, under experienced teachers, achieves some proficiency in one or more types of athletic sport which can give him continued satisfaction after leaving college. The results of the first year of this new program have been decidedly gratifying.

#### SALARIES AND WAGES

The cost of living as measured by the Consumers' Price Index had risen, as of April of this year, nearly 70 per cent since 1939 — and is now still higher. Actually in American colleges increasing compensation of faculty members has fallen far behind the rising cost of living. At M. I. T. our average monthly academic staff salary rate has gone up about 30 per cent since 1939. By means of the annual salary plan instituted at the end of the war, and involving summer-term duties which had not been included before, the total assured take-home pay of our faculty has increased about 45 per cent. It should be pointed out, however, that many of our staff on the old nine-month plan earned extra compensation during the summer, both at the Institute and outside, opportunity for which has shrunk or vanished under the twelve-month plan. Thus, while the annual plan benefited the faculty as a whole, it may not in individual cases have increased the total compensation, and the actual average compensation from all sources has not increased by as much as 45 per cent. Also in this period the tuition has been raised by 16 $\frac{2}{3}$  per cent.

## STATISTICS OF THE YEAR

*Finances.* The Institute's endowment and other funds now have a total book value of \$48,000,000, with a market value of \$53,000,000. Plant assets stand at \$19,600,000, about \$1,200,000 above last year. The yield on investments based on book values increased somewhat over the previous year with the allocation to funds at the rate of 4 per cent.

The cumulative deficit for the Institute's entire history is \$21,118. The year 1947-1948 ended with an excess of income of \$20,524 on operations totaling over \$21,000,000.

The volume of sponsored research was \$13,300,000, compared to \$9,825,000 in the previous year and \$24,000,000 in 1946. The following comparative percentage distribution of the major elements of income and expense shows the marked effects of the sponsored research on the Institute's fiscal operations. Of special significance is the low percentage of our total expenditures now required for General Administrative expense and Plant Operation:

**DISTRIBUTION OF MAJOR ELEMENTS OF INCOME AND EXPENSE  
1939-1940, 1946-1947, 1947-1948**

	INCOME		
	Per Cent		
	1939-1940	1946-1947	1947-1948
Tuition.....	48	20	20
Investments.....	32	6	6
Gifts and Other Funds.....	7	12	8
Research Contracts:			
For Direct Expense.....	3	49	55
For Indirect Expense.....	0	6	5
Dormitories, Dining Services.....	10	7	6
	100	100	100

	EXPENSE		
	Per Cent		
	1939-1940	1946-1947	1947-1948
Academic.....	61	27	24
General Administrative.....	13	7	7
Plant Operation.....	10	8	6
Research Contracts:			
Direct.....	3	49	55
Medical and Other.....	4	2	2
Dormitories, Dining Services.....	9	7	6
	100	100	100

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.....	1,149,551	2,191,822

Contributions to the Alumni Fund were the highest in its eight-year life, totaling \$224,634 from 9,789 alumni. This represented an increase in contributions of almost 22 per cent over 1947, the number of contributors remaining about the same.

*Enrollment.* The total student body reached an all-time high of 5,662 last year, compared with the official count of 5,172 on November 1, 1946. Registration this fall will decrease to 5,000. Of the total last year, approximately 54 per cent were veterans, as compared to 60 per cent for the preceding year; approximately 22 per cent were married, as compared to 25 per cent for the preceding year. Sixty-seven women students were enrolled. A total of 223 American colleges and universities and 88 foreign institutions were represented in the Institute student body. Students from 47 foreign countries were enrolled.

#### ENROLLMENT AT M. I. T.

	<i>Freshmen</i>	<i>Total Undergraduate</i>	<i>Total Graduate*</i>	<i>Total</i>
1935-1936.....	561	2,018	522	2,540
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 (est).....	825	3,600	1,400	5,000

\*A large part of the enrollment in the Graduate School is on a part-time basis. For example, of the 1,524 graduate students in 1947-48, 40 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 on the Loan Fund continued below normal, primarily because of the availability of scholarship aid to veterans from the Federal Government. Undergraduate scholarships totaled \$67,480, almost \$12,000 more than 1946-1947; loans to all students amounted to \$49,000, an increase of \$20,000 over the previous year but still far below the \$163,000 loaned in 1939-1940. On the other hand, graduate scholarships and fellowships increased materially, totaling \$181,791, compared to \$128,519 a year ago. The increase was accounted for in large measure by the increase in the number of industrial fellowships. The Student Employment Bureau of the Technology Christian Association placed 391 students in part-time jobs and they earned a total of \$75,507 compared with \$70,674 earned by 386 students in 1946-1947.

*Changes in Personnel.* The Corporation ranks have been seriously depleted during the year and the members have been much saddened by the deaths of three of its members. Gordon S. Rentschler, Life Member since 1938, died on March 3; Albert J. Browning, Alumni Term Member since 1946, died on July 2; and Harry C. Wiess, Special Term Member since 1945, died on August 26. They were among our most faithful attendants and helpful colleagues and they will be sorely missed.

Other losses come about by reason of term expirations, as follows: Phillips Ketchum, Special Term Member since 1943; Francis A. Barrett, Walter J. Beadle, and Donald F. Carpenter, Alumni Term Members since 1943.

New Special Term Members are William A. Coolidge and Beauchamp E. Smith, and new Alumni Term Members are Raymond H. Blanchard, Thomas D'A. Brophy, and Thomas H. West. C. George Dandrow replaces Raymond H. Blanchard as President of the Alumni Association.

Faculty changes have been numerous. Professor Albert A. Schaefer of the Department of Business and Engineering

Administration died on October 23; Professor Francis M. Currier of the Modern Languages Department, on February 11. Our emeritus ranks were depleted during the year by the deaths of Professors C. Francis Allen, Stephen A. Breed, Robert C. Eddy, W. Spencer Hutchinson, William H. Jones, and Arthur G. Robbins.

As this report goes to press, word comes of the death of Professor Charles E. Locke on September 24. Technology men all over the world will be saddened by his loss, for both in his capacity as a professor and as secretary of the Alumni Association, he had maintained warm and friendly contacts with more alumni than perhaps any other person associated with the Institute.

Retirements under the age rule included Robert G. Caldwell, Dean of Humanities; Warren K. Lewis, Professor in the Department of Chemical Engineering; and Addison F. Holmes, Associate Professor in Mechanical Engineering. All will continue to serve on a part-time basis as Lecturers during the coming year.

Dr. Caldwell, former United States Minister to Portugal and later Minister to Bolivia, joined the Faculty when he was appointed Dean in 1939. Under his leadership the Division of Humanities has contributed notably to the cultural resources of the Institute.

Dr. Lewis has been a member of the staff for some forty years. He joined the staff as an Assistant in Chemical Engineering in 1905 and served as head of his Department from 1920 until 1929 when, at his own request, he returned to his research and teaching. The prestige of the Institute's Department of Chemical Engineering rests in no small degree on the distinguished contributions which Dr. Lewis has made in teaching and research. He holds the Medal for Merit for outstanding service to the United States during the war.

Professor Holmes joined the staff of the Institute as an

Assistant in Mechanical Engineering in the year of his graduation, 1904. His promotion to the rank of Associate Professor of Applied Mechanics came in 1925. Professor Holmes is widely known as an excellent teacher.

Resignations were accepted from the following: Professors Wyman P. Fiske and Douglas M. McGregor; Associate Professors William C. D. Bridges, Dorwin P. Cartwright, Hollis Dakin, Jack F. Lane, Ronald Lippitt, and George G. Marvin; Assistant Professors H. Stanley Bennett, Leon Festinger, Alexander M. Grant, Harold K. Graves, David P. Herron, Irving Knickerbocker, Edward S. Lamar, Arthur D. McVoy, Frank J. Mehringer, Robert Plunkett, John C. Quinn, Keith E. Rumbel, Frank H. Senn, Rodney H. Smith, and Harlan Turner, Jr.

Promotions to the rank of full Professor were as follows: Richard M. Bissell, Jr., Harold E. Edgerton, William C. Greene, Ernst A. Hauser, William H. Hawthorne, John A. Hrones, Witold Hurewicz, Arthur T. Ippen, Douglas M. McGregor (later resigned), and Shatswell Ober.

The following were promoted to the rank of Associate Professor: Douglas P. Adams, Lawrence B. Arguimbau, Lieutenant Colonel Herrick F. Bearce, Michael B. Bever, Raymond L. Bisplinghoff, Major John C. Bolton, John T. Burwell, Jr., George D. DeSantillana, Nicholas J. Grant, Delbar P. Keily, Zdenek Kopal, Yuk-Wing Lee, Laszlo Tisza, Lieutenant Colonel Curtis L. Varner, William R. Weems, and Henry J. Zimmermann.

Promotions to the rank of Assistant Professor were as follows: James N. Addoms, Holt Ashley, Carroll J. Brown, Benjamin J. Dasher, Robert H. Eustis, David H. Frisch, Robert L. Halfman, Robert J. Hansen, Herman Klugman, William A. Reed, Matthew L. Sands, Howard Simpson, Malcolm W. P. Strandberg, Charles Gardner Swain, and Robert W. Williams.

New faculty appointments included the following: Judge Charles E. Wyzanski, Jr., Visiting Professor in Business and Engineering Administration; Associate Professors Charles P. Kindleberger II, in Economics and Social Science, and James A. Murray in Building Engineering and Construction; Assistant Professors Alan S. Michaels in Chemical Engineering, Morris A. Adelman in Economics, Irvin S. Cohen in Mathematics, Captain James E. Foster and Captain Harold Grossman in Military Science, S. Curtis Powell in Naval Architecture and Marine Engineering, and Lockhart B. Rogers in Chemistry.

Administrative changes, necessitated chiefly by the retirement of Dean Caldwell, included the appointment of Professor John E. Burchard to the post of Dean of Humanities; Dr. Vernon D. Tate, Institute Librarian, was appointed Director of Libraries, succeeding Professor Burchard; and Professor Burnham Kelly succeeded Professor Burchard as Director of the Bemis Foundation. Robert M. Kimball, Assistant to the President, and a member of the administrative staff since 1933, was granted leave of absence for a year to accept the post of Administrative Associate Director of the Los Alamos Scientific Laboratory; Henry Loomis has joined Malcolm G. Kispert as Assistant to the President; John W. Sheetz, III, resigned as Assistant to the Director of Admissions and has been succeeded by David A. Dudley; Malcolm M. Hubbard was appointed Assistant Director of the Laboratory for Nuclear Science and Engineering.

Respectfully submitted,

KARL T. COMPTON

October 4, 1948

*President*

## ADMINISTRATIVE OFFICERS

### DEAN OF STUDENTS

No college or university can fail to give full recognition to the significance of attitudes born of the social and physical environment of its students. Here more than from the content of any curriculum are bred those traits of character and personality, the habits and manners that make for self-reliant, responsible citizenship. The courses of our curriculum educate professionally the scientist and engineer. The environment in which the student lives informs his future home and family and the quality of his neighborliness.

It is because of this conviction that the Office of the Dean of Students is concerned with the implementation of the recent resolution of the Corporation stressing the need for improvement of living conditions, athletic and recreational facilities and the enrichment of the broadening influences of student life.

#### *Student Life and Activities*

One of the chief concerns of the Office of the Dean of Students is the stimulation of student responsibility for extra-curricular affairs. It is our opinion that during the past year there has been a continued growth within the undergraduate body of the quality of individual and group responsibility for which we are striving. Education in a democracy must lead to a high sense of social responsibility. It is through a very large number of extra-curricular activities that we give our students the opportunities to develop through experience the qualities of leadership, cooperation, and understanding of their fellow men so essential to citizenship in a free society.

Among the many examples of student initiative and responsibility three are particularly worthy of mention.

In an attempt to create more interest in athletics a group of students planned and organized what may become a permanent event in our annual calendar: "Tech's-a-poppin." This is the name given to a winter week-end program of inter-collegiate athletic events, fraternity house parties, dances, and a climactic rally at which time a Technology Queen is

chosen. There is no doubt that the student response to the first "Tech's-a-poppin" guarantees a continuing of this important new event in the social and athletic calendar.

Open House was held again for the first time since before the war. There were many minor problems because of the fact that none of the student chairmen had ever experienced the innumerable difficulties of planning and organization. In spite of this, and because of thorough cooperation from the Faculty and Staff Advisory Committee, the program was thoroughly successful. Eighteen committees involving over 1,500 students cooperated under the leadership of two seniors whose theses recorded their experience. (Copies of these are available at Dewey Library.)

The most noteworthy evidence of student responsibility was, however, the conception and organization of the M. I. T. Foreign Student Summer Project. A full report of this project has been published elsewhere but it should be mentioned here as the outstanding program of the year, planned and promoted entirely by students with a minimum of advice and help from Faculty or Administrative Officers. The opportunity afforded our own students to share in the development of this project was not the least of its values.

The Institute Committee established, in cooperation with the Dean of Students, a Judicial Committee to act on all cases of misconduct either on its own initiative or by referral from the Institute Committee or the Dean of Students. The Institute Committee moved its office from the basement of Walker Memorial to one of the first floor front rooms which with the other social rooms were completely redecorated during the winter. A full-time secretary was employed to assist the officers of the Institute Committee and the various activities of Student Government.

*Publications.* All undergraduate publications experienced financial difficulties because of increased production costs, *The Tech's* and *Technique's* situation being the more serious. The Advisory Council for Publications and the Dean of Students were instrumental in the reestablishment of closer operating relations among the several editors and managers and the institution of plans for future operations consistent with present financial limitations.

*Veterans Organization.* Early in the year the M. I. T. Veterans Association voted to disband. The feeling that veterans had fewer special problems and, therefore, less reason for a separate organization, and the quickening of the pace of the many undergraduate activities which command the time and interest of all students appear to be factors contributing to the end of this short-lived but active organization.

*Veteran Enrollment.* During the past year the proportion of veterans continued to make up more than one-half of the student body. It is expected that the numbers of veterans will begin to show a marked decrease during the next year with the completion of the accelerated schedule at the close of the 1948 Summer Session.

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

Tabulation 1	<i>Veterans Enrolled under P.L. 16 or 346 and their Percentage of Total Registration</i>	
	<i>1946-1947</i>	<i>1947-1948</i>
Fall Term.....	3,048 (59%)	3,023 (54%)
Spring Term.....	3,146 (60%)	2,809 (53%)
Summer Term.....	1,587 (60%)	1,027 (48%)

*Housing.* More housing for our students continues to be one of our greatest needs. Until a large majority of our students live together we shall not have the quality of community spirit that prompts group and individual responsibility. The new Senior House will be a long step in the right direction but it will accommodate fewer students than have been living in the temporary barracks.

As the accompanying table shows, even with anticipated decrease in enrollment in the coming year, we shall still have permanent housing facilities for only half of our students.

Tabulation 2	Number	Per Cent
Dormitories.....	711	13.1
Barracks.....	500	9.1
Graduate House.....	455	8.3
Student Houses.....	74	1.4
Westgate and Westgate West.....	270	4.9
Fraternity houses.....	682	12.5
Rooming houses or at home.....	2,774	50.7

A study made of all freshman ratings for the fall term indicated that those living in our permanent dormitories maintained an average of 3.43; those in the temporary barracks, 3.34; commuters, 3.14. Although figures for one year are not sufficient evidence, here is one indication that students living together on campus can do better work than those who commute from a distance.

The Westgate and Westgate West communities for married veterans continued to be highly beneficial to our total student life. With the financial aid of the Technology Christian Association a nursery school and a laundry were established. These have been entirely managed by committees of the Westgate Council and have proved completely satisfactory.

*Fraternities.* Six hundred eighty-two students lived in fraternity houses during the year. The Interfraternity Conference continued to strengthen its organization and purposes, notably by the establishment of its own Judicial Committee to parallel that of the Institute Committee to handle cases of misconduct in fraternity houses. All fraternities remaining open during the 1948 summer term agreed to give free housing to foreign students attending the special M. I. T. Foreign Student Summer Project.

A special committee of the Interfraternity Conference and alumni representatives was established to discuss with the Dean of Students long range plans for a fraternity housing program either on the west campus or on nearby land in Cambridge.

*Freshman Assemblies and Advisory Program.* The year marked the beginning of two new programs intended to assist freshmen to understand better their new environment. During the fall term four Freshman Assemblies were held in the Armory at which occasions the class had an opportunity to hear officers of the Administration, alumni and student leaders speak to them about life and work at M. I. T.

In the second term approximately ninety-five members of the Faculty, at Dean Pitre's suggestion, volunteered to serve as advisors to freshmen and each was given six students. Although this program was begun late in the year and not all freshmen were assigned to advisors, plans were laid for a better organized advisory system for freshmen in the future.

*Freshman Athletic Program.* With the appointment of a Director of Athletics a year ago, there was considerable discussion concerning the establishment of a required Athletic Program for Freshmen. Early in the summer Mr. Ivan J. Geiger submitted plans for a program of instruction in a number of different sports varying with the seasons. The first classes met in November and in spite of what had seemed to be adequate preparation there followed considerable confusion and misunderstanding. A petition to the Faculty to abolish the new course, circulated throughout the freshman class, gained over five hundred signatures. The Committee on Undergraduate Courses, after careful consideration of the petition, recommended to the Faculty to continue the course for another year and then to review the matter in the light of future experience. Before the final decision of the Faculty most of the opposition from the freshman class had been overcome by a better understanding of the purposes and methods of the course.

*Athletics.* Soon after Mr. Geiger officially began his duties as Director of Athletics in the fall, a new Athletic Board was appointed to assist him and the M. I. T. Athletic Association. The Board consists of two Faculty members, two alumni members, three student members of the M. I. T. Athletic Association, the Director of Athletics, the Medical Director and the Dean of Students, *ex officio*. Dr. H. Guyford Stever, Assistant Professor of Aeronautical Engineering, was appointed Chairman. Under the capable guidance of Mr. Geiger and the Board the program of athletics, both intercollegiate and intramural, was greatly expanded and enhanced during the year.

This year also witnessed notable improvements and additions to other existing athletic facilities. The John Rockwell Athletic Cage, named in honor of Dr. John A. Rockwell, who served M. I. T. and the student body faithfully for forty-nine years on the former Alumni Advisory Council, was officially dedicated on Alumni Day this spring. One half of the floor area will provide suitable indoor practice space for soccer, lacrosse, baseball, softball, badminton, volley ball, golf, etc. The other half of the area encloses a one-twelfth of a mile cinder track, vaulting and jumping pits, and shot put circle. The regular use of the Massachusetts Avenue Armory, made possible

by an arrangement negotiated early in the year, was another major addition.

Approximately seven acres of playable area were added to recreation space on Briggs Field by leveling, loaming and seeding the area at the new entrance to Briggs Field on Massachusetts Avenue and areas adjacent to the new tennis courts. This additional playing space has made possible the relocation of two practice lacrosse fields and one practice soccer field, the construction of four new softball fields and one regulation baseball diamond.

In 1947-1948, 1,717 M. I. T. students made good use of these increased facilities competing in intercollegiate or intramural sports. In addition, 575 freshmen were enrolled in the required Athletic Program for Freshmen. Approximately 800 students took part in seventeen different varsity and freshman intercollegiate sports, playing in 233 contests. There were six different intramural sports programs during the year in which over 2,000 students participated. Approximately 25 per cent of each living group played in one or more sport. 177 different teams played 563 games.

To handle new coaching loads caused by the freshman program, increased student participation, and the addition of a new sport, three full-time coaches were added to the athletic staff. Warren Berg, A.B., Harvard '45, was appointed baseball coach and assistant basketball coach; Arne Arnesen, B.S., University of Wisconsin '47, was appointed to assist Mr. Oscar F. Hedlund as coach of track, field events and cross country; Benjamin Martin, Syracuse '36, was appointed coach of lacrosse and hockey. All three will also instruct in the freshman athletic program.

In the spring a new sport, baseball, was formally introduced to the intercollegiate program. Both freshman and varsity schedules were maintained with forty men on the squads. The new baseball field and the cage will help greatly the development of this sport for which student interest has been very high.

*Musical Clubs.* Under Professor Klaus Liepmann's able direction the extra-curricular musical activities gained unprecedented popularity. Over 300 students were enrolled in the

various Musical Clubs' projects. The Glee Club gave several concerts during the past season. Highlights were combined concerts with the Mt. Holyoke Glee Club and the Radcliffe Choral Society and "Tech Night at the Pops." The Symphony Orchestra gave two concerts and, in addition, participated in two performances of Handel's *Messiah* and one concert of Bach cantatas. It also provided instrumental support for the Tech Show, which again was written, composed and produced entirely by students. The purchase of several phonographs, records, music literature, scores, three new pianos, and orchestra instruments have encouraged an increasing interest in music. The All Tech Sing enjoyed its usual popularity this year with fifteen vocal groups from the dormitories, fraternities and commuters competing before a large audience for the awards.

*Hobby Shop.* During the year the Hobby Shop increased its space approximately 50 per cent, added a considerable amount of new equipment, especially machine tools, and completely rearranged the shops. Great credit should be given to Mr. Joseph MacAllister and Mr. Robert McCadden, and members of the Hobby Shop, who did a large portion of the work themselves.

*Freshman Camp.* Held the weekend before the opening of the fall term at Camp Wonderland in Sharon, Massachusetts, the Technology Christian Association sponsored Freshman Camp was most successful: 565 freshmen, all that the camp could comfortably accommodate, attended. Of this number, seven were freshman coeds, the first to attend the camp. Fifty counselors, under the direction of the Technology Christian Association student staff and Mr. Wallace M. Ross, all entered enthusiastically into the weekend orientation activities. Mr. Geiger was very valuable in promoting and coördinating an increased program of athletics for the camp.

#### *Student Aid*

Distribution of student aid to undergraduates during 1947-1948 compared with 1946-1947 is set forth in Tabulation 3.

The tabulation (p. 34) includes only grants from our regular scholarship endowment. However, other agencies have contributed better than \$22,000 to undergraduates this past

Tabulation 3	1947-1948		1946-1947	
	Number	Award	Number	Award
Freshman Scholarships.....	135	\$33,675	137	\$30,850
Other Undergraduate Scholarships	189	33,805	180	24,892
<b>Total Scholarships.....</b>	<b>324</b>	<b>\$67,480</b>	<b>317</b>	<b>\$55,742</b>
Undergraduate Loans.....	69	35,305	47	20,702
<b>Total Aid to Undergraduates.....</b>	<b>370*</b>	<b>\$102,785</b>	<b>338*</b>	<b>\$76,444</b>

\* Allowing for individuals receiving both scholarship and loan.

academic year. The James Melvin Trust granted aid to twenty-six undergraduates totaling \$9,275, The Teagle Foundation, Inc. of New York to eight students totaling \$5,800, The

#### *Cumulative Record of the Technology Loan Fund*

Tabulation 4	At June 30,	At June 30,	Net Changes
	1948	1947	During 1947-1948
<i>Items of Outgo</i>			
Number of Men Receiving Loans.....	2,787	2,694	up 93
Total Amount Loaned.....	\$1,980,610	\$1,931,810	up \$48,800
Average Per Capita Loan.....	\$711	\$717	down \$6
<i>Items of Income</i>			
Number of Men Whose Indebtedness Has Been Completely Discharged.....	2,060	1,978	up 82
Principal Repayments in Advance.....	\$563,131	\$551,746	up \$11,385
Other Principal Repayments.....	\$1,057,205	\$1,005,951	up \$51,253
<b>Total Principal Repayments.....</b>	<b>\$1,620,336</b>	<b>\$1,557,698</b>	<b>up \$62,638</b>
Total Principal Matured, Considering "Advance Repayments" as Matured When Paid.....	\$1,652,187	\$1,591,405	up \$60,782
<i>Collection Ratio, i.e., Percentage of Total Maturities Paid.....</i>	98.1	97.9	up 0.2
Matured Principal in Arrears.....	\$25,846	\$27,978	down \$2,132
Actual "Written Off" Accounts.....	\$6,005	\$5,729	up \$276
Total Maturities Unpaid.....	\$31,851	\$33,707	down \$1,856
Percentage "Written Off" to Total Loans.....	0.3	0.3	...
Percentage Matured Loans in Arrears plus Amount Written off to Total Loans.....	1.61	1.74	down 0.13
Interest Received.....	\$219,464	\$212,174	up \$7,290
Times Interest Received to Matured Loans in Arrears plus Amount "Written Off".....	6.9	6.3	up 0.3
<i>Notes Outstanding.....</i>	<b>\$354,269</b>	<b>\$368,383</b>	<b>down \$14,114</b>

Foundry Educational Foundation to three students, totaling \$2,100, the Steel Founders Society to three students totaling \$4,500, and the Douglas Aircraft granted \$500 aid to one student.

From both graduate and undergraduate students, the Loan Fund Board received 104 applications during 1947-1948 and acted favorably upon 93, or 89 per cent, \$48,800 being loaned. For 1946-1947 the corresponding figures were: 76, 68, 89 per cent, and \$28,977. Repayments to the Fund during 1947-1948 were \$62,638 on principal account and \$7,290 for interest, or a total of \$69,928. Thus for the seventh year in the history of the Fund, repayments on principal account exceeded the total of loans made, the excess being \$13,832.

The cumulative record of the Fund from its establishment in 1930 up to June 30, 1948, appears in Tabulation 4 (p. 34). It is notable that the \$219,464 received for interest up to the end of 1947-1948 was over six times the amount of matured principal then unpaid, \$31,851.

The Student Employment Bureau of the Technology Christian Association placed a total of 391 individuals, who earned \$75,507; during the previous year, 386 individuals were placed who earned \$70,674.

### *Conclusion*

This office has been charged with responsibility for the general welfare, including the athletic program, of the student body. My experience during the year and a half that I have served as Dean of Students has led me to convictions as to the necessity of providing certain additional facilities and services for our student community. It is heartening to know that many, if not all, of these are already receiving careful consideration by the Corporation in its long range future planning.

I list here the items that, in my opinion, are of highest importance in our endeavors to build an ideal environment for our students.

- a) A student, fraternity and Faculty housing project of approximately two thousand units on the Westgate West site.
- b) An auditorium and little theatre.
- c) A considerably increased lecture program to bring to our students more frequently the stimulation of music and art,

people and ideas not directly within their fields of professional interest.

- d) A new gymnasium and crew house.
- e) Additional playing fields, tennis courts and campus on the Westgate site.
- f) A small chapel with an adjacent library of religious literature.
- g) A greatly improved student advisory system upon which could be built closer student-faculty relations.
- h) A psychometric-diagnostic service to assist the counselling program of the Dean of Students and the Medical Department.
- i) A new Student Union building on the west campus.

EVERETT M. BAKER

#### DEAN OF THE GRADUATE SCHOOL

The large number of graduate students in recent years has brought into focus several problems of graduate instruction, consideration of which by the Committee on the Graduate School has resulted in certain changes in its Rules and Regulations. The spirit of these revisions is more important than the actual changes. They endeavor to encourage in the atmosphere of a professional school the widest possible opportunity for advanced study and investigation in any field of scientific or engineering development, irrespective of the apparent boundaries of departmental interests.

The principal changes in administrative procedures confer more authority as well as responsibility upon graduate departmental registration officers, who may now arrange programs with less restriction by arbitrary rules than heretofore. These officers meet monthly with the Dean as the Committee on the Graduate School, which by free exchange and discussion of ideas formulates the strategy of its over-all pedagogical policy, leaving the tactical details to the operational level of action, in which as individual registration officers these members of the Faculty participate.

In addition to specialized professional competence built upon a broad foundation of fundamentals, the recipient of an

advanced degree from M. I. T. is expected to have acquired a reasonably intelligent understanding in non-professional fields, which for the engineer or scientist may include such areas as those of economics, psychology, human relations, international affairs, letters and the Fine Arts, in reasonable distribution.

A significant aid in accomplishing this phase of education at the Institute is afforded by the wide choice of skillfully presented subjects offered under our Division of Humanities.

Among the revisions in the Rules and Regulations are the following. Requirements for admission to graduate work in respect to mathematics and physics may be modified by Departmental Committees on Graduate Students where regular stated requirements are more stringent than the proposed work of a student requires. Such departmental modifications are set forth in the Catalogue from time to time, and any exceptional case which warrants special treatment may be presented to the Committee on the Graduate School by any interested department.

The former listing of subjects of instruction as either "A" or "B" for graduate student credit has been simplified by dropping the "B" classification. A new statement of minimum requirements for the Master's degree has been issued to include an approved program of at least 96 units, of which 72 units, including thesis, shall be graduate "A" subjects, the remaining 24 units to be any subjects, of "A" classification or not, which are most appropriate for a particular student's objectives in the light of his previous training and experience.

For a doctorate no changes have been made, but there is general agreement among graduate registration officers that the purpose of the Minor requirement is best met when the field of the Minor is distinct from and not directly ancillary to the Major field. Approved Minors are designed to contribute broadly toward professional and civic leadership rather than to sharpening technical competence.

Graduate Student Seminars in Philosophy, Famous Books, Industrial History, Economic Problems, International Relations and Psychological Concepts, which were announced in last year's report, have proved valuable and popular. Note-worthy is the fact that each group of students which has studied

under Professor Bavelas in his seminar on Psychological Concepts has petitioned to be allowed to continue the study at a more advanced level, as a result of which the advanced seminar has been added for the next academic year.

Research supported by contracts with governmental agencies has provided unusual opportunities of great educational value to graduate students. The physical resources for experimentation under these conditions are often far greater than would otherwise be possible. In certain instances, this type of investigation permits participation in group research, a form of investigation which became recognized during the last war as exceedingly effective.

An extensive survey of graduate student participation in contract research has developed the opinion that there is no educational problem in such participation posed by the contract sponsorship of such work. In student thesis work under any condition, much depends upon the motivation of the thesis supervisor. The effective supervisor does not lose sight of the fact that his primary role is that of educator, and that his responsibility is to bring out in students those skills and capacities which contribute to creative professional performance. The problem of thesis supervision is a pedagogical problem, and the accident of sponsorship of the research undertaken is not significant.

For the students in the Graduate House, local self-government in respect to behavior and House activities was formally recognized during the past year. This belated recognition of the responsibility of young adults in this academic community is in line with the established policy of the Institute toward its students.

Fellowships for graduate students provided by Industry have been increased in number, and in many instances in amount, following the rising cost of living. On April 1, 1948, there were available sixty-five such industrial fellowships paying \$116,965, an increase of 30 per cent in number over last year and of 42 per cent in total dollar value. The mean value of this group of fellowships is just under \$1,800. Recently established awards generally provide \$1,200 for maintenance of an unmarried student and \$1,800 for a married student with tuition in addition.

Institute funds available for graduate student scholarship aid in 1947-1948 amounted to \$50,820, an increase of ten per cent over last year, due principally to certain drafts made upon unexpended accumulation of scholarship fund earnings. This increase cannot be continued at this rate without serious depletion of reserves.

The scholarship situation has been aided by the payment of part tuition from the Veterans' Administration in behalf of the beneficiaries under Public Law 346. For those veterans who have been unable to meet full tuition charges through the supplementary Government payments authorized by the Veterans' Form 1950-A, we have awarded not more than \$100 per term toward tuition. Now that the proportion of such beneficiaries in the Graduate School has begun to diminish, an increase in the number and amount of requests for aid is anticipated. More industrial fellowships are therefore desirable, and it is to be hoped that present sponsors will be willing and able to continue this very valuable assistance to our graduate educational program.

The total registration in the Graduate School in November, 1947, was 1,524. However, 154 of these took only one subject per term and approximately 40 per cent of the remainder held academic staff appointments at the same time as graduate student status, so that the academic load created by them is much less than would be indicated by the total number of students.

During the twelve months preceding July 1, 1948, scholarship assistance in the sum of \$142,702 was awarded to 197 recipients. In the same period there were conferred 612 advanced degrees, as follows: Doctor of Philosophy, 74; Doctor of Science, 40; Master of Science, 475; Master in Architecture, 15; and Master in City Planning, 8. This includes degrees awarded in September, 1947, subsequent to the previous year's report.

It seems probable that the annual increase in size of the Graduate School of recent years should not be permitted to continue unchecked. The School is now as large as present facilities, staff, and finances warrant.

The Institute continues to cooperate with the Armed Forces in providing graduate work for qualified officers of the

Army, Navy and Air Force in a variety of fields of science and engineering for which its facilities are best adapted. The number of such officers in the Graduate School in June, 1948, was 191.

Applications for admission in the next academic year are more numerous than ever before. The need for scientists and engineers with advanced academic training is reflected by an unusually favorable employment situation. Applicants from foreign countries are still several times as numerous as permissible acceptances. The high selectivity of admission under these conditions is reflected in excellent student performance. It is a pleasure and a stimulation to the Faculty to work with these young men of high promise.

JOHN W. M. BUNKER

#### REGISTRAR

The total registration of 5,662, including 1,524 graduate students, established a new record which is expected to mark the peak of the post-war rise.

The accelerated program which began in the Summer of 1942 will terminate with the class graduating in September, 1948. An interesting comparative study of the degrees awarded during these seven years of accelerated education is shown in the table (p. 41). The base selected for the comparison is the average number of degrees awarded in the three calendar years immediately preceding the war. This was a period of stabilized enrollment and a more reliable base for comparison than a trend which might be projected at this time.

The average number of degrees awarded in the base period (1939-1941) was 502 Bachelors, 269 Masters, and 69 Doctors which represented a normal number of Bachelor's degrees but a high level of Graduate degrees. The four war years (1942-1945) resulted in a total deficit of 315 Bachelors, 409 Masters, and 106 Doctors which was three-fifths of one class of Bachelors and about one and a half classes each of Masters and Doctors. During the three years since the war (1946-1948) there has been a total excess above the pre-war normal of 1,121 Bachelors, 454 Masters and 43 Doctors.

The net result of the seven-year acceleration (1942-1948)

in terms of pre-war normal is an excess of 806 Bachelors (.16 class) and 45 Masters (.17 class). There is still a deficiency of 63 Doctors (about one class) but at the present 1948 rate this deficiency will be made up by 1949. The projected M. I. T.

*Number of Degrees Awarded 1939-1948  
(M. P. H. omitted)*

Year	Number of Degrees			Increase or Decrease from 1939-1941 Average		
	Bachelors	Masters	Doctors	Bachelors	Masters	Doctors
1939	468	245	72	—	—	—
1940	517	295	65	—	—	—
1941	520	266	69	—	—	—
<i>1939-1941 Average</i>	<i>502</i>	<i>269</i>	<i>69</i>			
1942	547	181	61	+ 45	- 88	- 8
1943	482	203	43	- 20	- 66	- 26
1944	404	155	42	- 98	- 114	- 27
1945	260	128	24	- 242	- 141	- 45
	<i>Total Deficit During War . . . .</i>			<i>- 315</i>	<i>- 409</i>	<i>- 106</i>
1946	486	294	40	- 16	+ 25	- 29
1947	943	491	80	+ 441	+ 222	+ 11
1948 (est.)	1198	476	130	+ 696	+ 207	+ 61
	<i>Total Excess Post-War . . . .</i>			<i>+ 1121</i>	<i>+ 454</i>	<i>+ 43</i>
	<i>Net Result of Accelerated Program 1942-1948 . . . .</i>			<i>+ 806</i>	<i>+ 45</i>	<i>- 63</i>

enrollment for the next few years indicates that M. I. T. will have produced an excess of degrees far above the pre-war normal and probably will be in excess of any reasonable rising trend.

The statistics for the year 1947-1948 and summary statistics for preceding years follow (pages 43-61).

JOSEPH C. MACKINNON

STATISTICS ON  
REGISTRATION AND DEGREES

REPORT OF THE REGISTRAR FOR THE YEAR 1947-1948

All statistics on registration and staff for this year are as of November 1, 1947.

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

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

TABLE 2. THE CORPS OF INSTRUCTORS

## ADMINISTRATIVE OFFICERS

TABLE 3. CLASSIFICATION OF STUDENTS BY COURSES AND YEARS

COURSE NAME AND NUMBER	1945-46						1946-47						1947-48					
	YEAR			YEAR			YEAR			YEAR			YEAR			YEAR		
	1	2	3	4	G	Total	1	2	3	4	G	Total	1	2	3	4	G	Total
Aeronautical Engineering XVI	103	21	6	47	31	268	104	83	74	54	110	425	78	53	74	58	83	346
Architecture IV-A, IV-B	12	5	—	6	35	34	34	22	17	41	41	148	34	29	33	23	14	133
Architecture (IV-A) Fifth Year	—	—	5	—	5	—	—	—	8	—	—	8	—	—	—	11	—	11
Biology	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Quantitative VII	11	4	—	—	6	21	11	11	10	5	24	61	7	22	7	13	32	81
Physical VII-A	—	—	—	—	—	—	—	—	—	3	2	5	—	—	1	1	1	4
Building Engineering and Construction XVII	7	5	2	1	—	15	15	24	9	7	70	11	24	23	27	13	98	
Business and Engineering Administration XV	38	17	8	4	73	64	160	104	130	32	490	53	106	192	167	38	556	
Chemical Engineering X	132	28	3	25	32	140	158	123	105	137	663	140	117	140	127	111	635	
Civil Engineering Practice X-A	—	—	—	—	—	—	—	—	—	—	32	32	—	—	—	—	—	58
Chemistry V	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
City Planning IV-B†	44	6	3	10	45	103	40	39	30	22	141	272	33	45	35	33	146	292
Civil Engineering I	17	7	4	8	27	63	42	36	32	37	62	209	51	45	55	20	49	220
Economics and Engineering XIV	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Electrical Engineering VI	158	38	11	13	51	271	222	242	192	139	201	996	4	6	35	21	7	69
Electrical Engineering (Cooperative) VI-A	—	—	2	24	6	52	—	—	55	27	13	95	—	—	52	60	17	129
Food Technology XX-XXX-A**	—	—	1	3	4	1	5	10	5	10	29	4	11	7	8	41	—	51
General Engineering IX-B	8	—	2	2	—	12	—	—	10	22	—	32	—	—	—	24	27	—
General Science IX-A	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	2	4	6
Geology XII	2	—	—	2	4	4	5	1	—	1	—	17	3	12	4	1	18	38
Group Psychology	—	—	—	—	—	—	—	—	—	—	—	13	13	—	—	—	—	15
Industrial Economics	—	—	—	—	—	—	—	—	—	—	—	16	16	—	—	—	—	26
Marine Transportation XII-C	—	—	—	—	—	—	—	—	—	—	—	13	4	9	7	2	—	22
Marine Transportation (XIIIC) Fifth Year	—	—	—	—	—	—	—	—	—	—	—	4	—	—	5	—	5	5
Mathematics XVIII	10	4	—	—	12	36	5	9	15	7	69	105	9	26	13	15	53	116
Mechanical Engineering II	97	23	10	16	30	176	110	177	160	155	109	711	132	178	156	146	135	747
Torpedo Engineering (in Mech. Eng. Dept.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
Metallurgy III (in Metallurgy Department)	6	2	3	2	3	18	31	12	14	18	62	125	4	40	23	15	63	145
Ceramics (in Metallurgy Department)	—	—	—	—	—	—	—	—	—	—	10	10	—	—	—	10	10	—
Meteorology XIX†	2	—	—	3	—	7	12	1	2	4	10	29	46	—	4	5	5	46
Naval Architecture and Marine Eng. XIII-A	14	6	2	4	26	18	13	5	23	9	68	21	10	13	7	58	101	
Naval Construction and Engineering XIII-AS	41	10	4	8	30	93	81	58	54	34	166	393	80	54	58	187	101	
Physics VIII	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	14	
Sanitary Engineering XI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	14	
Total	703	183	68	207*	378	1,538	907	1,063	950	891*	1,361	5,172	884	1,040	1,161	1,053*	1,524	5,662

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

\*\* Prior to September 1946 considered Course VII-B.

† Prior to September 1946 considered Course XIV.

‡ Prior to February 1947 included in Architecture.

§ Beginning 1945-46 last two years of Three Year Program students classified as Graduate Year.

Beginning 1947-48 all XIII-A classified as Graduate Year.

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

No.	NAME	COURSE	OPTION	YEAR						Course NUMBER		
				1 Opt.	1 Tot.	2 Opt.	2 Tot.	3 Opt.	3 Tot.	G Opt.	G Tot.	
I	Civil Engineering . . . . .	Army Engineer . . . . .		—	51	—	45	—	55	—	20	I
II	Mechanical Engineering . . . . .	1. General Mechanical Eng. . . . . 2. Engineering Science . . . . . 3. Automotive Engineering . . . . . 4. Torpedo Engineering . . . . . 5. Textile Technology . . . . .	1 2 3 4 5	—	132	—	178	—	99	—	36	49
III	Metallurgy . . . . .	1. Metallurgy . . . . . 2. Mineral Dressing . . . . .	1 2	—	4	—	40	2	21	4	15	73
IV-A	Architecture . . . . .	—	34	—	29	—	33	—	11	4	10	14
IV-B	Fifth Year . . . . .	—	—	—	—	—	—	—	11	—	—	—
V	City Planning . . . . .	—	33	—	4	—	4	—	4	—	2	25
V	Chemistry . . . . .	—	45	—	45	—	35	—	33	—	33	146
VI	Electrical Engineering . . . . .	1. Electric Power . . . . . 2. Electrical Communications . . . . . 3. Electronic Applications . . . . . 4. Radar (Navy) . . . . . 5. Guided Missiles . . . . .	1 2 3 4 5	—	33	—	28	21	21	—	9	1,086
VII-A	Electrical Engineering — Cooperative . . . . .	—	214	74	190	66	211	48	212	59	250	259
VII-A	Quantitative Biology . . . . .	—	—	—	—	—	—	52	19	60	—	129
VII-A	General Science . . . . .	—	—	—	—	—	—	22	7	13	—	81
VII-B	General Engineering . . . . .	—	—	—	—	—	—	2	2	1	—	32
VII-C	Chemical Engineering . . . . .	—	—	—	—	—	—	54	58	58	—	1
VII-C	Chemical Engineering Practice — Graduate . . . . .	—	—	—	—	—	—	2	4	27	—	4
XI	Sanitary Engineering . . . . .	—	—	—	—	—	—	140	117	140	—	127
XII	Geology . . . . .	—	—	—	—	—	—	—	—	—	—	—
XII-A	Naval Architecture and Marine Engineering . . . . .	—	3	—	12	—	4	—	1	—	14	XI
XII-B	Naval Construction and Engineering . . . . .	—	21	—	10	—	13	—	7	—	18	XII
XII-C	Marine Transportation . . . . .	—	—	—	—	—	—	—	—	7	—	38
XIII	Fifth Year . . . . .	—	4	—	9	—	7	—	2	—	5	XII-A
XIV	Economics and Engineering . . . . .	—	6	—	35	—	21	—	7	—	7	XII-C
XV	Business and Engineering . . . . .	1. Physical Sciences . . . . . 2. Chemical Sciences . . . . .	49 53	87 19	106 78	174 53	192 74	146 21	167 —	—	38	XV
XVI	Aeronautical Engineering . . . . .	—	—	—	—	—	—	—	58	—	83	XVI
XVII	Building Engineering and Construction . . . . .	1. Heavy Construction . . . . . 2. Light Construction . . . . .	1 2	—	11	—	24	—	23	6	27	XVII
XVIII	Mathematics . . . . .	1. Pure and Applied Math. . . . . 2. Applied Statistics . . . . .	1 2	—	9	—	26	—	13	11	—	116
XIX	Meteorology . . . . .	—	—	—	—	—	4	—	5	—	5	XIX
XX	Food Technology . . . . .	—	—	—	—	—	11	—	11	—	8	XX
XXX-A	Food Technology . . . . .	—	—	—	—	—	4	—	4	—	3	XXX-A
XXX-B	Industrial Economics . . . . .	—	—	—	—	—	—	—	—	3	26	Ind. Econ.
XXX-C	Economics and Engineering . . . . .	—	—	—	—	—	—	—	—	—	7	Gr. Psych.
	Group Psychology . . . . .	—	—	—	—	—	—	—	—	—	15	Group
Total					864		1,040		1,161		1,053	Total
											1,524	
											5,662	

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

## ADMINISTRATIVE OFFICERS

TABLE 4-B

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

COURSE	YEAR					TOTAL	COURSE
	1	2	3	4	G		
I Civil Engineering . . . . .	—	—	1	—	—	1	I
II Mechanical Engineering . . . . .	—	—	4	1	13	18	II
III Metallurgy . . . . .	—	—	2	—	9	11	III
IV-A Architecture . . . . .	—	—	—	3	1	4	IV-A
IV-B City Planning . . . . .	—	—	1	—	—	1	IV-B
V Chemistry . . . . .	—	1	1	3	10	15	V
VI Electrical Engineering . . . . .	1	—	3	19	44	67	VI
VII Quantitative Biology . . . . .	—	1	—	1	11	13	VII
VIII Physics . . . . .	—	—	1	—	10	11	VIII
IX-B General Engineering . . . . .	—	—	1	—	—	1	IX-B
X Chemical Engineering . . . . .	—	—	1	1	9	11	X
XII Geology . . . . .	—	—	—	—	2	2	XII
XIII Naval Architecture and Marine Engineering . . . . .	—	—	1	—	—	1	XIII
XIV Economics and Engineering . . . . .	—	1	—	—	—	1	XIV
XV Business and Engineering Administration . . . . .	—	—	—	2	4	6	XV
XVI Aeronautical Engineering . . . . .	—	—	—	—	18	18	XVI
XVII Building Engineering and Construction . . . . .	—	—	1	—	1	2	XVII
XVIII Mathematics . . . . .	—	—	1	—	11	12	XVIII
XX Food Technology . . . . .	—	—	—	—	2	2	XX
Total . . . . .	1	3	18	30	145	197	Total

TABLE 4-C

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

COURSE	YEAR					TOTAL	COURSE
	1	2	3	4	G		
I Civil Engineering . . . . .	2	1	4	—	1	8	I
II Mechanical Engineering . . . . .	5	11	6	2	4	28	II
III Metallurgy . . . . .	5	—	—	—	2	7	III
IV-A Architecture . . . . .	—	—	1	—	—	1	IV-A
V Chemistry . . . . .	—	2	5	1	—	8	V
VI Electrical Engineering . . . . .	9	8	5	6	8	36	VI
VII Quantitative Biology . . . . .	1	3	2	—	—	6	VII
VIII Physics . . . . .	1	6	3	1	4	15	VIII
IX-B General Engineering . . . . .	—	—	2	—	—	2	IX-B
X Chemical Engineering . . . . .	3	9	7	4	1	24	X
XII Geology . . . . .	—	—	—	—	1	1	XII
XIII Naval Architecture and Marine Engineering . . . . .	1	1	—	1	2	5	XIII
XIII-C Marine Transportation . . . . .	1	—	1	—	—	2	XIII-C
XIV Economics and Engineering . . . . .	—	1	—	—	—	1	XIV
XV Business and Engineering Administration . . . . .	2	9	7	5	2	25	XV
XVI Aeronautical Engineering . . . . .	3	4	4	4	6	21	XVI
XVII Building Engineering and Construction . . . . .	1	3	1	—	3	8	XVII
XVIII Mathematics . . . . .	—	6	—	—	—	6	XVIII
XIX Meteorology . . . . .	—	—	2	2	5	9	XIX
Industrial Economics . . . . .	—	—	—	—	1	1	Ind. Econ.
Total . . . . .	29	69	50	26	40	214	Total

\* Excludes 47 special students.

TABLE 5. CLASSIFICATION OF STUDENTS BY COURSES SINCE 1940

	1940-41	1941-42	1942-43	1943-44	1944-45	1945-46	1946-47	1947-48
<i>Engineering Courses</i>								
	1,922	1,836	1,861	1,276	976	1,225	4,092	4,398
Aeronautical Engineering XVI	237	147	169	199	136	268	425	346
Building Engineering and Construction XVII	17	14	16	9	11	15	70	98
Business and Engineering Administration XV	223	205	177	68	61	73	490	556
Chemical Engineering X, X-A, X-B, X-C	338	348	360	278	185	220	695	693
Civil Engineering I	80	71	72	72	62	63	209	220
†Economics and Engineering XIV	—	—	256	287	—	—	4	69
Electrical Engineering VI, VI-A	325	36	33	20	218	303	1,091	1,215
General Engineering IX-B	42	357	345	330	200	139	10	32
Mechanical Engineering II, II-A	129	125	88	40	36	31	718	749
Metallurgy III	—	—	110	141	19	15	135	155
†Meteorology XIX	—	—	121	125	115	52	12	46
Naval Architecture and Marine Eng. XIII, XIII-C	49	46	62	79	75	25	26	85
Naval Construction and Engineering XIII-A	—	4	8	6	3	81	78	101
Sanitary Engineering XI	—	—	—	—	—	3	78	14
<i>Science Courses</i>								
	453	427	341	265	187	269	895	1,037
§ Biology and Public Health VII, VII-A, VII-B, VII-T	82	81	79	42	13	21	66	85
*Food Technology XX, XX-A	—	—	—	—	—	4	29	41
Chemistry V	162	151	112	95	77	108	272	292
General Science IX-A	—	22	21	12	1	3	3	6
Geology XII	—	34	27	13	3	4	27	38
Mathematics XVIII	—	30	27	22	19	20	36	105
Physics VIII	123	120	103	100	73	93	393	459
Architecture IV-A, IV-B, IV-C	Total	112	92	77	30	30	40	156
*City Planning IV-B	Total	—	—	—	—	—	—	35
<i>Economics and Eng., Industrial Economics, and</i> <i>Group Psychology</i>								
<i>Unclassified</i>	Total	3	13	15	8	5	4	48
†First Year (not including Course IV)	Total	64	60	39	—	—	—	—
	584	627	715	—	—	—	—	—
Grand Total	3,138	3,055	3,048	1,579	1,198	1,538	5,172	5,662

\* Prior to February 1947 included in Architecture. Prior to November 1942, First Year Students not required to designate choice of course except for Course IV.

† From September 1940 to November 1942, First Year Students included in Aeronautical Engineering, 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.

## ADMINISTRATIVE OFFICERS

TABLE 6

## GEOGRAPHICAL CLASSIFICATION OF STUDENTS SINCE 1943

UNITED STATES	1943	1944	1945	1946	1947
<i>North Atlantic</i> . . . . . Total	1,002	694	951	3,441	3,837
Connecticut . . . . .	61	48	53	194	213
Maine . . . . .	12	6	8	36	44
Massachusetts . . . . .	445	319	450	1,569	1,817
New Hampshire . . . . .	12	10	8	43	54
New Jersey . . . . .	73	47	72	300	337
New York . . . . .	303	198	276	936	1,009
Pennsylvania . . . . .	76	46	62	300	285
Rhode Island . . . . .	12	16	21	46	57
Vermont . . . . .	8	4	1	17	21
<i>South Atlantic</i> . . . . . Total	104	63	92	341	351
Delaware . . . . .	7	4	4	16	17
District of Columbia . . . . .	32	21	26	72	57
Florida . . . . .	14	7	11	53	54
Georgia . . . . .	1	2	4	17	14
Maryland . . . . .	14	14	18	65	79
North Carolina . . . . .	9	1	3	26	29
South Carolina . . . . .	4	5	3	16	19
Virginia . . . . .	11	4	17	51	56
West Virginia . . . . .	12	5	6	25	26
<i>South Central</i> . . . . . Total	45	35	44	196	210
Alabama . . . . .	5	2	6	22	21
Arkansas . . . . .	2	3	2	16	19
Kentucky . . . . .	4	3	3	18	17
Louisiana . . . . .	5	4	7	24	26
Mississippi . . . . .	2	5	5	11	12
Tennessee . . . . .	12	3	7	32	41
Texas . . . . .	15	15	14	73	74
<i>North Central</i> . . . . . Total	169	123	151	664	675
Illinois . . . . .	51	31	45	181	189
Indiana . . . . .	8	6	7	25	31
Iowa . . . . .	2	2	2	16	21
Kansas . . . . .	4	4	7	22	21
Michigan . . . . .	26	13	16	79	83
Minnesota . . . . .	6	11	10	40	41
Missouri . . . . .	18	19	23	75	68
Nebraska . . . . .	7	3	3	16	19
North Dakota . . . . .	2	2	2	8	8
Ohio . . . . .	35	26	24	158	144
South Dakota . . . . .	—	—	—	5	4
Wisconsin . . . . .	10	6	12	39	46
<i>Western</i> . . . . . Total	72	41	56	258	276
Arizona . . . . .	2	—	2	4	8
California . . . . .	26	14	21	95	95
Colorado . . . . .	8	2	1	17	21
Idaho . . . . .	—	—	—	9	6
Montana . . . . .	4	2	1	6	7
Nevada . . . . .	1	—	1	4	3
New Mexico . . . . .	2	—	1	10	11
Oklahoma . . . . .	8	8	7	29	34
Oregon . . . . .	10	3	4	20	25
Utah . . . . .	4	4	2	8	13
Washington . . . . .	7	7	12	54	49
Wyoming . . . . .	—	1	4	2	4
<i>Territories and Dependencies</i> . . . . . Total	12	10	7	13	11
Alaska . . . . .	—	—	1	—	1
Hawaii . . . . .	2	2	1	7	7
Puerto Rico . . . . .	10	8	5	6	3
Total for United States . . . . .	1,404	966	1,301	4,913	5,360

(Continued on page 49)

TABLE 6 — (Continued)

FOREIGN COUNTRIES	1943	1944	1945	1946	1947
Total . . . . .	175	232	237	259	302
Africa . . . . .	—	—	—	—	1
Argentina . . . . .	9	12	5	8	7
Australia . . . . .	—	—	1	1	4
Belgian Congo . . . . .	—	—	—	—	1
Belgium . . . . .	1	1	1	1	—
Bolivia . . . . .	11	15	11	9	10
Brazil . . . . .	—	—	—	53	57
British Honduras . . . . .	1	1	2	3	2
British West Indies . . . . .	—	—	—	24	30
Canada . . . . .	12	9	10	3	1
Chile . . . . .	2	3	3	2	—
China . . . . .	34	82	69	3	6
Colombia . . . . .	3	5	3	3	—
Costa Rica . . . . .	—	—	1	1	—
Cuba . . . . .	14	10	12	17	20
Cyprus . . . . .	—	—	—	—	2
Czechoslovakia . . . . .	—	1	—	—	—
Denmark . . . . .	—	—	—	2	—
Dominican Republic . . . . .	2	1	—	—	1
Ecuador . . . . .	—	1	1	1	3
Egypt . . . . .	—	1	1	1	8
England . . . . .	—	—	—	7	2
Finland . . . . .	—	—	2	5	14
France . . . . .	—	—	—	1	1
French West Indies . . . . .	—	—	—	—	4
Greece . . . . .	—	—	—	—	1
Guatemala . . . . .	3	3	4	—	—
Haiti . . . . .	1	—	2	1	2
Honduras . . . . .	—	—	—	—	—
Hungary . . . . .	—	2	5	5	2
Iceland . . . . .	1	—	—	—	—
India . . . . .	7	21	27	13	25
Iran . . . . .	1	2	4	—	—
Iraq . . . . .	—	1	9	4	5
Italy . . . . .	—	—	—	2	2
Lebanon . . . . .	—	1	1	1	—
Libya . . . . .	—	—	—	—	—
Luxembourg . . . . .	—	—	—	—	—
Mexico . . . . .	10	10	9	10	9
Morocco . . . . .	—	—	—	—	3
Netherlands East Indies . . . . .	—	—	—	—	1
Netherlands West Indies . . . . .	—	—	1	2	1
Netherlands . . . . .	—	—	—	1	—
Newfoundland . . . . .	—	—	—	—	—
Nicaragua . . . . .	1	—	—	—	—
Norway . . . . .	—	—	1	22	26
Palestine . . . . .	—	—	1	1	3
Panama . . . . .	—	—	4	5	2
Peru . . . . .	10	10	13	10	9
Philippines . . . . .	2	—	—	7	6
Poland . . . . .	—	—	2	—	2
Portugal . . . . .	—	—	—	1	—
Rhodesia . . . . .	—	—	—	1	2
Salvador . . . . .	1	1	—	1	—
Scotland . . . . .	—	—	—	—	2
South Africa . . . . .	—	—	—	—	1
Spain . . . . .	—	—	—	1	2
Straits Settlements . . . . .	1	—	1	2	4
Sweden . . . . .	—	—	—	2	4
Switzerland . . . . .	—	—	—	1	8
Turkey . . . . .	35	18	15	11	8
Union of South Africa . . . . .	1	2	5	4	2
Uruguay . . . . .	3	1	2	1	1
Venezuela . . . . .	9	13	8	4	—
Grand Total, United States and Foreign . . . . .	1,579	1,198	1,538	5,172	5,662

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 . . . . .	19	3	5	3	30
Second Year . . . . .	14	6	3	7	30
Third Year . . . . .	3	14	6	6	29
Fourth Year . . . . .	—	—	—	1	1
Graduate Year . . . . .	—	—	75	231	306
Total . . . . .	36	23	89	248	396

TABLE 8  
WOMEN STUDENTS CLASSIFIED BY COURSES AND YEARS

Course	Year					Total
	1	2	3	4	G	
I Civil Engineering . . . . .	—	—	—	1	—	1
II Mechanical Engineering . . .	1	—	—	—	1	2
IV-A Architecture . . . . .	3	4	1	2	—	10
Fifth Year . . . . .	—	—	—	1	—	1
IV-B City Planning . . . . .	—	—	—	—	1	1
V Chemistry . . . . .	3	1	3	1	8	16
VI Electrical Engineering . . .	1	—	1	1	1	4
VII Quantitative Biology . . .	—	1	—	3	5	9
VIII Physics . . . . .	—	—	—	1	7	8
X Chemical Engineering . . .	1	1	—	1	—	3
XII Geology . . . . .	—	—	—	—	2	2
XVI Aeronautical Engineering .	1	—	1	—	1	3
XVII Building Engineering and Construction . . . . .	—	1	—	—	—	1
XVIII Mathematics . . . . .	—	1	—	—	3	4
Industrial Economics . . . . .	—	—	—	—	1	1
Group Psychology . . . . .	—	—	—	—	1	1
Total . . . . .	10	9	6	11	31	67

TABLE 9  
OLD AND NEW STUDENTS

Year	1942-43	1943-44	1944-45	1945-46	1946-47	1947-48
Students registered at end of last academic year (including specials) . . . . .	1,936	855	500	653	2,762	4,118
Students who have previously attended the Institute, but were not registered at end of last academic year (including specials) . . . . .	84	37	98	62	1,242	261
New students who entered by examination . . . . .	212	190	118	313	460	530
New students who entered without examination . . . . .	462	351	266	336	241	294
New students who entered from other colleges as candidates for degrees . . . . .	326	124	179	136	406	396
New students (specials, not candidates for degrees) . . . . .	28	22	37	38	61	63
Total . . . . .	3,048	1,579	1,198	1,538	5,172	5,662

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

College	College	College
Alabama Polytechnic Inst. . . . . 6	Idaho, University of . . . . . 3	Rochester, University of . . . . . 10
Alabama, University of . . . . . 3	Illinois Inst. of Technology . . . . . 7	Rose Polytechnic Institute . . . . . 1
Alfred University . . . . . 5	Illinois, University of . . . . . 21	Rutgers University . . . . . 6
American University . . . . . 1	Indiana, University of . . . . . 2	St. Lawrence University . . . . . 2
Amherst College . . . . . 7	Iowa State College . . . . . 13	St. Martin's College . . . . . 1
Antioch College . . . . . 1	Iowa Wesleyan College . . . . . 1	Simmons College . . . . . 1
Arizona, University of . . . . . 5	Jefferson Medical College . . . . . 1	Smith College . . . . . 1
Arkansas, University of . . . . . 3	Johns Hopkins University . . . . . 6	Sophie Newcomb College . . . . . 1
Augustana College and Theological Seminary . . . . . 2	Juanita College . . . . . 1	South, University of the . . . . . 1
Austin College . . . . . 1	Kansas State College of Agric. and Applied Science . . . . . 1	South. Calif., University of . . . . . 3
Ball Teachers' College . . . . . 1	Kansas, University of . . . . . 5	South Carolina, University of . . . . . 4
Bates College . . . . . 3	Kentucky, University of . . . . . 6	South Dakota State School of Mines . . . . . 2
Bethany College . . . . . 2	Kenyon College . . . . . 2	Southern Methodist Univ. . . . . 2
Birmingham-Southern Coll. . . . . 2	Lafayette College . . . . . 2	Southwestern College . . . . . 2
Boston College . . . . . 7	LaSalle College . . . . . 1	Southwest, Louisiana Inst. of Liberal and Tech. Learning . . . . . 1
Boston University . . . . . 8	La Sierra College . . . . . 1	Springfield College . . . . . 2
Bowdoin College . . . . . 9	Lawrence College . . . . . 1	Stanford University . . . . . 12
Bridgewater College . . . . . 1	Lehigh University . . . . . 10	State College of Washington . . . . . 2
Brigham Young University . . . . . 1	Louisiana State University and Agric. and Mech. Coll. . . . . 6	State University of Iowa . . . . . 2
Brooklyn College . . . . . 8	Louisville, University of . . . . . 1	Stevens Inst. of Technology . . . . . 7
Brooklyn Polytechnic Inst. . . . . 6	Maine, University of . . . . . 7	Suffolk Law School . . . . . 1
Brown University . . . . . 16	Manhattan College . . . . . 1	Susquehanna University . . . . . 1
Bryn Mawr College . . . . . 3	Massachusetts Inst. of Tech. . . . . 465	Swarthmore College . . . . . 10
Bucknell University . . . . . 3	Massachusetts, University of . . . . . 5	Syracuse University . . . . . 3
Buffalo, University of . . . . . 2	Maryland, University of . . . . . 4	Temple University . . . . . 6
California, University of at Berkeley . . . . . 21	Miami University (Ohio) . . . . . 4	Tennessee, University of . . . . . 1
California, University of at Los Angeles . . . . . 8	Miami, University of . . . . . 1	Tennessee Polytechnic Inst. . . . . 1
California Inst. of Technology . . . . . 15	Michigan College of Mining and Technology . . . . . 3	Texas, University of . . . . . 14
Canisius College . . . . . 1	Michigan State College . . . . . 3	Texas Agricultural and Mech. College . . . . . 8
Carnegie Inst. of Technology . . . . . 11	Michigan, University of . . . . . 15	Texas College of Arts and Industries . . . . . 1
Cass School of Applied Sc. . . . . 3	Michigan Western State Teachers' College . . . . . 1	Texas Technological College . . . . . 6
Chicago, University of . . . . . 9	Middlebury College . . . . . 6	Trinity College . . . . . 1
Cincinnati, University of . . . . . 5	Middlesex Medical School . . . . . 1	Tri-State College . . . . . 1
Citadel, The . . . . . 3	Minnesota, University of . . . . . 16	Tufts College . . . . . 16
Clark University . . . . . 3	Mississippi State College . . . . . 5	Tulane Univ. of Louisiana . . . . . 10
Clarkson Coll. of Technology . . . . . 3	Mississippi, University of . . . . . 2	Union College (N. Y.) . . . . . 5
Clemson College . . . . . 3	Missouri School of Mines . . . . . 3	U. S. Coast Guard Academy . . . . . 13
Colby College . . . . . 5	Missouri, University of . . . . . 1	U. S. Military Academy . . . . . 31
College of the City of N. Y. . . . . 26	Montana School of Mines . . . . . 6	U. S. Naval Academy . . . . . 213
College of Med. Evangelists . . . . . 1	Montana State College . . . . . 6	Ursinus College . . . . . 1
College of Wooster . . . . . 4	Mt. Holyoke College . . . . . 1	Utah State Agric. College . . . . . 2
Colorado School of Mines . . . . . 1	Nebraska, University of . . . . . 4	Utah, University of . . . . . 10
Colorado, University of . . . . . 6	Newark College of Engineering . . . . . 6	Vanderbilt University . . . . . 5
Columbia University (N. Y.) . . . . . 12	New Hampshire, University of . . . . . 2	Vermont, University of . . . . . 3
Cooper Union . . . . . 6	New Mexico, University of . . . . . 3	Villanova College . . . . . 4
Cornell University . . . . . 11	New York University . . . . . 22	Virginia Military Institute . . . . . 7
Creighton University . . . . . 1	North Carolina State Coll. . . . . 8	Virginia Polytechnic Inst. . . . . 6
Dartmouth College . . . . . 9	North Carolina, University of . . . . . 5	Virginia, University of . . . . . 5
Davis and Elkins College . . . . . 1	North Central College . . . . . 1	Washington, University of . . . . . 21
Dayton, University of . . . . . 1	North Dakota, University of . . . . . 1	Washington-Jefferson Coll. . . . . 3
Delaware, University of . . . . . 4	Northeastern University . . . . . 25	Washington-Lee University . . . . . 1
Denver, University of . . . . . 3	Northern Illinois Coll. of Op. . . . . 1	Washington University . . . . . 5
DePauw University . . . . . 3	North Texas State College . . . . . 2	Wayne University . . . . . 2
Dickinson College . . . . . 6	Northwestern University . . . . . 3	Webb Institute of Naval Arch. . . . . 7
Drexel Inst. of Technology . . . . . 3	Notre Dame, University of . . . . . 4	Wellesley College . . . . . 1
Duke University . . . . . 5	Norwich University . . . . . 2	Wesleyan University . . . . . 1
Earlham College . . . . . 1	Oberlin University . . . . . 7	West Virginia, University of . . . . . 1
East Texas State Teachers' College . . . . . 2	Ohio State University . . . . . 11	Weston College . . . . . 1
Emmanuel College . . . . . 3	Ohio Wesleyan University . . . . . 1	Whitman College . . . . . 1
Emory University . . . . . 1	Oklahoma, University of . . . . . 9	Whittier College . . . . . 1
Erskine College . . . . . 1	Oklahoma Agric. and Mech. College . . . . . 1	William and Mary College . . . . . 1
Florida, University of . . . . . 4	Oregon State College . . . . . 3	William Jewell College . . . . . 1
Fort Hays Kansas State Coll. . . . . 1	Pennsylvania State College . . . . . 16	Williams College . . . . . 8
Franklin and Marshall Coll. . . . . 2	Pennsylvania, University of . . . . . 10	Wilson College . . . . . 1
Furman University . . . . . 2	Pittsburgh, University of . . . . . 1	Wisconsin, University of . . . . . 8
George Washington Univ. . . . . 3	Pomona College . . . . . 5	Wittenberg College . . . . . 1
Georgetown University . . . . . 2	Pratt Institute . . . . . 3	Worcester Polytechnic Inst. . . . . 10
Georgia School of Technology . . . . . 21	Princeton University . . . . . 20	Wyoming, University of . . . . . 1
Gonzaga University . . . . . 1	Principia College . . . . . 1	Yale University . . . . . 22
Gorham State Teachers' Coll. . . . . 1	Purdue University . . . . . 14	Total . . . . . 1,815
Goucher College . . . . . 1	Queens College (N. Y.) . . . . . 2	Number of American Colleges Represented . . . . . 223
Grinnell College . . . . . 1	Radcliffe College . . . . . 5	Number of Foreign Colleges Represented (not listed) . . . . . 88
Hampden-Sydney College . . . . . 1	Rensselaer Polytechnic Inst. . . . . 26	Total . . . . . 311
Harvard University . . . . . 38	Rhode Island State College . . . . . 1	
Haverford College . . . . . 3	Rice Institute . . . . . 8	
Holy Cross, College of the . . . . . 2	Ripon College . . . . . 1	
Houghton College . . . . . 1		
Howard College . . . . . 2		

TABLE 11  
REGULAR STUDENTS FROM COLLEGES CLASSIFIED BY COURSES

COURSE	No Previous Degree		Graduates of Other Colleges						Graduates of M. I. T. Taking Graduate Work		
	Entered		Entered			Previous Years			S. B. Degree 1947		
	Nov. 1947	Previous Years	Nov. 1947	Under-grad.	Grad.	Under-grad.	Grad.	Total	Other Graduates	Total	
Aeronautical Engineering XVI	4	17	21	—	—	10	3	25	38	15	30
Architecture IV-A	7	23	30	3	10	16	2	31	—	1	1
Biology VII, VII-A	6	6	—	—	7	—	7	14	1	7	8
Building Engineering and Construction XVII	2	5	7	—	1	3	7	11	1	3	4
Business and Engineering Administration XV	4	46	50	—	12	15	18	45	1	3	4
Chemical Engineering X, X-A	4	39	43	1	37	82	122	22	19	41	41
Chemistry V	3	11	14	—	21	1	91	113	3	21	24
City Planning IV-B	1	3	4	—	10	—	14	24	—	1	1
Civil Engineering I	6	22	28	1	14	3	26	44	3	6	9
Economics and Engineering	—	—	—	—	—	—	—	—	6	1	7
Economics and Engineering XIV	2	6	8	—	—	—	—	—	—	—	—
Electrical Engineering VI, VI-A	18	84	102	1	51	127	124	303	25	32	57
Food Technology XX, XX-A	1	4	5	—	2	—	2	4	—	2	2
General Engineering IX-B	1	7	8	—	—	1	—	—	1	—	—
General Science IX-A	—	1	1	—	—	—	—	—	—	—	—
Geology XII	—	—	—	—	—	5	—	10	—	6	6
Group Psychology	—	—	—	—	—	2	—	13	15	—	—
Industrial Economics	—	—	—	—	—	16	—	8	—	2	2
Mathematics XVIII	5	4	9	—	10	1	23	34	—	9	9
Mechanical Engineering II	13	56	69	1	47	5	48	101	8	21	29
Metallurgy III	2	4	6	1	16	—	35	52	2	11	13
Meteorology XIX	—	4	4	—	5	1	25	7	1	1	2
Naval Architecture and Marine Eng. XIII, XIII-C	3	10	13	4	—	—	99	99	2	2	4
Naval Construction and Engineering XIII-A	—	—	—	—	21	—	23	139	9	31	2
Physics VIII	2	19	—	—	—	6	7	13	1	40	1
Sanitary Engineering XI	—	—	—	—	—	—	—	—	—	—	—
Total	78	371	449	12	306	180	777	1,275	100	196	295

TABLE 12. NUMBER OF DEGREES AWARDED IN SEPTEMBER 1947, FEBRUARY 1948, AND JUNE 1948

TABLE 13  
DEGREES OF BACHELOR OF SCIENCE ACCORDING TO CLASS IN WHICH THEY WERE AWARDED

Total by Decade		29	226	705	1,579	2,257
Total		14	5	10	17	21
Sanitary Eng.		5	5	19	19	18
Physics		1	1	1	1	1
Naval Arch.		3	3	2	2	2
Mining Eng. and Metallurgy		6	2	5	5	5
Military Eng.		6	3	6	7	8
Metecrology		2	2	3	4	4
Meteorology		2	2	5	5	5
Mechanical Eng. (Inc. II-A)		1	2	8	17	24
Mathematics		1	2	7	6	7
Geology		1	2	25	25	28
General Science or Course		1	2	1	1	1
General Eng.		1	2	6	7	9
Food Technology		1	2	6	7	8
Electromechanical Eng. (Inc. VI-A)		1	2	10	17	23
Civl Engineering and Construction		6	2	4	10	17
Chemistry		7	3	10	11	12
Business and Admin.		1	1	14	14	15
Bldg. Eng. & Constr.		2	3	11	11	12
History of Natural Hist. (Inc. VII-A)		1	1	9	9	10
Architecture		4	3	13	13	13
Aeronautical Eng.		3	3	6	6	6
Class (Academic Year)		8870	8871	8872	8873	8874

(Continued on page 55)

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

Class	(Calendar Year)	Total by Decades										Total by Decades										Total by Decades																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
		1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	Total																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
1911	1911	1	4	2	6	11	18	26	38	56	74	95	115	132	150	168	185	202	219	238	259	279	299	319	339	359	379	399	419	439	459	479	499	519	539	559	579	599	619	639	659	679	699	719	739	759	779	799	819	839	859	879	899	919	939	959	979	999	1019	1039	1059	1079	1099	1119	1139	1159	1179	1199	1219	1239	1259	1279	1299	1319	1339	1359	1379	1399	1419	1439	1459	1479	1499	1519	1539	1559	1579	1599	1619	1639	1659	1679	1699	1719	1739	1759	1779	1799	1819	1839	1859	1879	1899	1919	1939	1959	1979	1999	2019	2039	2059	2079	2099	2119	2139	2159	2179	2199	2219	2239	2259	2279	2299	2319	2339	2359	2379	2399	2419	2439	2459	2479	2499	2519	2539	2559	2579	2599	2619	2639	2659	2679	2699	2719	2739	2759	2779	2799	2819	2839	2859	2879	2899	2919	2939	2959	2979	2999	3019	3039	3059	3079	3099	3119	3139	3159	3179	3199	3219	3239	3259	3279	3299	3319	3339	3359	3379	3399	3419	3439	3459	3479	3499	3519	3539	3559	3579	3599	3619	3639	3659	3679	3699	3719	3739	3759	3779	3799	3819	3839	3859	3879	3899	3919	3939	3959	3979	3999	4019	4039	4059	4079	4099	4119	4139	4159	4179	4199	4219	4239	4259	4279	4299	4319	4339	4359	4379	4399	4419	4439	4459	4479	4499	4519	4539	4559	4579	4599	4619	4639	4659	4679	4699	4719	4739	4759	4779	4799	4819	4839	4859	4879	4899	4919	4939	4959	4979	4999	5019	5039	5059	5079	5099	5119	5139	5159	5179	5199	5219	5239	5259	5279	5299	5319	5339	5359	5379	5399	5419	5439	5459	5479	5499	5519	5539	5559	5579	5599	5619	5639	5659	5679	5699	5719	5739	5759	5779	5799	5819	5839	5859	5879	5899	5919	5939	5959	5979	5999	6019	6039	6059	6079	6099	6119	6139	6159	6179	6199	6219	6239	6259	6279	6299	6319	6339	6359	6379	6399	6419	6439	6459	6479	6499	6519	6539	6559	6579	6599	6619	6639	6659	6679	6699	6719	6739	6759	6779	6799	6819	6839	6859	6879	6899	6919	6939	6959	6979	6999	7019	7039	7059	7079	7099	7119	7139	7159	7179	7199	7219	7239	7259	7279	7299	7319	7339	7359	7379	7399	7419	7439	7459	7479	7499	7519	7539	7559	7579	7599	7619	7639	7659	7679	7699	7719	7739	7759	7779	7799	7819	7839	7859	7879	7899	7919	7939	7959	7979	7999	8019	8039	8059	8079	8099	8119	8139	8159	8179	8199	8219	8239	8259	8279	8299	8319	8339	8359	8379	8399	8419	8439	8459	8479	8499	8519	8539	8559	8579	8599	8619	8639	8659	8679	8699	8719	8739	8759	8779	8799	8819	8839	8859	8879	8899	8919	8939	8959	8979	8999	9019	9039	9059	9079	9099	9119	9139	9159	9179	9199	9219	9239	9259	9279	9299	9319	9339	9359	9379	9399	9419	9439	9459	9479	9499	9519	9539	9559	9579	9599	9619	9639	9659	9679	9699	9719	9739	9759	9779	9799	9819	9839	9859	9879	9899	9919	9939	9959	9979	9999	10019	10039	10059	10079	10099	10119	10139	10159	10179	10199	10219	10239	10259	10279	10299	10319	10339	10359	10379	10399	10419	10439	10459	10479	10499	10519	10539	10559	10579	10599	10619	10639	10659	10679	10699	10719	10739	10759	10779	10799	10819	10839	10859	10879	10899	10919	10939	10959	10979	10999	11019	11039	11059	11079	11099	11119	11139	11159	11179	11199	11219	11239	11259	11279	11299	11319	11339	11359	11379	11399	11419	11439	11459	11479	11499	11519	11539	11559	11579	11599	11619	11639	11659	11679	11699	11719	11739	11759	11779	11799	11819	11839	11859	11879	11899	11919	11939	11959	11979	11999	12019	12039	12059	12079	12099	12119	12139	12159	12179	12199	12219	12239	12259	12279	12299	12319	12339	12359	12379	12399	12419	12439	12459	12479	12499	12519	12539	12559	12579	12599	12619	12639	12659	12679	12699	12719	12739	12759	12779	12799	12819	12839	12859	12879	12899	12919	12939	12959	12979	12999	13019	13039	13059	13079	13099	13119	13139	13159	13179	13199	13219	13239	13259	13279	13299	13319	13339	13359	13379	13399	13419	13439	13459	13479	13499	13519	13539	13559	13579	13599	13619	13639	13659	13679	13699	13719	13739	13759	13779	13799	13819	13839	13859	13879	13899	13919	13939	13959	13979	13999	14019	14039	14059	14079	14099	14119	14139	14159	14179	14199	14219	14239	14259	14279	14299	14319	14339	14359	14379	14399	14419	14439	14459	14479	14499	14519	14539	14559	14579	14599	14619	14639	14659	14679	14699	14719	14739	14759	14779	14799	14819	14839	14859	14879	14899	14919	14939	14959	14979	14999	15019	15039	15059	15079	15099	15119	15139	15159	15179	15199	15219	15239	15259	15279	15299	15319	15339	15359	15379	15399	15419	15439	15459	15479	15499	15519	15539	15559	15579	15599	15619	15639	15659	15679	15699	15719	15739	15759	15779	15799	15819	15839	15859	15879	15899	15919	15939	15959	15979	15999	16019	16039	16059	16079	16099	16119	16139	16159	16179	16199	16219	16239	16259	16279	16299	16319	16339	16359	16379	16399	16419	16439	16459	16479	16499	16519	16539	16559	16579	16599	16619	16639	16659	16679	16699	16719	16739	16759	16779	16799	16819	16839	16859	16879	16899	16919	16939	16959	16979	16999	17019	17039	17059	17079	17099	17119	17139	17159	17179	17199	17219	17239	17259	17279	17299	17319	17339	17359	17379	17399	17419	17439	17459	17479	17499	17519	17539	17559	17579	17599	17619	17639	17659	17679	17699	17719	17739	17759	17779	17799	17819	17839	17859	17879	17899	17919	17939	17959	17979	17999	18019	18039	18059	18079	18099	18119	18139	18159	18179	18199	18219	18239	18259	18279	18299	18319	18339	18359	18379	18399	18419	18439	18459	18479	18499	18519	18539	18559	18579	18599	18619	18639	18659	18679	18699	18719	18739	18759	18779	18799	18819	18839	18859	18879	18899	18919	18939	18959	18979	18999	19019	19039	19059	19079	19099	19119	19139	19159	19179	19199	19219	19239	19259	19279	19299	19319	19339	19359	19379	19399	19419	19439	19459	19479	19499	19519	19539	19559	19579	19599	19619	19639	19659	19679	19699	19719	19739	19759	19779	19799	19819	19839	19859	19879	19899	19919	19939	19959	19979	19999	20019	20039	20059	20079	20099	20119	20139	20159	20179	20199	20219	20239	20259	20279	20299	20319	20339	20359	20379	20399	20419	20439	20459	20479	20499	20519	20539	20559	20579	20599	20619	20639	20659	20679	20699	20719	20739	20759	20779	20799	20819	20839	20859	20879	20899	20919	20939	20959	20979	20999	21019	21039	21059	21079	21099	21119	21139	21159	21179	21199	21219	21239	21259	21279	21299	21319	21339	21359	21379	21399	21419	21439	21459	21479	21499	21519	21539	21559	21579	21599	21619	21639	21659	21679	21699	21719	21739	21759	21779	21799	21819	21839	21859	21879	21899	21919	21939	21959	21979	21999	22019	22039	22059	22079	22099	22119	22139	22159	22179	22199	22219	22239	22259	22279	22299	22319	22339	22359	22379	22399	22419	22439	22459	22479	22499	22519	22539	22559	22579	22599	22619	22639	22659	22679	22699	22719	22739	22759	22779	22799	22819	22839	22859	22879	22899	22919	22939	22959	22979	22999	23019	23039	23059	23079	23099	23119</

\* Prior to 1909 this Course was designated as Option 3 (Electrochemistry) of Course VIII. Discontinued 1940.  
† Two received the degree in Naval Architecture, Course XIII.B, in 1916 and three in 1917.

Prior to 1923 degrees were awarded in Architecture. Prior to 1938 included in Mining Engineering and Metallurgy.

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	Electrical Eng. (Inc. VII-A)	Food Technology	Geology	Marine Engineering	Mathematics	Mech. Eng. (Inc. II-A)	Metalurgy	Meteorology	Naval Architecture	Naval Construction and Eng.	Petroleum Engineering	Physics	Sanitary Engineering	Without Course Classification	Total
1886																										
1887																										
1888																										
1889																										
1890																										
1891			1																							
1892			2																							
1893			3																							
1894			1																							
1895			5																							
1896			2																							
1897			2																							
1898			1																							
1899			1																							
1900			6																							
1901			2																							
1902			3																							
1903			4																							
1904			4																							
1905			3																							
1906			6																							
1907			6																							
1908			1																							
1909			6																							
1910			6																							
1911			5																							
1912			2																							
1913			4																							
1914			4																							
1915			5																							
1916			7																							
1917			4																							
1918			5																							
1919			1																							
1920			2																							
1921			3																							
1922			5																							
1923			10																							
1924			4																							
1925			6																							
1926			6																							
1927			9																							
1928			9																							
1929			5																							
1930			3																							
1931			4																							
1932			5																							
1933			10																							
1934			7																							
1935			3																							
1936			5																							
1937			12																							
1938			13																							
1939			8																							
1940			3																							
1941			16																							
1942			9																							
1943			21																							
1944			22																							
1945			9																							
1946			47																							
1947			67																							
1948			32																							
Total	375	84	48	7	134	6	415	702	158	402	22	1,271	5	56	30	60	558	102	115	50	478	5	87	58	657	5,885
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).																										
Grand Total																										6,011
* Includes only February and June degrees.																										

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 . . . .	8	2	7	5
Total . . . .	225	20	188	67

\* Includes only February and June degrees.

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

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

Class (Calendar Year)	Number of Degrees Awarded		
	Prior to 1948	1948*	Total
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
Total	31	72	103

\*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 DOCTOR OF PHILOSOPHY AWARDED

Class (Calendar Year)	Biology	Chemistry	Electrical Engineering	Food Technology	Geology	Industrial Economics	Mathem- atics	Physics	Total
1907	—	3	—	—	—	—	—	—	3
1908	—	3	—	—	—	—	—	—	3
1909	—	—	—	—	—	—	—	—	—
1910	—	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	—	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	—	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	2	15	—	—	5	1	8	23	54
Total	42	328	1	2	53	9	55	128	618

\* Includes only February and June degrees.

TABLE 18. DEGREES OF DOCTOR OF SCIENCE AWARDED

Class (Cal- endar Year)	Aero. Eng.	Ceramics	Chem. Eng.	Chem. istry	Civil Eng.	Electro- chem. Eng.	Food Tech- nology	Geology	Math- ematics	Mech. Eng.	Metal- lurgy	Meteor- ology	Min. Eng.	Naval Arch.	Petro- leum Eng.	Physics	San. Eng.	Total
1911						1												1
1912						1												1
1913						1												1
1914						1												1
1915						1												1
1916	1					1												1
1917						1												1
1918						1												1
1919						1												1
1920	1					1												3
1921						1												3
1922	1					1												3
1923	1					1												3
1924						2												6
1925	1					3												7
1926						1												9
1927						1												6
1928	1					5												10
1929						3												6
1930						9												20
1931						3												9
1932						5												14
1933						10	1											14
1934						3												24
1935						1	2											13
1936	2					12												13
1937	1					9	1											14
1938						12												20
1939	2					10												20
1940						3												20
1941	1					15	3											20
1942	1					14												20
1943	2					10												20
1944	2					4												20
1945						1	7											20
1946	1					11												20
1947	2					10												20
1948						6												20
Total	18		14	178	10	26	57	2	2	11	5	31	81	21	5	1	35	3

\*Includes only February and June degrees.

TABLE 19  
DEGREES OF DOCTOR OF PUBLIC HEALTH AWARDED  
(Discontinued after 1944)

Class (Calendar Year)	Number
1924	I
1927	I
1928	I
1930	I
1939	I
1942	I
1944	3
Total	9

TABLE 20  
DEGREES OF DOCTOR OF ENGINEERING AWARDED  
(Discontinued after 1918)

Class (Calendar Year)	Electrical Engineering	Electrochemical Engineering	Total
1910	I	—	I
1914	I	—	I
1916	I	—	I
1917	—	I	I
Total	3	I	4

TABLE 21  
SUMMARY OF DEGREES AWARDED (1868-1948)

Bachelor of Science . . . . .	21,899
Bachelor in Architecture . . . . .	225
Bachelor in City Planning . . . . .	20
Master of Science . . . . .	6,011
Master in Architecture . . . . .	188
Master in City Planning . . . . .	67
Master in Public Health (Discontinued after 1944) . . . . .	103
Doctor of Philosophy . . . . .	618
Doctor of Science . . . . .	501
Doctor of Public Health (Discontinued after 1944) . . . . .	9
Doctor of Engineering (Discontinued after 1918) . . . . .	4
Grand Total . . . . .	29,645

## DIRECTOR OF ADMISSIONS

As in previous years, this report covers the twelve-month period ending with the opening of the new academic year on September 27, 1948, which date marks the natural termination of the Admissions Office year.

The year has been marked by a reduction in freshman applications, due mainly to the passing of the postwar "bulge" of veterans, and by the resumption of college transfer admissions on a considerable scale.

For the first time since 1943, only a single freshman class entered during the calendar year. This class compared with the previous year as follows:

*First-Year Classes\**

	September 1947	September 1948
Total Applications.....	4,354	3,434
Admissions Granted.....	1,106	1,076
Actual Registration.....	851	808
Registration as Per Cent of Admissions.....	77.0	75.0
Number of Secondary Schools Represented...	542	510

\* Exclusive of former students returning in the first year.

Despite the lower total of applications, the class this year gives evidence of being of a calibre fully as good as in earlier years. It would appear that the earlier postwar totals of applications included a good many veterans who were not well qualified; the absence of these in the current year, therefore, did not affect the quality of the selected group.

The fact that our entering classes are drawn from a large number of secondary schools has long been an element of strength in our admissions situation. This phenomenon, while related to our high geographical distribution, is to some extent different in principle. It reflects a tendency for each school to send us only a few students, but these usually having a special interest in science, and often outstanding ability. Most colleges, in contrast, draw larger groups from a smaller ring of schools.

In order to reserve places for our own returning students after the war, we had virtually ceased accepting college trans-

fers at the undergraduate level after March, 1946, the chief exceptions being third-year students in a few less crowded courses. The September, 1948 term is the first in which this limitation could be relaxed all along the line, so that students could be accepted with advanced standing in all departments and at all levels.

A total of 2,063 applied for undergraduate transfer admission, but of these 1,146 permitted their preliminary applications to lapse, or re-dated them for a later year. Nevertheless, the remaining group of 917 was large enough to permit a high degree of selectivity, since only 319 were accepted, of whom 278 remained for actual entrance after deducting cancellations. This includes 34 under the Combined Plan of Study. The distribution of these transfer students among departments was made in accordance with quotas set by the Committee on Stabilization of Enrollment, and depended on the places available in each Course. Limitations at the third-year level were directly related to department capacity; those at the second-year level had reference to the total capacity of the basic second-year subjects, as well as to a forecast of department capacity for the following year.

On October 2 and 3, 1947, a conference was held at the Institute for the presidents and certain faculty members of the twelve colleges participating in the Combined Plan of Study, the arrangements being in charge of Dean John E. Burchard. Some seventy-five guests and sixty Institute staff members participated. In addition to general sessions, section meetings were held on Mathematics, Physics, Chemistry and the Humanities. Though the immediate purpose was to discuss curricular planning and problems of transition from college to professional study, the conference had a much broader value in facilitating personal contact and acquaintance among the faculties, and informing the colleges about the Institute, of the purposes and methods of which most of them had known little.

On April 8 and 9, 1948, all students in the twelve colleges who had signified an interest in the Combined Plan were invited to attend a guidance conference at the Institute. A total of one hundred and thirty attended, and all the colleges were represented. Individual sessions for professional fields were

so scheduled that each conferee could attend several, and opportunity was provided for each student to meet those already in residence here from his own college. This conference seemed to meet a genuine need, since the majority of liberal arts students know little of technical training or of the professional opportunities open to graduates. Such guidance might well be regarded as a normal part of our program of instruction so that each department would have material organized for occasions of this kind. Correspondence from students showed a discerning appreciation of those department programs that were most effectively presented. Visits to laboratories were especially desired, and it appears that fuller provision should be made for these.

Gradual additions have been made to the corps of Honorary Secretaries, which now number 240, including twenty-four in foreign centers.

Close contacts have been maintained with the College Entrance Examination Board, of whose tests we make extensive use. The Director of Admissions has served a two-year term on the Executive Committee of the Board, during the period comprising the merger of its testing activities together with those of the Carnegie Foundation and the American Council of Education, into the newly founded Educational Testing Service.

Mr. John W. Sheetz, III, whose work has been of outstanding merit, resigned on August 1 to accept an appointment with the Office of Naval Research. Mr. David A. Dudley of the Department of English and History succeeds him.

B. ALDEN THRESHER

#### DIRECTOR OF LIBRARIES

##### *Foreword*

On July 1, 1948, Dr. Vernon D. Tate assumed the post of Director of Libraries, previously held by the writer. Since the libraries were under my jurisdiction during the year 1947-1948, I have signed this report, although it has been prepared entirely by my successor.

*The Library*

Ground breaking ceremonies for the Charles Hayden Memorial Library on April 5, 1948, marked the final stage in the series of efforts that will create at M. I. T. the long needed nucleus of its library system and the first university library planned to take full advantage of modern concepts of documentation and of scientific aids to learning. Occupancy, scheduled for the late fall of 1949, projecting its shadow into all library activities, gave added impetus to planning, the analysis of existing policies, functions and operations, and to preparations for the move with all attendant ramifications. Significantly enough, just sixty years ago, in 1887, Dr. Clement W. Andrews made the first move toward the creation of the library at M. I. T.; he was formally appointed Librarian in 1889.

The proud slogan of the theatrical profession "the show must go on" and the motto of the Post Office Department "neither snow, nor rain, nor heat, nor gloom of night stays these couriers from the swift completion of their appointed rounds" express ideals of service shared no less by the library profession. Service to the Faculty, students, the M. I. T. community, and alumni has continued without diminution, in fact has registered a normal healthy growth.

A true measure of the utility of a library can be found in the use made of its collections. Unfortunately, the amount of use cannot be calculated with exactitude. Our shelves for the most part are open. Readers consult the collections little or much, predominantly the latter, although no quantitative measurement exists. Circulation is recorded and has increased slightly over the past year thereby maintaining the very significant increase over the fiscal year 1945-1946. Reader registration continued at about the same level, but the work of the Reference Department continues to show something more than normal expansion: over one thousand more telephone calls were received than last year, three times as many microfilm orders with a notable increase in microfilm requests from State and Federal agencies, from foreign countries, and from book dealers; about twice as many business firms have contacted the Reference Department as in the past year. We borrowed

on inter-library loan some 908 items, but we supplied 3,667. M. I. T. theses are in demand with the greater number of requests for them coming from commercial organizations.

The growth of the Institute Library is a complicated process involving not only the addition of new material but also arrangement of the collections, the discarding of duplicate, unwanted, or obsolete material, and even binding and repair.

Accessions from all sources totaled 12,458 items, a decrease of 2,410 from the preceding year, but an increase of 5,165 over the fiscal year 1945. The slight recession this year is understandable. Foreign material withheld during the war has been secured in so far as possible; with the resumption of trade relations only the current output is available. Moreover, it is an incontrovertible fact that inflation is particularly evident in the book and periodical market. Increases of 50 to 100 per cent for new titles are common and the trend shows no signs of abatement. Much of the wealth of the M. I. T. working collections is concentrated in files of periodicals. New subscriptions were increased again during the past year and with the exception of some of the German, postwar European issues are arriving on schedule. Missing back volumes in sets have been largely filled. Russian, Chinese, and a few Japanese titles are being received with some degree of regularity.

Government publications, including research reports of great current value, continue to appear in vast quantities both as a result of our second year of operation as a limited Government Documents Depository and through the activities of the Documents Expediter, an agent maintained in Washington under a cooperative arrangement of the Association of Research Libraries in which we participate. To these should be added Army maps, of which some three thousand were received during the year, and a multitude of pamphlets, reprints, reports, leaflets, and other fugitive but highly valuable material. These latter items constitute a perplexing problem that remains to be solved. A realistic approach dictates a cold-blooded analysis of cost and need, the preparation of simple and inexpensive finding media and an inflexible disposal policy. The Farmington Plan, initiated by the Association of Research Libraries in an attempt to provide at least one copy in the United States

of all significant publications originating in Sweden, France, and Switzerland, produced its first dividends late in the year. M. I. T.'s commitments include categories in electrical engineering and aeronautics. It is too early as yet to assess the value of the cooperative arrangement; at least the initial difficulties have been surmounted and the project is fully under way.

As of June 30, 1948, the official count of volumes in the Institute Libraries was 417,680.

Conventional library practice requires newly accessioned materials to be catalogued in order that they may be readily available through the library card catalogue. Our Catalogue Department produced the imposing total of 38,289 new cards, cataloguing 6,991 new titles (including 875 M. I. T. theses) in thirteen languages. But the difficulties of the catalogue department in most libraries are perennial. In a technological and scientific environment the greatest premium is placed on speed of access, but speed and the meticulous accuracy of the cataloguers' code do not go hand in hand. Perhaps we are approaching the point of diminishing returns, and as the tempo of research increases it will become necessary not to uproot the catalogue as we know it, but rather to supplement its resources. Preliminary work on abridged entries during the year may point the way toward a workable solution.

Library stacks in the Central and several branch libraries are almost bursting at the seams. Despite transfers of duplicate reserves and other material to the New England Depository and the disposal of some obvious rubbish much remains to be done. Saleable duplicates received particular attention, and contributions for devastated libraries were set aside.

Special efforts to rehabilitate library material that suffered appreciably from intensive use in wartime brought highly gratifying results. The addition of a book repair specialist, a partially disabled veteran, to the staff has enabled much needed repair work to be done in the library thereby obviating delays, transportation costs, and binders' fees. Binding is approaching its prewar status, that is to say, binders are again anxious to secure orders, but here, too, prices have advanced. Much unbound material awaits attention.

The operation of the branch library system continues to be a source of satisfaction; for, while the benefits of centralized administration, purchase, processing, and reference can be realized, the flexibility of special collections and close cooperation with the faculties is maintained. Each branch library reflects the needs and work of the department or departments with which it is primarily associated. Further progress, nowhere better illustrated than in the Aeronautics Library, has been achieved in stripping collections and maintaining them on the basis of day to day use with lesser used material being housed in the Central. Congestion of shelving and of reading space is thereby minimized, but a good deal of book shifting is required. Eastman Library continued to be crowded, busy, and plagued by missing volumes. Lindgren operated smoothly, noting an increasing interest in ceramics and allied fields at the expense of geology and metallurgy.

Walker Library was responsible for approximately 20 per cent of the total circulation despite necessary curtailment of shelf space on the balcony. A structural defect necessitated the shifting of about 2,000 selected, lesser used titles to Central. The facilities for music were notably improved by the addition of new playing facilities, some new records, and last, but not least, a competent music librarian.

During the year changes occurred in the organization of the Dewey Library that preface even greater changes when the Hayden can be occupied. To its major collections in the fields of engineering and economics was added the important and active industrial relations library that previously had been in, but not of, the Dewey. The Industrial Relations librarian, Barbara Klingenhagen, was named Dewey Librarian and has supervised the integration of the economics and industrial relations collection. These will move to the Hayden Library as a unit, leaving the engineering collections to occupy the same space. It is planned within the next two years to incorporate certain other material to form a new branch tentatively named the Engineering and Naval Architecture Library.

Rotch Library completed its second year as a part of the library system, but the achievements of the year were dimmed by the resignation of Florence W. Stiles to resume the practice

of architecture. Her work over the past sixteen years has helped materially to bring the Rotch to its present position as one of the best architectural and city planning libraries in the country. The former city planning librarian, Margaret H. Beale, has been named Acting Rotch Librarian.

Vail Library, one of the richest in resources of the branch libraries, faced particular problems. Sharing with the Central the area beneath the great dome, with the move of Central to Hayden it will become necessary to rearrange Vail collections completely, to prepare a separate catalogue, and to plan for the occupancy of the area exclusively, or possibly to share it if the projected Biology Branch Library becomes a reality. To get these changes under way without diminishing the active part played by the Vail Library in the work of the Department of Electrical Engineering has not been easy. Moreover, although an explicit announcement cannot now be made negotiations have been completed whereby within two years a very large industrial organization will transfer to M. I. T. its significant collection of historical material relevant to electrical engineering. We are happy to have this generous gift as it is the first step in the realization of our hope to collect within the Institute documentary material important in the study of American technological and industrial history.

It is unfortunate to note that, as in international relations, apparently in academic life the accepted moral tenets of conduct are not uniformly observed; specifically, book losses at the Institute are becoming a matter of concern. The monetary value of the missing items is considerable, but the intellectual losses are far more alarming. Informal borrowing without registration, an acute manifestation of selfishness, means that much-wanted titles will not be available to many readers. Often with limited editions of foreign works brought about by the shortage of paper, lost titles are irreplaceable. Some books reappear after a period of time, but in the interval when they are on the missing list their utility to the M. I. T. community as a whole is nil. Obvious remedies involve limiting access, locking doors, and fencing readers away from their resources. This rigorous step can be taken, but it is in direct violation of the principle that as few barriers should be placed between

the reader and the library as possible. No solution or immediate action is proposed at this time.

It is far more pleasant to turn to other aspects of the library program, particularly the reactivation of the Friends of the M. I. T. Library. Under the energetic chairmanship of Ralph T. Walker '11, the first postwar number of "Footnotes — The Bulletin of the Friends" appeared in the Spring of 1948. The stated purpose of the organization is to purchase for the Institute Library unusual books not possible of inclusion in the annual budget. Two outstanding contributions, the rare *Enciclopedia Italiana* and the *Reports from the Scientific Expedition to the Northwestern Provinces of China under the Leadership of Dr. Sven Hedin*, (The Sino-Swedish Expedition, 1927-1933) in 32 volumes were acquired and presented by the Friends during the year.

Besides the activity of the organized Friends, the Institute Libraries benefited materially from a large number of individual gifts of publications from members of the staff, alumni, scholarly and scientific organizations, publishers, other universities, business and industrial firms. Some of these involved new publications while others consisted of manuscripts, photographs, drawings, and old or rare books not in the collections. A few random examples of the wealth and diversity of the gifts are: a file of *Stars and Stripes*, the official newspaper of the A. E. F., given by Mr. Edward K. Robinson of Boston; a large gift of 411 books, periodicals and pamphlets by Dean Robert G. Caldwell; Eadweard Muybridge's much sought after *Animal Locomotion*, 1887, by Samuel Cabot '09; a *German-Turkish Technical Dictionary* by Adnan Halet Taspinar '32, now of Istanbul, Turkey, which easily captures the long-distance gift record for the year; and the rare Macquer, *Dictionnaire de chymie . . . Paris*, 1766, in two volumes from the Harvard College Library. Supreme among manuscripts was the gift by Professor William Hovgaard of the Hovgaard Papers, an extensive collection of reports, memoranda and correspondence relating to naval architecture. His long association with the Institute is thus fittingly memorialized. It is a matter of regret that all gifts cannot be listed and fully described.

The Institute Libraries were visited during the year by a

large number of professional librarians, scientists, engineers, scholars, and technicians. Some came to utilize our documentary and other resources for work in progress or in prospect; others wished to study library organization and procedure, or library construction and planning as illustrated in the Charles Hayden Memorial Library, while documentary reproduction and microphotography attracted a substantial quota. Many foreign countries were represented. Individual visitors from Africa, Argentina, Australia, Canada, Chile, China, England, Germany, Holland, India, Mexico, and Peru were given cordial receptions. Each visitor by his questions or comments added to our store of information and helped in the development of our library program. In this latter connection the work of Dr. Ralph E. Ellsworth, Director of Libraries of the State University of Iowa, who came at our invitation to assist in the planning of the Hayden Library, was of utmost benefit.

The library staff continued active participation not only in the work of professional library organizations but also in the programs of scientific, technical and scholarly societies. The Librarian, Dr. Vernon D. Tate, as President of the American Documentation Institute and Correspondent of the International Federation for Documentation continued to develop phases of international cooperation in these fields. As Chairman of the Committee on Microphotography of the Association of Research Libraries, he participated in the development of standards for newspaper and journal reproduction, the listing of current resources and the exploration of techniques and applications in the field. Publications by the staff including various operational documents and research contributions will be completely discussed in the Library Annual.

In the restricted compass of this report only barest mention can be made of many other interesting and significant library developments. The allocation of twenty titles per week from the recreational reading shelves of Walker to the Infirmary for the use of convalescing patients proved a welcome innovation. The continuation and expansion of the several library publications including the "Guide to the Institute Libraries," accessions lists of branch libraries, and a valuable summary of physics material added to Eastman 1937-1947 presage the

development of a formal publication plan. The keystone of this activity, however, the proposed Library Annual, was forced by circumstance into the following year. The checking of gift collections in Rotch under a special appropriation was completed, and in cooperation with the Museum Committee the important task of listing and identifying the study collections of the Dard Hunter Paper Museum was well begun.

On October 1, 1947, Robert E. Booth was appointed Associate Librarian. A graduate of Wayne and Columbia Universities with the degree of A.M. in Library Science from the University of Michigan, Mr. Booth brings to the Institute broad competence in library service, documentary reproduction and microphotography together with excellent bibliographic and administrative experience gained in the Peabody Library in Baltimore. The activities of the two Library Fellows, Harold J. Oatfield and James W. Perry, cannot be passed over. The former completed his assignment in the Biology Department where he helped to lay the foundation for an adequate working library in the fall of 1947 and resigned to accept a position with the National Research Council in Washington. The latter has continued his work in the application of punched card techniques to the literature of chemistry under the joint auspices of M. I. T. and the American Chemical Society. The emergence of the Dyson-Perry code for chemical compounds has been described as basic. In the year to come it is hoped that the system will be applied to a specific field for extended tests.

The most exciting outside development of the year came in December, 1947, with the announcement of a grant from the Carnegie Corporation to the Institute of \$100,000 to be expended over a period of three years in the study of scientific aids to learning. This library project marks the invasion of the library by technology or possibly the entrance of the library into technical fields. Administered by a distinguished Committee including the Deans of Humanities and Science, one Professor each from the Departments of Economics, Electrical Engineering, Mechanical Engineering, and Physics, the Chief Engineer of the General Radio Corporation of Cambridge and the Director of Libraries, the general objectives in broadest terms include: efforts to make the location of sources of informa-

tion more rapid than is now the case; to reproduce located information more rapidly, more cheaply or more extensively and to disseminate located and reproduced information more rapidly, more cheaply or more extensively. The program includes bibliographical and technical research in five fields, namely: printing with particular emphasis on offset lithography and low cost duplicating methods; documentary reproduction or all methods of reproducing textual materials by photography; microphotography, miniature facsimile and related techniques, and mechanical selection. A laboratory was in operation at the end of the year and several research projects had been set up. The first fruits of the enterprise were used in the planning of the Hayden Library.

JOHN E. BURCHARD

#### DIVISION OF INDUSTRIAL COÖPERATION

During the past year total research volume increased \$2,631,000, excluding the costs of the Supersonic Wind Tunnel. Of this increase, \$1,435,900 is for salaries and wages, \$1,100,000 of which was caused by an increase in payrolls on non-classified research.

A large part of the staff on the various projects continues to be drawn from the Institute's academic staff, as shown by the 1947-1948 ratio of 5 academic to 6 D. I. C. Of the total academic staff employed, 120 were Faculty members and 313 Research Assistants and Associates.

The enlarged graduate student program and the use of these advanced degree candidates on Division research, which was started in 1946, began to bear fruit this year, when the first group was graduated. Most of them took jobs with industry and the Government in research laboratories.

#### *Fiscal Report for the Year Ending June 30, 1948*

<i>Dollar Volume</i>	<i>Fiscal Years</i>	
	<i>1947-1948</i>	<i>1946-1947</i>
Office of Scientific Research and Development (Radiation Laboratory).....	.....	\$1,157,000
General Government.....	\$12,387,000*	8,075,000
Industrial.....	914,000	593,000
	<hr/>	<hr/>
	\$13,301,000	\$9,825,000

\*Includes \$845,000 for new construction.

*Fiscal Report (Continued)*

Active Projects	Number on July 1, 1947	Additions	Expirations	Number on June 30, 1948
General Government	117	49	12	154
Industrial .....	68	21	12	77
<i>Total</i> .....	<i>185</i>	<i>70</i>	<i>24</i>	<i>231</i>

Personnel	As of June 30, 1948	As of June 30, 1947
D. I. C. Staff .....	526	473
D. I. C. Non-staff .....	858	631
M. I. T. Staff .....	433	351
	<i>1,817</i>	<i>1,455</i>

NATHANIEL McL. SAGE

## ADVISER TO FOREIGN STUDENTS

In spite of an increasing difficulty in securing dollar exchange, the number of foreign students seeking American education continues to be as great as in other post-war years. For September, 1947, 636 applications were received from abroad; for September, 1948, 630 were received. In 1947, 144 admissions were granted; in 1948, 140. Since the average stay of a foreign student, graduate and undergraduate, is three years, this number of new admissions insures a stable population of about 300 foreign students. This constitutes about six per cent of our total student body, which the Faculty considers a desirable proportion.

The summer of 1948 saw a very interesting experiment at the Institute in the form of a Foreign Student Summer Project. This was instigated by a number of our students acting as a committee of the local chapter of the National Student Association. Its head was Earl Ward Eames, Jr., a third year student in Course XV, one of our many veteran students who had returned after service to complete his undergraduate course. Eames and a small group of fellow-students conceived the idea of bringing eighty graduate students from seventeen war-devastated countries of Europe for a four-month summer session at the Institute. So that finances would play no part in selection, the trip was to be "all expenses paid."

F. S. S. P. has been a tremendous success. Sixty-two

students from Austria, Belgium, Bulgaria, Czechoslovakia, Denmark, Finland, France, Germany, Great Britain, Greece, Italy, Netherlands, Norway, Poland, and Sweden have attended summer session courses as listeners. They have also participated in an extensive and stimulating series of seminars and discussion groups, organized by the students and generously contributed to by our faculty. Eames and his N. S. A. committee assumed complete responsibility for organization and for fund-raising. On President Compton's enthusiastic recommendation, the Corporation voted to waive all fees for attendance to the summer session as listeners. Those of the Institute's fraternity houses which remained open in the summer generously agreed to house the visitors rent-free. Funds were raised, with great difficulty and much hard work, to defray expenses for board, transportation, books, and incidentals.

The many applicants abroad for F. S. S. P. were very carefully screened by selection committees set up in each country, and the group chosen was a very superior one. Most were young engineers about twenty-six years old with several years of teaching or research or industrial experience. They feel they have profited greatly by their study, and the Institute's life has been the richer for their stay.

The following table shows the number of inquiries received from abroad concerning the possibility of admission to the Institute in September, 1948. Of the 630 completed applications, 310 were for admission to undergraduate courses; 94 of these were granted admission. There were 320 completed appli-

*Foreign Students Applying for Admission in September, 1948*  
(Inquiries Received from May 1, 1947 — May 1, 1948)

	Inquiries Received and Applications Sent	Applications Completed	Admitted for September, 1948
Latin America.....	418	88	21
British Commonwealth.....	216	42	16
Northern Europe.....	104	42	25
Western Europe.....	156	42	16
Central and Southern Europe.....	130	41	19
Near East.....	334	71	12
India and Pakistan.....	517	146	11
China.....	419	141	10
Other Far East.....	55	17	10
<i>Total</i> .....	<u>2,349</u>	<u>630</u>	<u>140</u>

cations for admission to Graduate School; 46 of these were granted admission.

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 Professor Carlton E. Tucker, follow.

*Student Placement.* During the period from June, 1947, through June, 1948, a total of 340 companies have conducted employment interviews with students at the Institute and some 495 more have announced openings by letter and have invited us to have interested and qualified students contact them directly. Since classes were placed in September, 1947, February, 1948, and June, 1948, some repetition of companies is necessary in the above totals.

Students in Mechanical Engineering, Chemical Engineering, Electrical Engineering, Aeronautical Engineering, and Business and Engineering Administration are in greatest demand. However, the demand for Civil Engineers, Metallurgists, and Physicists and Chemists more than equals the number of men available.

The salary offerings are currently running somewhat over \$250 a month for men receiving the S.B. degree, and from \$300 up for the Master's degree.

With jobs as plentiful as they are now, it is difficult to get all students to cooperate with the Placement Bureau in reporting employment which is secured by individual efforts. Consequently, the figures given below of percentages placed are lower than actual. Judging from the fact that very few men come back to the Placement Bureau after graduation seeking help in placement, it is to be assumed that nearly one hundred per cent of each class is placed.

#### Classes Graduating During 1947-1948

	Individuals	Those Reported Placed	Per Cent
Bachelors.....	1,110	774	70
Masters.....	513	352	69
Doctors.....	111	71	64
<i>Total</i> .....	<u>1,734</u>	<u>1,197</u>	<u>69</u>

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

	July, 1947-June, 1948	July, 1946-June, 1947
Number of Jobs.....	3,743	2,594
Men Who Went on Available List.....	1,080	1,309
Men Who Came off Available List .....	935	1,082
Placements.....	187	246

These figures appear to indicate that during the fiscal year 1947-1948, we have had our greatest manpower shortage since the end of the war. The reasons seem to be that (1) the government has re-entered the employment field more aggressively than ever; (2) companies have been flooding this office with specifications which they admit are "impossible," but are refusing to consider anyone who does not meet the standards they have set; (3) many jobs listed do not really exist—companies have developed a habit of 'shopping' to see whether manpower *would* be available if they decided to accept a contract; (4) many organizations are entering fields new to them and lack suitably trained men on their regular staffs to supervise the new undertaking—or to sell the new products.

Reasons (2) and (3) as listed above swelled the total enough to make it seem reasonable that the actual demand for manpower in this country during the past fiscal year was not much greater than it was during 1946-1947.

The fact that the list of men available has not been so extensive as during the preceding two years is also not a particularly fair indication of the actual situation. The housing shortage has made it necessary for most men seeking new positions to exhaust every possibility within commuting distance of their homes. For this reason an unusually large percentage of the men listed in this office have been men already living in New England, and we find that men living in the South or West have not registered with us because they believe that we are less likely to know of openings in their home towns than they are themselves. As a result, our communications from men in the South and West have come largely from those men who have definitely exhausted local possibilities and have made up their minds that it is necessary for them to leave their communities in order to obtain satisfactory employment.

During the last three or four months of this year, a larger number of men who were actually unemployed registered with this office than at any time during the past six years. The number, however, is still too small to indicate any special trend; and in almost every instance the man knew of positions that were open to him, but he was holding out for something nearer to his ideal.

However, the average or slightly better than average man who is over forty is once more in trouble when he seeks a new job that will compare in salary and responsibility with what he has had. This year many organizations have gone back to a prewar policy, and are refusing to consider the applications of men "over forty."

Unless there is a major upset in our present economy, it looks as though the demand for well-trained men in research, design, development, and production supervision will continue unabated through the coming year. However, the time has definitely passed when the man who is not a specialist or the man whose employment record is not unusually good, can hope to find a new position quickly and easily. The larger companies are becoming increasingly selective and high costs are discouraging the medium and small-size companies from increasing their engineering staffs or even from maintaining them at the size they established immediately after the war.

NATHANIEL McL. SAGE

#### PERSONNEL OFFICER

During the past year one of the major problems which faced the employees of the Institute was the rising cost of living. After careful study of comparative rates with other organizations and the internal financial problems of the Institute, the Administration approved a minimum increase of eight cents per hour for all Maintenance and Laboratory Service employees and authorized the reviewing of the salaries of Office employees twice during the year instead of once.

The increases for the first two groups were negotiated with the unions which represented these groups, namely, the M.I.T. Employees' Union for laboratory service employees and the

A. F. of L. for the maintenance employees. It is now felt that although costs and wages have climbed rapidly in recent years, the Institute has maintained the wages and salaries of employees at a fair level in relation to other organizations in the Boston area.

The classification procedure installed for laboratory service employees during the previous year appears to have worked out satisfactorily again this year. The wages of all such employees were reviewed in September, 1947, and a substantial percentage received merit increases.

Although there was considerable delay in the negotiations of the contract for the maintenance employees, there were very few grievances and all were settled amicably. The representatives of both unions made helpful suggestions during the course of the year and were willing to face problems of the Administration in addition to their primary purpose of assisting union members.

The number of non-staff employees has increased from 1679 on July 1, 1947 to 1876 June 30, 1948. The latter figure includes 858 employees on the D.I.C. payroll. During the year there were 593 terminations, thus it was necessary to hire 790 employees.

This was a year of full employment and there were a number of occupations in which there were distinct shortages of capable men and women in the Boston area; one of the largest of these being secretaries. However, due to the energy and effective efforts of Mrs. Gordon Benedict (formerly Miss Ruth Buttner), most of our vacancies were filled with competent employees within a reasonable length of time and we were able to obtain quite a number of unusually capable employees. This would not have been possible without the Institute's sound wage policy and the numerous other benefits which it offers. The wives of some of our students have made a noteworthy contribution in the secretarial field.

There have been two changes in policy during the year. One provides that employees who are entitled to a two weeks vacation receive an extra week of vacation if they participate in two weeks of National Guard or Naval Reserve training. The second provides that if an employee leaves the rolls of the

Institute, he receives, in addition to his own contributions to the Pension Plan, two per cent compound interest, where formerly he received only his own contributions to the Plan.

A very attractive lounge for women employees was opened in Building 5. The decorating of this room was planned by Professor Herbert L. Beckwith of the Architectural Department, Mrs. Gordon S. J. Bowell of the Personnel Office and several employees from other departments, and was financed by the Administration. This room has been much appreciated by the employees and they have kept it in excellent condition. It is hoped that when more space is available the Institute will be able to set aside rooms in other locations for meals and relaxation.

R. COLIN MACLAURIN

#### MEDICAL DIRECTOR

Although the Medical Department has had a busy year, the chief fact that stands out is that serious illness has been at a minimum. We have had no epidemics during the entire year. This is not a local situation since the general health of all sections of the population in New England has been quite good.

The outstanding development within the Medical Department during the past year is the section of Occupational Medicine. Because of the wide range of research work in progress at the Institute and the numerous hazards involved in handling potentially dangerous materials, it became obvious that a general program designed to prevent illness or injury was needed. Doctors Robert S. Grier and Ivan D. Frantz, Jr. were added to the staff as consultants in this field.

Prior to October 1, 1947, radiation protection was supervised by the Laboratory of Nuclear Science and Engineering. This arrangement was appropriate when only a few departments were making use of radioactive materials. As the use of isotopes has become more widespread, it has become increasingly desirable to place their supervision in the hands of a group having jurisdiction over the entire Institute. The transfer of responsibility has taken place gradually over the past year.

A film badge service has been in operation for over a year. A fairly adequate supply of instruments for measuring radiation is on hand for loan to departments requiring them. Regular blood counts and other preventive measures are carried out on all possibly exposed persons. An improved record system facilitating the evaluation of the degree of exposure of any individual on the film badge list, as well as the variations in the blood picture, has been instituted. Periodic monitoring of all laboratories making use of radioactive isotopes is now being carried out. An additional member has been added to the staff to make this service possible.

In December, 1947, two conferences on the safe handling of radioactive materials were held. Informal discussions have been held with practically all groups in the Institute who are using radioactive materials or operating devices which produce radiation.

A questionnaire was sent out to all departments during the year listing most of the usual industrial hazards of a chemical nature and asking that each department supply us with information concerning the potential hazards that may exist within its jurisdiction in order that they might be evaluated and preventive measures taken if indicated. In several instances improvements in the handling of materials have been effected, which have definitely reduced potential hazards. The consulting service concerning such hazards has been extensively and frequently used.

In order to meet the needs of the student who is not prepared to pay the expenses of a medical or surgical emergency, an insurance plan has been worked out so that, for the payment of a small sum each semester, a student may be protected against the cost of medical care up to \$500 for each illness or injury. This plan has been devised specifically for our own local conditions, and by close cooperation between the insuring agency and the Department it is hoped that costs can be kept at a low figure. Enrollment in the plan is voluntary, and its provisions will go into effect in September, 1948.

Even though there were no epidemics, the total number of patients hospitalized in the Homberg Infirmary increased from 731 to 831 or 13.7 per cent. The increase was due almost

entirely to added use of the Infirmary by employees. The average stay for each patient was slightly more than four days making a total of 3,792 patient days. Of this number 65 per cent were accounted for by students and the other 35 per cent by staff members and employees. Twenty-three patients were transferred to other hospitals for operations or other treatment not readily available in the Infirmary. The average daily Infirmary census during the entire year was slightly above ten patients. There were two deaths during the year, one being a faculty member and the other an alumnus who happened to fall ill while visiting the Institute. There was one student death due to accident, but this occurred outside the Infirmary.

The number of visits to the Clinic was almost the same as last year. There were 33,131 Clinic visits for illness, 6,524 for X-rays, and 3,817 for physical examinations, making a total of 43,572. The corresponding total for 1946-1947 was 43,488. Of the Clinic visits 67 per cent were made by students and 33 per cent by staff members and employees. During the year 124 minor surgical operations were performed in the Clinic.

There has been a strong impression among our staff members that more time was being spent with each patient on the average than in previous years. This is borne out by the experience of the special clinics, all of which showed a definite increase in patronage. The William R. Kales Clinic had 1,115 consultations in the Ophthalmological Section and 535 in the Otolaryngological Section. The Dermatologist saw 590 patients while the Psychiatric Clinic increased from 737 to 1,327 consultations.

We had very few contagious diseases and no semblance of an epidemic. The total number of cases for the year was only 18. In addition, two active cases of tuberculosis were diagnosed and sanatorium treatment instituted. The recently acquired 70 millimeter chest survey X-ray equipment has been of great help in carrying out the health program of the Department.

The chief change in personnel has been the resignation of Dr. John M. Murray as Psychiatrist. He organized the psychiatric service at its inception in 1942 and has guided its development in a most efficient manner since that time. Pres-

sure of his many other duties forced him to make this move, but he will be available for consultation on general policy matters.

The real value of a medical service lies not so much in seeing large numbers of people but in making available to every one the principles and information which will aid in preventing disease when possible or in managing it with the greatest efficiency possible when it cannot be avoided. Illness is often an index of social adjustment as well as physical adjustment, and therefore the maintenance of health in a college community calls for attention to many factors other than injuries and the control of bacterial agents. Cooperation along these lines from members of the faculty has indeed been notable and gratifying.

DANA L. FARNSWORTH, M.D.

#### EXECUTIVE VICE-PRESIDENT OF THE ALUMNI ASSOCIATION

Since its formation in 1875, the "object" of the Alumni Association, now composed of some 40,000 living graduates and former students has been "to further the well-being of the Institute by fostering the interest of the Alumni in the Institute and in each other." To that end, the principal current activities of the Association are: (a) the periodical dissemination of information about Institute affairs through *The Technology Review*; (b) the solicitation of capital gifts to M. I. T. through the annual Alumni Fund, to which 9,789 individuals contributed over \$200,000 during its eighth year of operation; (c) the promotion of group meetings of alumni at Cambridge, such as the Alumni Day celebration at the time of Commencement, and those held monthly throughout the academic year by the representative Council of the Association; and (d) the improvement and strengthening of the relations of the Association and the Institute's Administration with the 85 organized M. I. T. Clubs within the United States and abroad. It is with the last-named activity of the Association that this report is primarily concerned.

Officially, there are 85 M. I. T. Clubs, 13 of which are overseas and not within easy striking distance of Cambridge (e.g., Bombay, Buenos Aires, or Shanghai), and eight of which

are small and semi-inactive groups located in areas where but a few alumni now reside (*e.g.*, Butte, Duluth, or Urbana). Thus, as a practical matter, the problem reduces itself to maintaining contact between Cambridge and a total of 64 M. I. T. Clubs. It is a pleasure now to report that during the past 18 months, 60 of these 64 clubs, or nearly 94 per cent, have been visited at least once by an officer of the Association or the Institute's Administration, or by a member of the Faculty; and to 38 of the 64, or nearly 60 per cent, located in the larger centers, such visits have been made more than once. In the accomplishment of all this, some 25 individuals have actively participated, including President Compton, Vice-President Killian, several deans, the Director and Assistant Director of Admissions, and seven Department Heads—as well as Professor Charles E. Locke, Secretary of the Association, Mr. Ralph T. Jope, its Treasurer, and myself. Thus, information about current conditions at Cambridge has been imparted to nearly 150 separate group meetings of alumni, at which the average attendance has ranged between 40 and 50.

Uniformly, these speakers have been given a cordial welcome by the clubs whose meetings they have attended, and it has been clearly evidenced, first, that our alumni generally are very proud of the accomplishments of their alma mater, especially of those during World War II, and second, that they are eager to keep themselves informed as to its progress and prospects. These 150-odd separate contacts with alumni groups, however, have yielded further important values other than concentrating the attention of those present upon Institute affairs for an evening, or during a luncheon. They have reassured the officers of the clubs that we, at Cambridge, are more than passively interested in maintaining a continuity of effective leadership in the M. I. T. Clubs; and they have reassured the local honorary secretaries that the invaluable aid they render in the selection of admission applicants, and in many other ways, is appreciated by the Institute. Finally, one would hardly expect any visiting speaker not to carry back to Cambridge some of the inspiration and stimulation which he himself has derived.

As will be readily appreciated, many of those who have

participated in this program have arranged to do so at more than ordinary sacrifice of their convenience. Moreover, in most instances, the duration of a speaker's stay in any particular city has necessarily been limited because of the understandable pressure of his academic duties and administrative obligations, and his other professional commitments. It was partially in recognition of these conditions that the office I now hold was created on January 1, 1947, under circumstances which would permit me, as a representative of the Alumni Association and also of the Institute's administration, to devote a major portion of my efforts to strengthening the relations between Cambridge and alumni non-residents of the Boston area.

In the past 18 months, therefore, I have spent approximately half-time away from Boston, traveling an estimated total of 48,400 miles, during the course of which I have attended over 50 formal meetings of 41 different M. I. T. Clubs in the United States, Canada, Cuba and Mexico. Itineraries have been arranged so as to permit my spending several days in most of the alumni centers visited, not only to give me ample opportunity to become better acquainted with club officers and honorary secretaries, and to discuss their local problems, but also to allow for the possibility, often realized, of "extra" smaller luncheon or dinner meetings of alumni, especially with some of those who may have been unable to attend the club meeting, and for seeking out individual alumni or other potential friends of M. I. T. with whom, for one or another reason, it might appear desirable to make contact.

HAROLD E. LOBDELL

## SCHOOL OF ENGINEERING

### AERONAUTICAL ENGINEERING

The space available to the Department, Building 33 and temporary Buildings 23 and 19, has been increased by the beneficial occupancy of part of the new Supersonic Laboratory on Memorial Drive. This has permitted the transfer of some 40 employees of Project Meteor and the release of one large room in Building 33.

The Library's new quarters on the third floor have proved very satisfactory. The sound-proofed ceiling, modern lighting, and the convenient arrangement of reading tables and book shelves have greatly increased its use by students and staff. In spite of the greater space assigned, the library again became crowded. The normal addition during the year of several hundred books, reports, and periodicals makes it evident, that to avoid serious crowding in the future, less active documents must be placed in Room 33-310.

In addition to the regular staff, twelve graduate students were appointed as part-time assistants to help with teaching and unsponsored research. Five graduate students were given part time academic appointments to work on D. I. C. sponsored research projects and eleven students were employed on an hourly basis.

The pressing demand for aeronautical engineers by the aircraft industry and government laboratories continues. The major employers have repeatedly sent representatives to interview students, who were placed in the position of having five or six offers each. The greater competition was for graduate students, in particular those with special training in supersonic aerodynamics, dynamics of structures, automatic controls, and instrumentation. This I consider a well justified recognition of the professional leadership of our faculty members.

It is gratifying to note that a substantial number of S.B. graduates will continue in the graduate school. The development of higher speed airplanes and guided missiles accents the need for aeronautical engineers with a higher level of professional training.

The fact that employment by the Government appears to

have been shunned may represent a temporary situation. The civil service is not generally appreciated by ambitious veterans. Nevertheless, the Government offers young aeronautical engineers an unparalleled opportunity for professional experience with unique facilities for research and development.

The situation may be altered in the future as thirty students have been given employment for the summer of 1948 by the Office of Naval Research in various Naval aeronautical laboratories and testing stations. Transportation by air is furnished from their homes to their assignments and return.

Professors Walter H. Gale and Raymond L. Bisplinghoff served tours of active duty in the Bureau of Aeronautics of the Navy Department, and Instructor Holt Ashley served with the United States Air Force. Professor Jerome C. Hunsaker was placed on the retired list of the United States Naval Reserve.

It was still necessary to refuse admission to qualified applicants for graduate work in Aeronautical Engineering because of quota limitations.

In view of the need of industry for potential leaders of the highest professional training, the recent tendency for our graduate students to concentrate in a narrow field has given the Department much concern. As a result of conferences, both within the Institute and with industry, the Department has recommended that the Degree of Master of Aeronautical Engineering be authorized, to be awarded for the successful completion of a two-year program, a substantial portion of which would be prescribed in such a way as to avoid narrow specialization.

The following new graduate subjects of instruction were offered, reflecting the recent extension of the problems of flight to include jet propulsion, supersonic speeds, and guided missiles: Rocket Engineering by Professor Hsue-Shen Tsien, Aerodynamics Seminar by Professors Tsien and Chia-Chiao Lin, Advanced Aero-Elasticity by Instructor Holt Ashley, Engine Theory by Professor Augustus R. Rogowski, Space Kinetics and Gyroscopic Theory by Professor William R. Weems, and Advanced Airplane Design by Professor Rene H. Miller.

Unlike former years, there were no special groups of stu-

dent officers, but there were six officers registered as individual graduate students. In addition, instruction in aerodynamics and fire control was given to a group of Naval officers registered in the Department of Electrical Engineering.

*Wright Brothers Wind Tunnel.* The tunnel was operated throughout the year on a one-shift basis under the supervision of Professors Shatswell Ober and Joseph Bicknell. The special staff consisted of eight professional employees and nine others. During the year, 31 test programs were completed for seven airplane manufacturers. This service to industry consisted of confidential aerodynamic studies of new designs of airplanes and guided missiles. While this work does not involve fundamental research nor publication, it does keep the staff abreast of current design problems and maintains a relation with industry very much to the advantage of student placement. The tunnel was shut down from December 3 to March 16 to repair damaged windings in the main-drive motor. During this period, a much needed overhaul of measuring equipment was made and new fan blades installed.

*Student Wind Tunnel.* Construction of the new student wind tunnel,  $4\frac{1}{2}$  by 6 foot throat, was completed and used for class instruction and theses during the second term. This tunnel has a six-component balance with automatic measuring beams. With the 75 horsepower motor of the old five-foot Venturi tunnel, an airspeed of 120 miles per hour is reached. With some inconvenience, the variable-frequency set of the Wright Brothers Wind Tunnel was used to supply model motor power for laboratory class experiments. An additional frequency change set with controls and model motors would be helpful for student instruction, as even model motors had to be borrowed. The new tunnel has already greatly improved the techniques of students' experimental work and extended the scope of their theses opportunities.

*Supersonic Laboratory.* Ground was broken in June, 1947, for this laboratory for the Bureau of Ordnance of the Navy Department. The aerodynamic design has been made under the supervision of Professor John R. Markham, whose staff of 40 people moved into the new laboratory in June, 1948. It is expected that the wind tunnel proper and its associated

equipment will be completed and calibrated during 1948-1949.

*Sloan Laboratory and Gas Turbine Laboratory.* These laboratories are jointly staffed with the Department of Mechanical Engineering and operated by the latter Department, whose report will describe current operations.

**Structures.** No new subjects were introduced, but the content of five catalogued subjects was substantially revised to include more advanced work and to shift emphasis to current problems of design. In particular, a new treatment of shell deformation and a better integration with parallel teaching of airplane design was effected.

Research projects of the structures group included three sponsored by the Navy, involving the employment of eight men. The work was supervised by Professors Joseph S. Newell, Walter H. Gale and Raymond L. Bisplinghoff.

The structures laboratory was completely reworked. New models and test structures were acquired, including a box beam, tension field beam and a swept back wing model. A new bed plate was installed. Modern strain gage instrumentation (developed at M. I. T.) permits precise loading via hydraulic jacks without need for expensive testing machines.

*Aero-elasticity.* Under the supervision of Professor Manfred Rauscher, Instructor Ashley offered a new subject, "Advanced Aero-elasticity," in which recent theoretical developments and the results of current experimental investigations were utilized. Topics treated for the first time were aileron reversal, wing divergence, Reissner theory of flutter of a finite span, compressible subsonic and supersonic flutter. The parallel laboratory course was altered to keep abreast of flutter research, with an increased repertory of experiments.

A Navy-sponsored study of the flutter influence of concentrated masses, flexibly mounted on a wing, brought to light an unexpected dependence of flutter on the nature and location of such masses.

The measurement of the aerodynamic forces on an oscillating wing was successfully accomplished for the National Advisory Committee for Aeronautics. Three other government sponsored research projects were carried well along toward a conclusion during the year.

The provision of shop facilities was greatly helped by the allocation of surplus equipment by the Navy. The partial supervision of students by shop craftsmen while constructing thesis apparatus was found to meet with general satisfaction.

*Design.* The sequence and content of subjects of instruction in design were revised, and the changes will be put into effect next year. Sophomores will no longer go to the Mechanical Engineering Department for Engineering Drawing but will begin their training with aircraft drafting techniques. These differ from conventional drafting practice in placing emphasis on temporary "experimental drawings" for use by skilled mechanics rather than permanent shop drawings for mass production methods. The second-term design subject in the fourth year has been expanded to nine hours per week in the drafting room, to allow the student more latitude in his choice of airplane type and to permit a more complete structural analysis of his design project. The attempt will be made to simulate professional responsibility for the exercise of judgment.

A new graduate subject in design has been prepared by Professor Rene H. Miller, to be offered in 1948-1949, affording the students an opportunity to apply advanced material and concepts usually treated in more specialized graduate subjects. Emphasis will be placed on the aerodynamic, structural and propulsion problems of jet and rocket propelled vehicles.

Two unsponsored helicopter research projects were made possible by a Department appropriation and a Carnegie grant. Both were conducted by Professor Miller. One was an experimental program to study, by means of a restrained model, the stability and control characteristics of helicopters, by measuring the transient response to control manipulations. The other was a theoretical effort to develop an adequate induction theory for a helicopter rotor, making use of strain gage measurements of the blade bending moment during hovering and forward flight.

Professor Otto Koppen participated in the National Advisory Committee for Aeronautics sponsored project to develop and to demonstrate in flight a quiet airplane. This project was handled by a special corporation organized by a Harvard-M. I. T. group.

*Instrumentation.* Ninety students were enrolled in subjects on Instrumentation, of whom 50 were student officers specializing in fire control. All of the subjects were revised to place the main emphasis on closed loop systems.

*Instrumentation Laboratory (Unclassified).* Considerable new equipment was acquired by this laboratory under the direction of Professor Walter McKay. Included were vibration pickups, amplifiers, and oscilloscopes to be used by the Vibration Measurements group directed by Professor James E. Forbes. There were also acquired an electronic simulator and an harmonic synthesizer for solving dynamic control problems. The Fire Control Instruments laboratory under the direction of Professor William R. Weems was air-conditioned, enlarged by the addition of a conference room, and rewired. A unique testing system for fire control equipment, capable of simulating static and dynamic effects, including ship's roll and pitch as well as arbitrary motions of airborne targets, was added. This equipment will be used for instruction, thesis work, and research projects.

Dr. Yao T. Li's work on the engine indicator was the principal research effort. On the basis of tests thus far completed, the indicator has performed in highly successful fashion. A publication is now being prepared.

A Special Committee on Instrumentation was established to supervise candidates for the doctorate in this field. Appointed to serve on this committee were Professor C. Stark Draper, Aeronautical Engineering; Professor Philip Franklin, Mathematics; Professor Jan P. Den Hartog, Mechanical Engineering; Professor Gordon S. Brown, Electrical Engineering; and Professor Francis W. Sears, Physics.

*Instrumentation Laboratory (Classified).* Under the direction of Professor C. Stark Draper, this laboratory has been actively engaged in research and development for the Armed Services in connection with gyroscopes and their application to fire control and navigation. During the past year, one project has been completed with singular success; nine projects now are being prosecuted, and a new one will be undertaken in the near future. The increase in the scope of the Laboratory's work has necessitated an expansion in both personnel and facilities.

In the immediate vicinity of the Institute, the Laboratory occupied two floors of the Hood Building and the entire adjacent Whittemore Building. The latter, a reinforced concrete air-conditioned structure, housed special facilities required for precision work. At Fort Heath, Winthrop, a large modern building was made available by the Navy. Located directly on the ocean, this installation is ideal for fire control investigations and tests involving the tracking of airplanes. At Bedford Airport, the laboratory, with the sponsorship of the Air Force, replaced its temporary flight test facility with a 20,000 square-foot hangar, together with suitable shops, laboratories, and offices, to be used for investigations and tests of airplanes and airborne equipment. For this purpose, the Laboratory has been provided with the following airplanes: one B-25, one C-47, two A-26's, and one B-29. The Bedford flight test facility is operated by Instrumentation Laboratory personnel.

Professor Draper's direction of this classified work was in addition to his teaching and other departmental duties. Members of the Department assisting him were Professor Robert C. Seamans, Jr., Professor Yee J. Liu, Professor Robert K. Mueller Dr. John F. Hutztenlaub, Mr. Dominic Amara, Mr. Sidney Lees, Mr. Albert Madwed and Mr. Donald J. Atwood, Jr. In addition to these, the Laboratory has 75 D. I. C. staff members and 133 persons of non-staff categories. Fifty-one engineers and draftsmen of the firm of Jackson and Moreland work under the supervision of the Laboratory personnel.

Although security considerations have precluded ordinary publication of the Laboratory's work, some 27 volumes and reports were prepared and printed for distribution by the armed services.

The work of the Laboratory is closely integrated with the teaching program. As new theories and techniques evolve and as new apparatus is developed, they are brought to the attention of Service personnel studying subjects to which they are related, and to other students insofar as security considerations permit.

*Cooperative Research.* Leaving out of account the Sloan Laboratory and Wright Brothers Wind Tunnel, members of the staff supervised, in connection with the Division of Indus-

trial Coöperation, some 29 projects. Of these 13 were for the Bureau of Ordnance and six for the Bureau of Aeronautics of the Navy, seven for the Air Force, and one for the National Advisory Committee for Aeronautics.

*Outside Activities.* Professors C. Stark Draper, Hsue-Shen Tsien, John R. Markham and H. Guyford Stever served on the Scientific Advisory Board of the United States Air Force. Professor Tsien acted as consultant to the Naval Ordnance Laboratory and Professor Markham served on the Visiting Committee of the Air Force Institute of Technology. Professor Stever also served on the Guided Missiles Committee of the Research and Development Board and acted as leader of the Systems group of Project Meteor. Professors Edward S. Taylor, C. Stark Draper, Shatswell Ober, Raymond L. Bisplinghoff, Walter H. Gale and René H. Miller served on technical sub committees of the National Advisory Committee for Aeronautics. Professor Miller served on the Editorial Board of the Journal of the Aeronautical Sciences. Professor Hunsaker served on the National Advisory Committee for Aeronautics, on the Council of the National Academy of Science, as consultant to the Atomic Energy Commission, on the President's Air Safety Board and on the President's Scientific Research Board.

JEROME C. HUNSAKER

#### BUILDING ENGINEERING AND CONSTRUCTION

The tremendous interest in the field of construction throughout the country has made itself felt in the registration in this Department. The activities of the Department in sponsored research have been augmented. Staff loads have been unusually heavy during the year because of large classes and because of situations involving leaves of absence and changes in personnel. The outlook for the coming year because of new appointments will relieve this situation materially.

The registered graduate students in the Department were up to our full quota. Most of the graduate students showed great interest in the structural design nad materials courses.

*Masonry Materials.* The sponsored research of the Na-

tional Lime Association has taken on a more fundamental approach and the sponsors have increased their grants substantially during the year for this work. This project was placed under the direction of Professor James A. Murray in February of this year and the work was continued with the assistance of Mr. Sidney H. Greenfeld, Research Associate, and Mr. Donald W. Sabean, Jr., Research Assistant in the Department. In cooperation with the Research Committee of the National Lime Association the program has been pointed at the problems surrounding the burning of limestone and the hydration of lime. Much of the time has been spent in development of a laboratory kiln for careful control. Professor Murray has started the preparation of a long range research survey of the problems surrounding masonry and cementitious materials for the activities of his division.

*Plastics.* The research sponsored by the Plastic Materials Manufacturers Association under the direction of Professor Albert G. H. Dietz and with the assistance of Walter J. Gailus, Research Associate, Steven Yurenka and Earl E. Patterson, Research Assistants in the Department, has made considerable progress during the year. An important part of the program was the development of testing methods and devices which resulted in a testing machine, which has received national attention through the American Society for Testing Materials. The Society of the Plastics Industry has prepared a technicolor movie of the machine which will be shown for the first time at the National Plastics Show in New York on September 29.

*Adhesives.* A project has been set up under the Division of Industrial Coöperation to study the mechanisms of deterioration of adhesive bonds, particularly of synthetic resin and similar adhesives in metal to metal bonds. This project is under the direction of Professor Albert G. H. Dietz who is being assisted by Mr. George M. Kavanagh, Research Associate in Chemistry and Mr. Philip J. Closmann, Research Assistant in the Department. Sonic and mechanical methods of measuring the characteristics of adhesives are being investigated.

*Solar Energy.* The Solar Energy Project operating under a Committee composed of Professors Lawrence B. Anderson of Architecture, Hoyt C. Hottel of Chemical Engineering and

Albert G. H. Dietz of the Department has progressed to the point where plans are now underway to turn the Solar Laboratory into a home for family occupancy for the purpose of studying the usefulness of solar heating under actual living conditions. Messrs. Edmund L. Czapek and Frank Haws of Architecture are directly operating this work and are assisted by Mr. Thomas A. Hood, Assistant in the Department.

*Copper Roofing.* The sponsored research of the Revere Copper and Brass, Inc. under the direction of Professor Walter C. Voss has continued during the current year. The actual tests and studies have been made by Mr. Albert J. O'Neill, Research Associate of the Department who has been assisted by Professor Irving H. Cowdrey of the Mechanical Engineering Department. The report on gravel stops has been made to the sponsors. A study of the fundamentals developed under the previous research on copper gutters has been extended to other metals to study the effect of mechanical properties of such metals under similar uses.

*Personnel.* The textbooks, *Semi-Fireproof Construction* by Professor Howard R. Staley and *Fireproof Construction* by Professor Walter C. Voss, have been issued during the year. The manuscript for "Organic Materials of Construction" is complete and should be in the hands of the printer for publication during the coming year. Professor Albert G. H. Dietz will be the author of this volume. The publication of a book on "Engineering Laminates" under the authorship of Professor Dietz, with the assistance of several other experts, is in the hands of the printer and should be issued shortly. Other volumes in the Construction Series by members of the Department and Institute staff are in the process of manuscript preparation.

At the Forty-Fifth Annual Meeting of the National Lime Association in May Professor Murray reported on some of the work which was performed during the year under Professor Staley's direction, and Professor Voss presented a paper on "Fundamentals and Research." Professor Dietz, together with G. S. Burr, W. J. Gailus, J. O. Silvey and S. Yurenka, prepared a paper on the "Universal Plastics Testing Machine" for which they were awarded the Templin Award by the American Society

for Testing Materials. Professor Dietz gave a paper to the Northeastern Wood Utilization Council in April on "High-Grade and Low-Grade Lumber in Glued Laminated Members"; he prepared an article for the Society of Plastics Engineering News on "Stress-Time Relations in Plastics"; a paper presented before the American Society of Civil Engineers in October on "Stress Distribution Around Split-Ring Timber Connectors"; and a paper presented before the American Society for Testing Materials in June 1948 on the "Effect of Speed of Test on Strength Properties of Plastics," which was prepared with the assistance of Messrs. Walter Gailus and Steven Yurenka.

The interest of various members of the staff in professional society activities has continued to grow. Professor Dietz is Temporary Chairman of the newly formed Technical Committee C-19 on Structural Sandwich Constructions of the American Society for Testing Materials; he is a member of the Administrative Committee on Papers and Publications of the American Society for Testing Materials; a member of Committees D-7 on Wood, D-14 on Adhesives, and D-20 on Plastics, all of the American Society for Testing Materials; a member of the Structural Timber Committee of the American Society of Civil Engineers; a member of the Committee on Coordination of Research of the Forest Products Research Society; member of the Educational Committee of the Society of the Plastics Industry; member of the Executive Council of the Eastern Massachusetts Chapter of the Society of Plastics Engineers; member of the Executive Committee of the Structural Section of the Boston Society of Civil Engineers, and has continued his activities as a member of the American Society of Mechanical Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Engineering Education and the Northeastern Wood Utilization Council. Professor Voss has continued his activities as Chairman of Committee C-7 and as Chairman of Subcommittee V of Committee C-12 and as a member of Committee E-6; he has been appointed Chairman of the Administrative Committee on Research of the American Society for Testing Materials and has continued his activities on the Building Code Committee of the American Institute of Architects.

Professor Staley was granted a leave of absence during the year and will return for duty in September. Mr. Sidney H. Greenfeld has resigned as Research Associate in the Department and has been replaced by Mr. Herman C. Fischer to assist Professor Murray in his division. Mr. Thomas A. Hood has been appointed an Assistant in the Department and is continuing his studies as a graduate student in Building Management and Materials. Professor Peabody will assist the Department as a part-time Professor in connection with the graduate course in Structural Design. Professor Howard Simpson and Mr. Thomas A. Hood have spent the summer in industrial employment to amplify their experience in their respective fields.

WALTER C. VOSS

#### BUSINESS AND ENGINEERING ADMINISTRATION

During the past year the Department experienced its largest post-war enrollment. Special measures to assure continued individual student contacts with faculty, executives, industry and alumni were, therefore, essential.

*Faculty-Student Relations.* The number of faculty members appointed as student counselors was increased, and special instruction in registration and counseling was given the group by Professor Charles H. Porter. A series of meetings at the homes of faculty members was arranged, enabling each student to have the opportunity of at least one such informal social contact with staff members. In addition, periodic teas were continued in the Commons Room.

At the opening of the fall term, photographs were obtained of all undergraduate and graduate students. Multiple copies made it possible to provide each instructor with visual identification cards for each student in each subject given. Conversely, through the medium of the undergraduate professional association, a bulletin was issued entitled "Who's Who in Course XV," giving photographs and background of staff members.

To implement ease of contact between instructors and students, a name-file for returning class papers was instituted. For ease in communicating promptly with students, a noti-

fication system was also re-instituted. Finally, the announcement of assigned consultation hours on the part of faculty members enabled students to confer with their teachers more conveniently.

As a result of this multiple program, a definite advance in faculty-student relations has occurred.

*Executive-Student Relations.* The undergraduate professional association known as the M. I. T. Management Association has, through evening meetings and seminar sessions, brought both undergraduates and graduates in close touch with a number of prominent executives who have discussed current developments of general interest in the industrial field.

Further executive-student contact has resulted from the organization of graduate seminars. In one such graduate subject, devoted to the study of organization, students were privileged to attend a series of conferences with Lounsbury Fish, Visiting Professor in the Department and Organization Counsel for the Standard Oil Company of California; and Alvin Brown, Treasurer of the Johns-Manville Corporation.

A second series of seminars, dealing with public relations, gave graduate students opportunity to discuss aspects of this topic with practitioners in the field, including: John W. Barriger, 3d, President, Chicago, Indianapolis and Louisville Railway Company; Clark Belden, Executive Secretary, New England Gas Association; Lemuel R. Boulware, Vice-President, General Electric Company; Holgar J. Johnson, President, Institute of Life Insurance; Adrian C. Minton, Secretary, Standard Oil Company of New Jersey; and Fred G. Rudge, President, Fred Rudge, Inc.

*Industry-Student Relations.* In two required undergraduate subjects given at the beginning and end of the department curriculum, extensive and intensive plant visits are assigned. The number of companies collaborating in these activities during the past year totaled 126 and afforded a form of laboratory experience vital to practical and realistic instruction.

Further emphasis has been placed upon the organization of thesis investigations in industry, and upon summer employment for undergraduates, which has been specifically promoted through letters of introduction and other assistance by members of the Department.

*Alumni-Student Relations.* The continuing program of annual correspondence with the more than 2,500 graduates of Course XV centered upon the general topic of free or private enterprise. A questionnaire was first issued, followed by a series of four letters to all graduates, which classified the many responses received. Copies of these letters were distributed to all undergraduate students in order that they also might gain from this assembly of viewpoints.

A further activity has been the preparation of detailed exhibits which describe current promotions experienced by graduates, reflecting a specific example of distinguished attainment. A final device in the furtherance of alumni-student relations has been a series of weekly evening seminars in the theory and practice of administration, involving the collaboration of departmental alumni. During the past year the following industrialists contributed to this program: Frederick S. Blackall, Jr., '22, President, Taft-Peirce Manufacturing Company; Richard L. Bowditch, '23, President, C. H. Sprague & Son Company; Percy Bugbee, '20, General Manager, National Fire Protection Association; Donald F. Carpenter, '22, Vice-President, Remington Arms Company; Warren L. Chaffin, '20, President, J. L. Stifel and Sons Company; William W. Garth, Jr., '36, President, Lithomat Corporation; Ralph F. Gow, '25, Vice-President, Norton Company; Henry C. Haskell, '20, President, Brunswick Worsted Mills; Duncan R. Linsley, '22, executive Vice President, First Boston Corporation; Newman M. Marsilius, '17, President, Producto Machine Company; David A. Meeker, '24, President, Hobart Manufacturing Company; Albert S. Redway, '23, Vice-President, Geometric Tool Company.

*Services to Other Students.* In addition to the presentation to out-of-course students of the subject 15.11, Introduction to Business, the Department has provided training for 590 students from other departments who wish to take one or more business subjects. This opportunity has been so widely grasped that enrollment of outside students sometimes exceeds that of Course XV undergraduates, and the trend in this direction is mounting. In addition, larger numbers of graduates of other departments have applied for entrance for further study leading to a bachelor's degree in business and engineering

administration. The problem of adequately servicing the needs of students from other courses is receiving serious attention.

*Departmental Developments.* A modernization program involving objectives, methods, facilities and equipment has been actively pursued during the year.

A special Appraisal Committee was appointed early in the year to review basic objectives and general curricular organization and administration. This committee has held many meetings and made several reports involving recommendations which are being put into practice.

Following a special investigation, a schedule has been instituted whereby each staff member is afforded a specific interim during the school year in which to maintain and develop external industrial contacts in his field which may result in the accumulation of new teaching material or data for general publication. This is in addition to the usual vacation period.

A special committee was also appointed to study the administration of thesis activities, and ensuing recommendations incorporated important changes in this activity.

Another special committee appointed to study library facilities has, with assistance and cooperation of Institute Library officials, proposed a variety of improvements in operating relationships.

Special studies were made of equipment essential to the divisions of administration, production, marketing and accounting; and the Department is especially appreciative of the cooperation of the Administration in making funds available for the rehabilitation of laboratory and office equipment.

An important advance in office facilities has resulted from a program of improved office lighting, floor treatment, and redecoration of offices which has provided a more serviceable working environment for members of the teaching staff.

Of greatest significance has been the gift of \$225,000 by Mr. Alfred P. Sloan, enabling the re-establishment of the Alfred P. Sloan Sponsored Fellowship Program, which was temporarily discontinued upon the outbreak of the war. Professor Gerald B. Tallman has been appointed director of the resumed program, and is conducting an extended preliminary

survey of the organization and re-establishment in 1949 of this activity. The responsibility of this program is shared equally with the Department of Economics and Social Science.

A great loss was suffered in the passing on October 23, 1947, of Professor Albert A. Schaefer, Professor of Business Law and for many years a member of the Institute faculty. His excellence as a teacher as well as his wisdom and humanity in counseling students made him a constant resource and one whose services will be long remembered.

The Department wishes to express its sincere gratitude to the many executives and alumni who have given liberally and freely of their time and effort in the furtherance of our activities. Special appreciation is extended to Howard D. Williams, '11, and Newman M. Marsilius, '17, for their gifts of unrestricted funds. Many forward-looking developments could not have taken place without their timely and generous assistance.

ERWIN H. SCHELL

#### CHEMICAL ENGINEERING

As in the earlier post-war period, the past year has been characterized by heavy student loads in both the undergraduate and graduate curricula. Undergraduate enrollment in the junior and senior years was more than double the prewar figures. Over 160 men were enrolled in the Graduate School, of which 42 were working for the doctorate. These numbers continue to place a severe burden on the teaching staff.

Part of the graduate teaching was, as usual, carried on in the School of Chemical Engineering Practice. Because of the large number of graduate students, it has not been feasible to reopen the undergraduate Practice School, which, however, it is hoped, can be resumed next Spring. With the assistance of the cooperating companies, the facilities of the Buffalo and Bangor Stations were considerably improved during the year.

To meet the need for training engineers in nuclear engineering, the Institute has established a new Engineering Practice School. By arrangement with the Atomic Energy Commission and the Carbide and Carbon Chemicals Corporation, operators of the Oak Ridge Atomic Energy plants, a station has been

established at Oak Ridge. Operation of the school will be along the general principles of the Chemical Engineering Practice School, and administration is, at present, in the hands of this department. In view of the diversity of the problems encountered, properly qualified graduate students will be accepted from any course in the Institute. The first student group, consisting of seven chemical engineers and one electrical engineer, started the scheduled twenty-two weeks of study in July of this year. There is no commitment on the part of the students to continue work in the field of atomic energy after completing their studies, but it is hoped in this school to provide not only excellent educational facilities but also to turn out a group of engineers trained in a field of great importance in times of National emergency.

Several awards of distinction were made to staff members during the year. For his contributions in the war, Professor Hoyt C. Hottel received from Great Britain the King's Medal for Services in the Cause of Freedom, and from the United States, the Medal of Merit. Professor Harold C. Weber was awarded a Certificate of Merit by Presidential citation. Several lectures were delivered by staff members at other institutions: Professor William H. McAdams, on recent developments in heat transfer at Purdue University, and Professor Ernst A. Hauser, on ultramicroscopy at McGill University.

The fuels research laboratory, mainly government sponsored, has continued and expanded its basic studies of high-output combustion. This is a major problem in the field of jet propulsion. New subjects include atomization and mixing of liquid jets and fundamental studies of rocket motor performance. Experimental work has also been initiated on thermal radiation from carbon dioxide and steam at elevated temperatures. Further investigations have been made of the manner in which flames are attached to and move from stabilizing shapes. Studies on the effects of turbulence in the approaching stream of unburned gas on flame propagation have tentatively established a correlation between the scale and intensity of the turbulence and apparent increases in burning rates. Measurements have been made of the thermal energy required for igniting high velocity streams of vaporized gasoline-air mixtures,

and a technique for producing and analyzing unmixed gas streams of known inhomogeneity is being developed to assist the high-output combustion program. Further studies are underway on the mechanism of carbon combustion, especially with reference to effect of particle size on reaction rate with oxygen, carbon dioxide, and steam.

The research on hydrogen peroxide, now sponsored by the Office of Naval Research, continued through its third year in cooperation with members of the Chemistry Department. The program includes investigations of the fundamental properties of hydrogen peroxide and of its aqueous solutions, the stability of hydrogen peroxide in storage, the mechanism of catalytic and thermal decomposition in liquid and vapor phases, and other peroxide reactions.

Basic thermodynamic property charts have been prepared as an aid to calculating combustion cycles, particularly the Otto cycle, gas turbine, ram jet, and rocket. Contributions have been made in calculating chemical reaction equilibria, in the field of azeotrope formation, and in the estimation of adsorption equilibria.

The investigation of fluidized powder flowing in gas streams has been carried forward on several fronts. Study of the fundamental mechanics of the operation have continued, especially with reference to heat transfer, mass transfer, and general mixing of gases and solids within the fluidized beds. The influences of particle size and size distribution, and the transport of solids through the beds are also being tested. In the application of fluidized solids to chemical reactions, studies are underway on the gasification of coal with air, oxygen, steam, and carbon dioxide, on iron ore reduction, on oxidation of hydrocarbons and on the production of pure sulphur dioxide.

Adsorption is another chemical engineering technique under intensive investigation. Particular attention is focused upon the equilibrium relations between hydrocarbon gas mixtures adsorbed on different adsorbents and on rates of exchange in fixed and moving beds. Studies of heat and mass transfer in fixed beds are being directed particularly towards their significance to catalysis. In the general field of heat flow, work on transfer to water boiling at high pressures has

been completed, progress has been made on transfer to air at supersonic velocities, and work was initiated on heat transfer and pressure drop for air flowing in short capillary tubes.

Colloid research has been extended into the field of antibiotics. Penicillin has been shown to be a colloid whose antibiotic activity is a function of the number of micelles present. Vulcanization of rubber and polymerizations generally have been further studied with the new ultramicroscopic technique using incident light. The pendant drop technique of determining interfacial tension has been extended to the region of very high pressure, which is of particular interest in oil field production. Colloidal properties of cellulose and the colloidal chemistry of silicious matter are of current interest.

The abnormal teaching load and the demands of research continue to interfere with publication. Progress is underway on revision of texts and on new text material. Early publication is scheduled for "Thermodynamic Charts for Combustion Processes," and it is hoped that the flow of articles to current literature may increase in the near future.

WALTER G. WHITMAN

### CIVIL AND SANITARY ENGINEERING

The past year has seen the new undergraduate curriculum in Civil Engineering put into operation for second-year students. Choice between the three options, namely, Theory and Design, Planning and Administration, and Construction and Management, does not occur until the middle of the third year, so that there is no indication as yet as to the relative interest that will be shown with respect to options. In the meantime, the new curriculum has aroused considerable comment which has been predominantly favorable.

The enrollment in the Department increased moderately during the year, as summarized in the following table:

Date	1st Year Civil	2d Year Civil	3d Year Civil	4th Year Civil	Graduate Civil	Graduate Sanitary	Total Department
November, 1944...	19	14	14	10	22	3	82
November, 1945...	24	8	15	14	35	3	99
November, 1946...	42	36	32	37	62	14	223
November, 1947...	51	45	55	20	49	14	234

The decrease in fourth year students resulted from irregular programs and is reflected in the increase in third year students. The decrease in graduate students in Civil Engineering resulted from an enforcement of the quota of fifty for that group. Enrollment of graduate students in Sanitary Engineering remained at the quota of fourteen. Included among the graduate students in Civil Engineering were thirteen Army Engineer Officers.

In December, another department news letter was sent to the 2,500 living graduates of this Department.

The Visiting Committee for the Department has been most helpful during the past year, particularly in connection with our efforts to secure improved laboratory facilities in Fluid Mechanics and in Photogrammetry. A well-attended meeting of the Committee was held at the Institute in December under the chairmanship of Thomas C. Desmond, '09, who has shown, in so many ways, his staunch support of the Department.

In April the Department sponsored two lectures by Doctor Edward H. Graham, Chief of the Biology Division of the Soil Conservation Service of the United States Department of Agriculture, who spoke on "The Science of Soil Conservation" and on "Soil Conservation and the Engineer." Other lectures on conservation are planned from time to time.

*Structural Division.* The research program being conducted in the Structural Dynamics Laboratory for the Office of the Chief of Engineers of the War Department, with the objective of determining design parameters for reinforced concrete structures subjected to impulsive loads, has been expanded during the past year by Professor Robert J. Hansen, who has constructed a new type controlled impulsive-load testing machine for beams and is planning to build, during the next year, a similar machine for slabs. Professor Hansen, who was promoted to the grade of Assistant Professor in April, presented two papers in connection with the above research: one to the Designers Section of the Boston Society of Civil Engineers; and one to the Society for Experimental Stress Analysis.

The research program being conducted in the Structural Analysis Laboratory, sponsored by the Welding Research

Council and dealing with the elastic stability of welded struts and flexural members, has continued under the supervision of Professor Charles H. Norris.

Professor John B. Wilbur and Professor Norris collaborated on a text book, *Elementary Structural Analysis*, which was published during the year. They also served as consultants to the War Department in connection with an underground explosion program.

*Hydraulics Division.* During the spring term a Hydro-mechanics Seminar was conducted with lectures given by both staff members and outside speakers, the latter including Doctor Boris Bakhmeteff of Columbia University. The seminar was attended by engineers from various Boston firms as well as by students and staff members from practically all departments of the Institute.

A number of improvements were made in the old Hydraulics Laboratory in Building 21, including the clearing of the area containing the main reservoir of the laboratory which was above floor level, and the building of a new water-storage reservoir of reinforced concrete construction below floor level in the same area. The special funds provided by the Institute two years ago to re-establish the old Hydraulics Laboratory on a temporary working basis and to purchase equipment that will be useful in the new Hydrodynamics Laboratory are now exhausted. It is believed that maximum all-around benefits for both of these purposes have been achieved.

Most of the research projects described in last year's report have been placed on an active basis, although some have not been organized as yet, since their confirmation by contract has only been very recent. The following projects are now active: for the United States Army Air Forces, an investigation entitled "Studies and Experimental Investigations on the Validity and Applicability of the Hydraulic Analogy to Supersonic Flow of Gases"; for the Office of Naval Research, a study dealing with "Basic Principles Governing Fluid Friction and Cavitation Phenomena in Unsteady Motion"; and for the Research Committee of the American Society of Civil Engineers, one study dealing with "Stability of Flow Stratified due to Density Differences," and one with "The Motion of Oscillatory

Waves in Open Channels." There are also funds available to commence work on the following projects: for the Engineering Foundation, an investigation dealing with "Development of Methods and Instruments to Determine the Characteristics of Turbulent Motion in Water"; and for the United States Public Health Service, a study entitled "Methods of Air Dispersion to Secure Greater Efficiency in the Solution of Oxygen in the Activated Sludge Process."

The above work is being conducted under the direction of Doctor Arthur T. Ippen, who has been promoted to the grade of Professor, and with the assistance of Doctor James W. Daily, who is serving as Research Secretary to the Hydraulics Division of the American Society of Mechanical Engineers. During the year Professor Allan T. Gifford lectured at the Water Works School of the New England Water Works Association. Henry M. Paynter was promoted to the grade of Instructor.

*Sanitary Division.* On December third the William Thompson Sedgwick Laboratories of Sanitary Science were dedicated. Speakers at the dedication exercises included Doctor Samuel C. Prescott, Professor Gordon M. Fair, Dean of the Graduate School of Engineering at Harvard, Arthur D. Weston, Chief Engineer of the Massachusetts Department of Public Health, and Professor William E. Stanley.

Professor Murray P. Horwood continued his supervision of the sanitary operation of the swimming pool and the dining services at Walker Memorial and the Graduate House. He was also responsible for the preparation of a new sanitary code pertaining to the restaurants in Boston.

Under the direction of Professor Clair N. Sawyer three research projects have been under way: under a grant-in-aid from the Wallace & Tiernan Company, the use of chlorine in the treatment of industrial wastes has been studied; an investigation of nutritional factors involved during the biological stabilization of industrial wastes has been conducted for the National Institute of Health; and studies dealing with the biochemical oxygen demand test have been carried out with funds obtained from the Federation of Sewage Works Association. All of these projects will continue next year.

*Soil Mechanics Division.* During the past year the research project for the United States Corps of Engineers, dealing with the solidification of soils in the field of chemical agents, has continued. This project is guided by a steering committee that includes Professor Ernst A. Hauser and Professor Harold C. Weber of the Department of Chemical Engineering, and of which Professor Donald W. Taylor is chairman. The contract for this project has been extended until 1950.

Professor Taylor and Thomas W. Lambe attended the Congress on Large Dams in Sweden, and the International Conference on Soil Mechanics in Holland during June.

During the year, a textbook, *Fundamentals of Soil Mechanics*, written by Professor Taylor, was published. Professor Taylor also served as consultant to the Corps of Engineers on a number of matters including a long range program on field measurements of pressures.

*Transportation and Surveying Division.* After having been closed during the war, the Summer Surveying School was reopened. With a total enrollment of 126 students, it was necessary to divide the camp into two sessions of four weeks each. It was hoped that this condition would not occur again, but a similar number of students in the summer of 1948 necessitated a continuation of the abbreviated camps. The camp is under the direction of Professor Herman J. Shea, with Professor Allan T. Gifford acting as his executive officer.

Professor Shea has made considerable progress in equipping our new Photogrammetry Laboratory. This has been made possible through the generosity of a distinguished graduate of the Department.

Professor John B. Babcock has been active in the work of professional societies, particularly in connection with the Centennial Celebration of the Boston Society of Civil Engineers which is the oldest engineering society in this country. Professor Babcock also continued his outstanding work as placement officer for the Department. A new venture was initiated this year in making a concerted effort to obtain summer jobs for students of the Department. With the help of Professor Shea, all the men who wanted work were placed in engineering jobs. The demand for graduates continues to exceed the supply.

JOHN B. WILBUR

## ELECTRICAL ENGINEERING

That the past year represents an all-time high in Department as well as Institute activity is apparent from Institute statistics. This fact has had a major influence on Department policies, progress, and problems. Some consequences of this scale of operations are the following:

The record numbers of students and staff, the large scale of research activity and the consequent heavy responsibilities on our senior staff have maintained some of the wartime atmosphere of pressure. Much fine work has been accomplished under these challenging conditions. We look forward, however, toward conditions under which our senior staff can devote somewhat more thought and effort to the advancement of our undergraduate teaching and educational methods.

This peak of load is presumably temporary. Because of the discontinuance of the Navy Electronics Program for undergraduates, this past year has been the high point of undergraduate electrical enrollment. Anticipating a relatively short peak, we used junior staff to carry much of the increment of load. Fortunately the quality, experience, and maturity of the young men available, many of them Veterans, have been exceptional. As a result, the placing of unusual responsibility on these younger men has, on the whole, produced good results.

Administration of the Department has been much assisted by the formation of an advisory group of senior staff members who have met regularly to consider matters of Department policy and its application in important cases. A somewhat larger group, including associate and full professors, has lunched together weekly during most of the year as a means of getting wider discussion on departmental matters, of keeping this group informed on the many and varied activities, and of bringing our group closer together following the centrifugal effects of the war activities.

The weekly Staff seminar in which new developments in the Department and in adjacent fields at the Institute are presented, has been very well attended both by our own staff and by numerous outside groups who have requested permission to attend.

A notable series of lectures on a generalized direct-current

machine theory were given in the spring by Dr. Joseph M. Pestarini.

A valuable meeting of the Visiting Committee under the chairmanship of Dr. Vannevar Bush emphasized the importance of the engineering as well as the scientific spirit in the Department.

Staff honors include the following: Professor Harold E. Edgerton was awarded the Honorary degree of Doctor of Engineering by his *alma mater*, the University of Nebraska, and Professor Eugene W. Boehne also received the Honorary degree of Doctor of Engineering from his *alma mater*, the Texas Agricultural and Mechanical College. In the competition sponsored by the national Electrical Engineering Honorary Fraternity, Eta Kappa Nu, for the Recognition Award to Outstanding Young Electrical Engineers, Professors Albert C. Hall and Jerome B. Wiesner received Honorable Mention.

Professors Edward L. Bowles, Samuel H. Caldwell and Ivan A. Getting received the Medal of Merit for their war work. Professors John G. Trump and Samuel H. Caldwell received the British recognition, "His Majesty's Medal for Service in the Cause of Freedom"; and Professor Edward L. Bowles received the recognition, "Most Excellent Order of the British Empire." These are in addition to the following earlier awards not previously mentioned: The Distinguished Service Medal to Professor Edward L. Bowles; the Medal of Freedom to Professor Harold E. Edgerton; the Naval Ordnance Development Award to the Servomechanisms Laboratory and to Dr. Gordon S. Brown as Director; and to the Ballistics Computation Group of the Center of Analysis. Professor Samuel H. Caldwell as Chief of Section 7.2, National Defense Research Committee received the Naval Ordnance Development Award.

Professor Harold E. Edgerton has been promoted to a full professorship, Assistant Professors Lawrence B. Arguimbau, Yuk W. Lee and Henry J. Zimmermann have been promoted to Associate Professorships, and Mr. Benjamin J. Dasher has been made an Assistant Professor.

Notable among activities of the staff are the memberships of Professors Leo L. Beranek, Ivan A. Getting, Albert C. Hall and Jerome B. Wiesner on panels of the Research and Develop-

ment Board. Many members of the staff are retained in a consulting capacity on work of a character that enhances their professional development and their contributions to the students.

In response to an urgent request Professor Harold L. Edgerton was granted leave this spring to participate in the Pacific tests of Project Sandstone of the Atomic Energy Commission.

In our formal teaching program several new subjects of instruction have been added. In the undergraduate group, Engineering Acoustics has been offered by Professor Leo L. Beranek, particularly for seniors in the communications option desiring a subject dealing with acoustical apparatus and systems including those psychological aspects of hearing related to acoustical design. Additions to the graduate subjects include Optimum Linear Systems, in which Professor Yuk W. Lee applies the Wiener smoothing and prediction theory to a variety of engineering problems; an extension of Transients in Linear Systems by Professor Murray F. Gardner into a two-term subject; the Design of Automatic Control Systems for Aircraft offered by Professor Albert C. Hall; and Electrodynamics of Particles offered by Professor Ivan A. Getting. Dr. Stanford Goldman has given a subject, Modulation, Noise and the Transmission of Information; and Professor Lawrence B. Arguimbau has given Principles of Frequency Modulation. The graduate instruction in Acoustics has been thoroughly revised with Professor Leo L. Beranek giving Advanced Acoustics and Professor Richard D. Fay giving a companion subject Electro-Acoustic Devices, to complement the Physics subjects in this field.

The experiment of Professors Arthur E. Fitzgerald and Charles Kingsley in replacing the conventional approach to electrical machinery by a fundamental approach to electro-mechanical energy conversion devices generally has proved notably successful in initial trials this year. Bound notes will be available for much of this work which will be given to all electrical undergraduates beginning September 1948. This experiment may well lead to as significant a development as that from hydraulics to fluid mechanics.

An unusual number of new books by members of the staff include the following: *Principles of Servomechanisms* by Professors Gordon S. Brown and Donald P. Campbell; *Vacuum Tube Circuits* by Professor Lawrence B. Arguibau; *Frequency Analysis Modulation and Noise* by Dr. Stanford Goldman; *Table of Planck's Function 2000 to 3500 Degree K* by Professor Parry Moon; *Lighting Design* by Professor Parry Moon and Dr. Domina E. Spencer; *Microwave Transmission Design Data* by Mr. Theodore Moreno; *Tables of Supersonic Flow Around Yawing Cones — Technical Report No. 3* by the Staff of the Center of Analysis under the direction of Dr. Zdenek Kopal.

In addition, the long-awaited reference volume for the "M. I. T. — Electrical Engineering Staff Series" entitled "Mathematics of Circuit Analysis" is now in proof form.

The Department considers teaching training as one of its important functions, exemplified this year by eleven members of the junior staff accepting teaching posts elsewhere, of which nine are assistant professorships.

Many of the staff continue to serve in various capacities in national professional societies and their local sections; for example, Professor William H. Radford was Chairman of the Boston Section of the Institute of Radio Engineers, and Professor Carlton E. Tucker was Chairman of the New England Section of the American Society for Engineering Education.

Research continues as a major activity with Department faculty directing the expenditure of about three and one-half million dollars during the year. Project directors have been notably productive in high-level graduate training as well as in creating new art. Space permits only suggestive mention of highlights.

Servomechanisms activity under Professor Gordon S. Brown includes teaching several undergraduate and graduate class subjects, and operating an educational and two research laboratories. Recognized internationally as a leader in the field, this group attracts many students who are much sought following graduation. This apparently highly specialized field proves actually to be one of the best media for fundamental training in dynamics emphasizing composite mechanical-electrical-fluid systems. In research, the Servomechanisms

Laboratory continued the Whirlwind Project on electronic-digital computation, the fire-control project for the Armament Laboratory at Wright Field, and the instrumentation and control project for the Brookhaven reactor. The entire personnel and facilities for Project Whirlwind were moved to the Barta Building which has been reconditioned and converted as a research space to house the installation of the Whirlwind 1 electronic digital computer sometime during 1949. The activities on fire control and for Brookhaven were carried on in Building 32. Research on fire-control work seems to be assured of continued support for several years. The Brookhaven project, being of specific character, is scheduled for completion during the fall of 1948.

The Dynamic Analysis and Control Laboratory under the direction of Professor Albert C. Hall is continuing its program in the development of a simulator and of automatic-control systems for aircraft and guided missiles. Among the activities of that laboratory during the past year have been research on strain gauge techniques for use in flight instruments and the development of miniaturized electro-hydraulic control systems. The major effort of the laboratory continues to be the development of the flight simulator, an electromechanical analogue computer that will permit laboratory study of the problem of controlled flight. The flight simulator is presently being placed into operation, and it is expected that practical results will be obtained during the coming year.

In the Laboratory for Insulation Research under the direction of Dr. Arthur R. von Hippel, a diversified group totalling about forty people, appears effective for the combined physical-chemical-electrical engineering research-educational attack on the electrical behavior of materials. Among the group are doctorate students from all three fields. At present problems of the solid state are in the forefront with research on ferro-electric titania ceramics giving results of considerable practical importance. The piezo-electric response of these materials over a wide temperature range and their insensitivity to moisture and rough handling makes them successful competitors of Rochelle salt for microphones, pickups, loud speakers, pressure gages, and many other devices. Several companies

have started to produce such instruments on the basis of these findings. Our fundamental research has, in the meantime, turned to the investigation of single crystals of these materials, and it has become possible to see the domains in the ferroelectric state and to change their number, size, and orientation. Thus phenomena, for which indirect evidence has existed in the case of ferromagnetics, can now be made visible and are being studied in detail.

Similarly useful results may be expected from the studies, which are in progress, of ferromagnetic semiconductors, the elements of the VI<sub>b</sub> group of the periodic system, absorption spectra of solids and the synthesis of new crystal types.

The Department continues its enthusiasm for the inter-departmental laboratories in which it is a partner, namely, the Research Laboratory of Electronics, the Laboratory of Nuclear Science and Engineering and the Acoustics Laboratory, detailed reports of which are contained elsewhere. In the Electronics Laboratory the staff of this Department has been particularly concerned with the researches on the transmission of information, missile guidance and telemetering.

The Synchrotron Project under Dr. Ivan A. Getting and the twelve-million-volt generator project in Dr. John G. Trump's High Voltage Research Laboratory form the Department's contribution to the Laboratory of Nuclear Science and Engineering.

The High Voltage Research Laboratory also received in April, 1948, a grant of \$70,000 made to the Institute by the American Cancer Society for the furtherance of the studies of the medical properties of X-rays and for the acquisition of an additional supervoltage X-ray generator. In cooperation with the Department of Food Technology, the High Voltage Research group has used the Building 28 generator for the investigation of the biological properties of both supervoltage X-rays and cathode rays.

In the Center of Analysis under Dr. Samuel H. Caldwell most of the effort is now devoted to the normal operation of equipment in the solution of problems touching a wide area of science and engineering and to fundamental training in the rapidly growing field of mechanical computation. A modest

program of new development has made the Differential Analyzer even more effective in handling the difficult problems brought to it. The group using punched-card machinery has been re-organized and new equipment has been added to increase our range and flexibility of operation in this field. Much of the work of the Center of Analysis is under security classification and this is particularly true of the group using standard desk machines. However, a substantial part of this work involves important astronomical computations which are being released for publication. Partly as a result of this work in astronomy, the leader of the group, Professor Zdenek Kopal, was recently elected President of the Commission on the Study of Close Binary Stars of the International Astronomical Union.

Professor Harold E. Edgerton's group continues to push the techniques of short-flash photography to new and striking accomplishments, and important new scientific and technical applications. Color photography of large-scale indoor spectacles is one recent spectacular accomplishment derived from the group's war work on airborne night reconnaissance photography.

In summary, Department activity, spirit, and productivity are at a high level, limited in scale basically only by the availability of mature staff leadership.

HAROLD L. HAZEN  
CARLTON E. TUCKER

### GRAPHICS

The Section of Graphics continued its gradual introduction of graphical methods of solution into its course in Engineering Drawing. This has proved very stimulating to students and has afforded added opportunities for cooperation with other departments at points where graphical explanations are illuminating. While maintaining the calibre of the student's drafting, this work has added greatly to his respect for graphical solutions and his capacity to execute them. The work has thus met the test of classroom use and can be considered a sound portion of the modern Engineering Drawing Course.

Professor Douglas P. Adams has completed his "Index of Nomography" which is to be published shortly.

JOHN T. RULE

### MECHANICAL ENGINEERING

The average teaching load was reduced slightly during the year, and there was a beginning towards an increase in the time available to staff members for creative work. How to maintain and improve the educational standards with the continued pressure for admission of large numbers of students, nevertheless, continued to be the most important problem.

Much attention has been given during the year to the general aim and philosophical background of education for the mechanical engineer. The four-year undergraduate program is inadequate for a complete professional background. The emphasis on fundamental science in preference to vocational skill is a sound compromise, but we are becoming more conscious of the fact that the professional background is particularly important in the development of critical judgment and sense of responsibility, which must be part of the make-up of the engineer. Professional subjects have a role in general education and the development of character which we have not fully utilized. Contact with industry during the formative years is of importance in this connection. We have given much attention during the year to the re-establishment of a cooperative program of education. We are seeking a formula which would cut less into the college life than the old Course II-A program, but still give the majority of students an opportunity for at least six months' employment in industry prior to the senior year. A tentative solution for this has been found and will be tried out on a small scale during the coming year. Many industrial concerns have expressed interest in such a program.

The mechanical engineer serves practically all branches of industry, power and manufacturing being the only two fields which he can call his own. The significance of manufacturing as a field for professional development has only lately become apparent. Recognition of this was made during the year in a rearrangement of the option system, whereby Option 2 was changed from Engineering Science to Materials, Design, and Manufacturing. The new option depends for much of its professional background upon the Metals Processing Laboratory.

The enrollment of graduate students in Mechanical Engineering continues to be heavy, and the number of candidates

for the Doctor of Science degree is particularly large. Much attention has been given during the year to combat the evils of highly formalized instruction in the Graduate School. Professional subjects are preferably extended over two terms, the second term involving principally the preparation of a term project, in which there is some scope for individual initiative and judgment. This method has proved highly successful in several graduate subjects.

The Department of Mechanical Engineering is favorably inclined towards the new degree of Master of Engineering, proposed by Professor Jerome C. Hunsaker and requiring two years beyond the undergraduate degree. It is our hope that this degree will serve as the termination of the program of study for many competent engineers who are now working for the Doctor of Science degree but do not possess the scholarly make-up which is essential for the high academic accomplishment for the doctorate.

Under the initiative of Professors Joseph H. Keenan and Warren M. Rohsenow, monthly supper meetings have been held by the department staff. These meetings have been well attended, and many matters of educational policy have been discussed vigorously and at great length.

*Applied Mechanics.* Professor Jacob P. Den Hartog assumed his duties as head of the Applied Mechanics Division at the beginning of the academic year. No major change in the program of instruction has been made, but the development of laboratory aids to instruction in this field has been continued. The Dynamics and Control Laboratory is now playing an important role in the instruction program.

Professor Ascher H. Shapiro was placed in charge of the program of instruction in Fluid Mechanics, beginning with the fall term of 1948. This will enable Professor Brandon G. Rightmire to give more attention to his research on cavitation and will strengthen the correlation of fluid mechanics with thermodynamics. With the simultaneous strengthening of the other aspects of fluid mechanics, which is taking place in Courses I and XVI, we hope to develop to its fullest possibilities those areas of the subject which are of importance to the mechanical engineer.

Professor Alvin Sloane completed a textbook, *Fundamentals of Engineering Mechanics*, which was adopted for certain of the subjects in applied mechanics.

Professor Den Hartog completed a textbook, *Mechanics*, which will be available for the fall term.

At the end of the academic year, Professor Addison F. Holmes completed forty-four years of devoted service in the department. Following his retirement, Professor Holmes will continue to serve as Lecturer.

Professor Den Hartog received the Richards Memorial Award of the American Society of Mechanical Engineers.

*Lubrication Laboratory.* A special summer conference on mechanical wear was held from June 14 to June 16, 1948, with the registered attendance exceeding two hundred. The conference was sponsored jointly by the Massachusetts Institute of Technology, the American Society of Mechanical Engineers, the General Motors Corporation, and the Chrysler Corporation. The committee in charge consisted of Professor John T. Burwell, chairman, and Professors Charles W. MacGregor, Milton C. Shaw, C. Fayette Taylor, Herbert H. Uhlig, and John Wulff.

Fourteen papers were given by prominent speakers from schools and industry from both this country and abroad with considerable discussion following their presentation. The papers covered service experience and controlled experiments on mechanical wear of piston rings and cylinders, gears, steam turbines, brake materials, sleeve bearings, and electrical contacts. In addition, theories on the various factors contributing to wear were presented, together with their correlation with experiment. The papers, together with all the written discussion, will be published in a printed volume as proceedings of the conference.

The Chrysler Corporation has continued its support of the research program on the friction and wear of rubbing metal surfaces. First results on the work are now being published.

In addition to the present senior professional subject in lubrication, a graduate subject in the same field has been inaugurated. It covers all aspects of hydrodynamic and thin-film lubrication, the current theories of dry friction, and the mechanism of wear.

*Machine Design.* With the establishment of the option in Design, Materials, and Manufacturing, the instruction in machine design has been brought closer to its full educational possibilities. Plans for a seminar room and development of exhibits for machine design have been formulated, and it is hoped that financial means will become available for their full realization.

A program of basic research in the field of kinematics has been initiated by Mr. George L. Nelson under the supervision of Professor John E. Arnold.

The extensive growth of the Dynamics and Control Laboratory, which is operated in cooperation with the Applied Mechanics Division, made it necessary to acquire a second room to house the work associated with the development of high-speed electronic analogues of dynamic systems. A project is under way for the development of a multi-mass analogue for the study of non-linear dynamic systems. The laboratory is handling a large number of graduate theses and has proved to be highly effective in stimulating interest in engineering dynamics.

*Machine Tool Laboratory.* Most of the obsolete equipment has now been replaced by modern, direct-drive machine tools. New lighting has been installed, and by painting in light colors, this laboratory has assumed a much more cheerful aspect.

Professor Prescott A. Smith is giving a considerable part of his attention to a gradual revision of the subjects in Machine Tool Practice, whereby greater emphasis will be placed upon production methods and the fundamentals in metals cutting. This instruction will assume greater importance in connection with the new Option 2. The development of operational skill is necessarily put into the background by knowledge of the basic function of the machine tools and the development of responsibility and judgment in the general handling of machinery.

Development of a basic program of research in the fields related to metals cutting is still regarded as an important aim. A beginning in this direction has been made by a program of cutting of leather and other materials, which has been initiated by Professor Milton C. Shaw under partial sponsorship of the United Shoe Machinery Corporation.

*Materials.* Under the direction of Professor Charles W. MacGregor, several new laboratory units have been completed for the execution of major Division of Industrial Coöperation projects. In the High Speed Impact Laboratory, several projects on the brittle fracture of metals are under way, some of which have already yielded valuable information on this important subject. The Whirl Pit, in which it is possible to burst steel disks, has been in operation for some time, and many significant results have been obtained. Facilities are now being developed for bursting tests under controlled temperatures. In the Creep and Plastic Flow Laboratory, several major pieces of equipment have been put into operation during the year. Among these are six dead-load creep machines, a constant strain rate creep machine, a dynamic modulus tester, all associated with power panels and accurate temperature controls.

Five major Division of Industrial Coöperation projects are now active, the latest being a project on Creep to Rupture in Torsion for the National Advisory Committee for Aeronautics. In addition, there have been carried out several projects sponsored within the department, and a project on Rolling of Metals, sponsored by the American Society of Mechanical Engineers and most of the important metals fabricating companies in the United States, has been completed during the year. Special equipment has been developed for the study of constant stresses in rolling.

About ten papers were published during the year on various projects, and several additional ones are now on the press.

Professor William M. Murray was appointed Assistant Placement Officer and is now devoting a considerable part of his time to the problem of cooperative education.

*Thermodynamics.* Several research projects, all sponsored by outside agencies, have been completed during the year. New values of recovery factors and friction factors have been obtained for Mach numbers between 1 and 2.6 under sponsorship of the Office of Naval Research. Experimental studies of momentum and mass transfer between parallel gas streams are being continued, as well as experimental studies of the interaction of boundary layers and shock waves. The hydraulic analogue to supersonic gas flow has been developed and is being

used for tests of supersonic diffusers. Tables of the properties of air and gaseous products of combustion of hydrocarbons have been compiled by Professors Joseph H. Keenan and Joseph Kaye and will be published this year.

After thirty-six years of faithful service, Professor William H. Jones died in October, 1947, after a long illness.

*Engineering Laboratories.* The program of modernization of the equipment has continued during the year. The most important new equipment is two Westinghouse steam turbines, which were put into operation during the year. They provide means for a variety of tests relating to modern steam plants which have not been available before.

Laboratory instruction appears to be one of the most difficult problems of engineering education. It is difficult to provide sources of inspiration to the students and the necessary continuity between the instruction in applied science and the laboratories. This problem has been studied during the year, and a change has been made in the senior program for Option I, in which class instruction in power plant engineering is combined with laboratory exercises.

*Cryogenic Laboratory.* Professor Samuel C. Collins was invited to attend a conference on International Cooperation in Very Low Temperature Physics, which was held in Amsterdam in July under the auspices of the Bureau of the International Union of Physics. While in Europe, he spent two months observing techniques and apparatus for low temperature research in Leiden, Oxford, and Cambridge.

The liquid nitrogen-oxygen generator for supplying liquefied gases to all departments of the Institute has been completed, and work continues on government sponsored research directed toward greater efficiency in the production of refrigeration at very low temperatures.

*Textile Technology.* A rotary impact tester capable of rates of deformation in tension up to 1500 feet per second has been built in the Slater Laboratory. It can be operated at low temperatures. Its development is sponsored by the United States Air Force.

Professor Edward R. Schwarz received the Olney Medal, awarded by the American Association of Textile Chemists and Colorists.

*Sloan Automotive Laboratory.* The new facilities which were made available by the generosity of Mr. Alfred P. Sloan, and which have been mentioned in earlier reports, have now been in operation for nearly a year and have proved entirely satisfactory, both for teaching and research.

A short elective subject in internal combustion engines, open to students in all departments, has proved to be very popular.

The laboratory has been in active use for graduate and undergraduate theses. The important new research projects started during the year include a study of the effect of size, by means of three geometrically similar engines, and a study of partial load performance of automobile engines.

*Gas Turbine Laboratory.* The Gas Turbine Laboratory was formally opened on October 7, 1948. The dedication was attended by about sixty representatives of industry and the armed services. The exercises were followed by an inspection of the facilities. The experimental work in progress was explained by the graduate students working in the laboratory.

The Mach-Zehnder interferometer designed and constructed by the laboratory staff has been notably successful, and a number of interesting studies of fluid flow using this device are now in progress.

The 8 inch by 8 inch supersonic wind tunnel has successfully operated at a Mach number of 2. Alterations which appeared desirable in the light of these tests are now being made.

Contributions totaling \$27,500 have been received from the General Electric Company, the Lima-Hamilton Corporation, and the Westinghouse Electric Corporation for the purpose of investigating turbine and compressor blade shapes at low velocities. These experiments are now started.

Professor William R. Hawthorne of the Gas Turbine Laboratory staff was appointed Westinghouse Professor of Mechanical Engineering. Funds for research are available in connection with this professorship. Professor Hawthorne was also awarded the Medal of Freedom from the War Department.

C. RICHARD SODERBERG

## METALLURGY

Increasing interest in the field of metallurgy has led to larger numbers of students in the Department, especially in the graduate school. The undergraduate enrollment increased to forty students in the sophomore class but junior and senior classes were small. Graduate enrollment totalled seventy-three including a high proportion of research assistants. To take care of the larger teaching load and an extensive research program, the staff has been increased to a total of twenty-four professors, nine instructors, four research associates and forty-one research assistants. In addition, 121 Division of Industrial Coöperation staff members were employed on research projects supervised by the Department. The sponsored research programs aggregated more than \$1,600,000 in 1947-1948.

*Mineral Engineering.* The year has been marked by an expansion in this field in student interest, research activities and industrial contacts. The wisdom of the establishment of the Division of Mineral Engineering several years ago has been well shown by the increasingly important part this division is playing in research for both government and industry and in the training of men urgently needed if we are to continue to hold a dominant position in mineral and metal production.

Two research programs of a restricted nature are being carried out for the Atomic Energy Commission. These are large programs employing more than sixty people. Substantial progress has been made in devising ore treatment methods for low grade ores and the results obtained promise to be of national significance.

Other problems occupying the attention of staff members in this division include the recovery of tungsten from molybdenite tailings, the beneficiation of tin ores, the production of abrasive garnet from mica schists, the development of an electronic separator for the treatment of optical grade fluorspar, the flotation of French potash minerals, a study of the fundamentals of a new type cyclonic mineral separator, the mechanism of mineral-bubble adhesion in the flotation process, and the use of tracers for studying the action of flotation reagents. Results on the last problem have led to a new project sponsored by the Atomic Energy Commission which has to do with the

application of tracer techniques to the entire mineral engineering field. Unlike earlier A. E. C. projects, this one will carry no restrictions as to publication of results. Other sponsors of the above research programs included Armour and Company and the Climax Molybdenum Company.

*Process Metallurgy.* Modernization of the undergraduate process metallurgy laboratories will be completed during the summer. The new laboratories are designed for carrying out small-scale quantitative experiments which illustrate the principles underlying metallurgical unit processes.

During the year a program of research was started on the physical chemistry of copper metallurgy. The topics being investigated include the high temperature physical chemistry of the copper-sulfur system and oxygen activities in iron-silicate slags.

The program on slag-metal equilibria in steelmaking is continuing for the tenth year. The distribution of sulfur, oxygen, and phosphorus has been studied in the past. Current experimental work includes studies of the distribution of chromium between liquid steel and open hearth slag, and of sulfur between liquid pig iron and blast furnace slag.

Studies of reactions of molten iron with gases in the temperature range 1500 to 1750° C. have provided more reliable data than were formerly available on the thermodynamic properties of the important impurity elements (sulfur, oxygen and hydrogen) in liquid steel.

The effect of hydrogen in steel and aluminum alloys is also being studied, particularly from the standpoint of developing refined analytical methods for measuring the amount present. An evaluation of the effects of hydrogen on properties is also being made.

These programs have been supported by grants from the Republic Steel Corporation, the American Iron and Steel Institute, the International Nickel Company, the Research Corporation and the Office of Naval Research.

*Physical Metallurgy.* Modernization of the physical metallurgy laboratories has been carried on throughout the year with a gift from the Loeb Foundation. The undergraduate heat treatment laboratory, in particular, has been equipped

with new benches and furnaces. Procurement of war surplus property has aided this program considerably. In general, this will result in adequate laboratories for all phases of undergraduate teaching with one exception. A well equipped metallographic laboratory is still badly needed.

The new quarters for the X-ray metallurgy laboratory which were provided last year have proved very satisfactory. The ability to handle larger instruction groups in an efficient manner and at the same time to carry on a considerable thesis program has entirely justified the rearrangement. The load of this latter program has been quite heavy during the past year since X-ray diffraction methods are now being used to a greater or less extent in a very large proportion of theses in all branches of metallurgy and in ceramics.

Research activities have included further studies on the heat treatment of steel, dimensional stability of metals, effect of strain on phase transformations, self-diffusion in iron, the beryllium-iron system and the iron-nitrogen system, reactions between gases and metals, and solubility relations of the hard and refractory metal carbides. Research has continued on the development of alloys for service at 1500° F. and above. Phase diagrams are being developed for a wide variety of alloy systems applicable to materials used in jet engines and gas turbines.

The above programs were aided by grants or contracts from Armour and Company, the Republic Steel Corporation, the Sheffield Foundation, the Titanium Alloy Manufacturing Company, the Vanadium Alloy Steel Company, and the United States Army and Navy.

Metallurgical research for the Atomic Energy Commission has continued. While a large fraction of this research must necessarily remain secret, certain parts have been released for publication, and it is expected that the proportion of non-secret work will increase.

The year marked the publication of the new fifth edition of *The Principles of Metallography* by Professors Robert S. Williams and Victor O. Homerberg.

*Mechanical Metallurgy.* Reorganization of the subjects on materials given for other engineering students has been an

important activity in this division during the past year. The purpose is to place these subjects on a more quantitative and scientific basis and to get away from the older types of shop courses.

Excellent support has been obtained from industry, particularly for the foundry program. Several graduate and undergraduate scholarships are available as a result of grants from the Foundry Educational Foundation and the Steel Founders' Society of America. It is expected that interest in mechanical metallurgy will increase, particularly since the demand for men in this field is very great.

The research activity has included a study of the fundamentals of plastic deformation and sintering of metal powders, deformation textures of metals during swaging and wire drawing, friction characteristics of powder metal compacts, shrinkage and segregation in metal castings, resistance of materials to heat shock, and the true stress-strain relations in metals at hot-working temperatures.

Support for these programs has come from several outside sources including the Engineering Foundation, the S. K. Wellman Company, the Foundry Educational Foundation, the Steel Founders' Society of America, the Illinois Clay Products Company, the Warwick Malleable Fittings Company, the American Brake Shoe Company, and the United States Army and Navy.

*Ceramics.* Modernization of the ceramics laboratory has continued, especially in the way of development of apparatus for student experiments and new equipment for research. Of particular interest is a high frequency vacuum furnace using a sapphire optical system which permits far greater precision of measurement than heretofore. Research work has included a fundamental study of the thermal shock resistance of refractories and a study of the nature of clay and plasticity.

*Corrosion Laboratory.* Installation of equipment was completed during the year and an excellent laboratory for the study of all phases of corrosion is now available. Subjects now under investigation include the physical and chemical properties of intermetallic compounds, effect of stress on corrosion, the mechanism of oxidation of alloys at elevated temperatures and the nature of passivity.

During the year the long-awaited *Corrosion Handbook* was published under the editorship of Professor Herbert H. Uhlig.

Research in corrosion has been aided by grants from the Research Corporation, the Union Carbide and Carbon Corporation, and the United States Navy.

JOHN CHIPMAN

### METEOROLOGY

The principal educational activity of the Department continues to be in the field of graduate study. The number of graduate students slightly exceeded the quota. The caliber of the work performed by the students has been extremely gratifying. The number of undergraduate students has continued to be below our capacity. This is apparently a reflection of the general lack of appreciation of the opportunities and interest of a professional career in meteorology.

No major changes have been made in the subjects of instruction although the material presented is subject to constant revision to keep pace with the latest research results.

Placement of graduates has been no problem. Almost every graduate has had several offers and salary scales are at least commensurate with those in other fields of science and engineering. There is every indication that this condition will continue in the future.

The Department maintains a relatively large and active research program. There are five principal projects plus a number of smaller investigations conducted by individual staff members. The larger projects are all supported either directly or indirectly by agencies of the Federal Government. All of these projects are on subjects of major interest to the staff members involved and have greatly stimulated and enhanced our instructional program.

The largest research project is known as the Weather Radar Research Project. This project operates under contract with the United States Army Signal Corps and is directed by Mr. Alan C. Bemis. It has as its object the exploration of the uses of radar in meteorology. The project operates radar equipment on wavelengths of 10 centimeters and 3 centimeters and has the use of an Air Force airplane which carries special instrumentation designed and constructed by the project. Quantifi-

tative measurements are made both in the air and on the ground in carefully integrated flight missions. Instruments have been devised for measuring the drop size distribution and liquid water content of rain in flight, and for determining the power of the radar return and its audio frequency spectrum. The stormy New England winter and spring of 1947-1948 was completely recorded by radar motion pictures. This includes 77 separate storms, about 920 hours of precipitation and required 13,000 feet of film. Many of the preliminary results have appeared in scientific papers, project reports, and theses. Only a preliminary analysis of the data has been made and it is anticipated that a more complete analysis coupled with additional data will yield many interesting and significant results.

The fundamental problem of atmospheric pressure changes and their relationship to atmospheric motions and weather changes is being studied under a contract with the Office of Naval Research. This project is under the direct supervision of Professors James M. Austin and Thomas F. Malone. Considerable light has been shed on the nature of atmospheric processes and many of the results have forced the modification of previous concepts. The problem is so broad and fundamental that a complete solution is not to be expected. It is hoped that this may be a continuing project for several years.

The joint Weather Bureau-M. I. T. research program on extended forecasting under Professor Hurd C. Willett has continued to make progress. The primary concern of the project continues to be the synoptic and statistical analysis of northern hemisphere weather data as applied to the study of the general circulation of the atmosphere and long range weather forecasting. It becomes increasingly apparent that an extension of both the time range and geographical extent of the weather analysis is needed. Consequently, attention is being turned to the study of the 40-year historical map series of the northern hemisphere prepared by the Weather Bureau and to tropical and southern hemisphere weather data. Considerable attention has also been directed to the role of irregular solar variability in the world weather patterns.

The project on the improvement of the hygrometric element of the radiosonde under contract with the General Electric

Company was resumed after a short suspension. Under the direction of Professor Delbar P. Keily an improved element has been developed and is receiving final tests and modifications.

A new project on the general circulation of the atmosphere has been established under contract with the United States Air Force. This project is directed by Professor Victor P. Starr. The work is concerned with the meridional transport of zonal angular momentum and the exchange of angular momentum between the atmosphere and the earth. Preliminary results appear to verify theoretical expectations and offer promise that this will be a fruitful method of attack.

The Department has continued to cooperate with the Lowell Institute Cooperative Broadcasting Council in presenting the weekly radio program, "Our Weather." Listener surveys have indicated the success of this effort to present scientific material over the radio directed to the intelligent layman.

Professor Victor P. Starr was appointed in September to replace Dr. Bernhard Haurwitz who resigned. Professor Starr has an international reputation and it is a pleasure to have him with us.

Members of the staff have been active on committees of Federal agencies and of the American Meteorological Society. Professor Willett served as a Deputy Member of the Panel on Meteorology of the Research and Development Board. Professor Malone was Chairman of the Committee on Admissions of the American Meteorological Society. Professor Houghton served on six governmental committees and two committees of the American Meteorological Society. His term of office as president of this Society expired in January when he became a member of the Council.

HENRY G. HOUGHTON

#### MILITARY SCIENCE AND TACTICS

The Department activated in the fall of 1947 three new advanced course units, the Artillery unit, the Army Security Agency unit and the Quartermaster unit. At the close of the 1947-1948 school year, the Department of the Army decided to withdraw the Artillery unit due to the very small enrollment in this unit.

Enrollment in the Reserve Officers' Training Corps increased to 475 freshmen, 393 sophomores, making a total of 868 enrolled in the basic course. A total of 140 students enrolled in the advanced course.

Plans are being made for the administration of deferments under the Selective Service Act of 1948 as it affects students in Military Science.

Lieutenant Colonel Burton B. Bruce arrived in September 1948 to assume charge of the Corps of Engineer unit replacing Colonel William D. Bridges who left to attend the Industrial College of the Armed Forces. Lieutenant Colonel John R. Thompson, who arrived in September 1948, will assist Lieutenant Colonel Bruce in the Engineer unit, filling a vacancy created when Captain Harold K. Graves was transferred. Lieutenant Colonel John W. Fitzpatrick arrived in September 1948 to assume charge of the Chemical Corps unit replacing Major Jack F. Lane who left to attend the Command and General Staff College. Major James E. Foster arrived in July 1948 to assume charge of the Signal Corps unit replacing Major Hollis Dakin. Major Thomas U. Lineham, Jr. has been newly assigned to the Air Force unit, arriving in September 1948. Since the Artillery unit has been discontinued, Captain Robert L. Rooker was transferred to the Artillery unit at Boston College. First Lieutenant Frank H. Senn was relieved from active duty and returned to civilian pursuits in June 1948.

In addition to Scabbard and Blade, the Department sponsored the activation of the M. I. T. Chapter of Pershing Rifles. This is a national honorary military society primarily for freshmen and sophomore Reserve Officers' Training Corps students.

HAROLD R. JACKSON

#### NAVAL ARCHITECTURE AND MARINE ENGINEERING

Because of the shortage of well-trained and qualified technical officers, this Department at the request of the Navy Department continued to give throughout the year accelerated work in the Graduate School for student Naval Officers in Course XIII-A. A class of twenty-three officers including two from the United States Coast Guard and two from the

Chinese Navy was graduated in February, 1948, and a class of ten officers of the United States Navy whose course had been shortened from six to four terms was graduated in June, 1948. With these two classes the war training program was completed and the Department is resuming the normal routine with two regular terms a year.

The number of civilian students taking graduate work in this Department is increasing very satisfactorily. During the past year four received the degree of Master of Science in Marine Engineering and one, the degree of Master of Science without specification. For the coming year, it is anticipated that there will be five candidates for the degree of Master of Science, some in Naval Architecture and some in Marine Engineering.

In June we had two resignations of younger members of the teaching staff to accept positions in industry: Mr. Harland Turner, Jr., Assistant Professor of Naval Architecture and Mr. Albert J. Harno, Instructor. The services of a lecturer in Shipbuilding were no longer required, and Mr. Gordon G. Holbrook has not been retained on the staff in this capacity.

Mr. J. Harvey Evans, a graduate of the University of Liverpool, England, joined the Staff in September, 1948, and is handling principally work relating to the structural design of ships. Mr. Philip Thiel, Jr., a graduate of the University of Michigan, joined in July, 1948. He has specialized in ship resistance problems and is continuing in that field in connection with the prospective Towing Tank included in the plans for the proposed Hydraulics Laboratory Building at the Institute. Mr. S. Curtis Powell, Doctor of Engineering, Regia Scuola Navale, University of Genoa, Italy, is being appointed as of September, 1948, as Assistant Professor of Marine Engineering. There is a vacancy in the teaching staff for an Assistant Professor of Marine Transportation for which, however, a suitable candidate is in view.

There have been no major changes in the curricula during the year except to add a subject, Elementary Ship Design, during the preliminary summer term for the entering class of student Naval officers. This subject included the cutting

of a model of a ship form. The supervision of the Ship Model Shop was accordingly returned to this Department. This also is in line with the needs of the Department for work with the prospective Towing Tank.

History of Warship Design, has been emphasized and developed by Professor Ernest C. Holtzworth, and the subjects covering the Structural Design of Ships have been rearranged and strengthened through the efforts of Professor Holtzworth and Assistant Professor Evans.

The rather complicated programs initiated last year to permit more specialized training of student Naval officers have been reviewed and adjusted as experience dictated. Further adjustments are indicated.

Additional space has been allocated to this Department in Building 5 to permit installing a ship-stability research laboratory and to initiate work on those types of structures peculiar to ships. These plans will require time to develop, but the augmented teaching staff will permit their execution. Great advantage to the work of the Department will accrue from these added facilities when they are completed.

The operation of the Propeller Tunnel has continued with some time devoted to research, some time to testing for industry and some time to student thesis work.

The Course in Marine Transportation has attracted a good deal of attention from industry and is meeting its obligations very satisfactorily. The problem of finding suitable billets at sea for the fourth-year students to assure satisfactory sea experience is causing some difficulty. Some additional instruction in the commercial and business phases of marine transportation is required. It is anticipated that this need can be met with the filling of the approved position of Assistant Professor of Marine Transportation.

A good deal of effort has been exerted in improving the reference material available to this Department by additions to the stacks of the Dewey Library through the organization in this Department of a motion picture film file and through accumulation of technical data, plans and specifications on both warships and merchant vessels.

EDWARD L. COCHRANE

## SCHOOL OF SCIENCE

### BIOLOGY

The Department's teaching and research program in physical and chemical biology has now become well established. Its usefulness is attested by the steadily increasing enrollment at the graduate and postdoctoral levels. However, to emphasize the fact that the Department also offers a thorough undergraduate training in general biology, the Department has issued a well illustrated brochure describing the undergraduate curriculum and teaching facilities. Wide circulation has been given the brochure and encouraging response has already been received. As compared with the previous year, enrollment has doubled in the general biology course and enrollment in Course VII has increased about 30 per cent. The number of postdoctoral students, chiefly interested in preparing for careers in basic medical research, has about reached the maximum which can be accommodated in the present quarters. During the present year medical Fellows from the United States, Europe, and South America have been in residence. Several Fellows will continue their research at the Massachusetts General Hospital, thus further establishing valuable liaison between these two Institutions.

New regulations governing candidacy for the doctorate have been put into operation. Before advancing to thesis work, graduate students must demonstrate in preliminary examinations, their grasp of general biology, general physiology, and biochemistry. A staff adviser is assigned to each graduate student upon registration.

A new course on the biochemistry of microorganisms was offered by Professor Bernard S. Gould in collaboration with Professor George T. Johnson.

Valuable facilities for biophysical and biochemical research have been added. These include a center for physical chemical research (ultracentrifuge, electrophoresis apparatus, viscosity, diffusion and solubility equipment, and a new cold room), a laboratory for the study of thin films, and equipment for low temperature spectroscopy in the ultra-violet and infrared.

Significant advances have been made in the Staff's research program which follows the general pattern previously established. Major consideration is given to investigations of the structure of cell and tissue constituents at the molecular level. These include electron microscope studies, particularly of fibrous and globular proteins, by Professors Francis O. Schmitt, Cecil E. Hall and associates, X-ray diffraction studies of fibrous proteins and starch by Professor Richard S. Bear and associates, ultraviolet microscopy and microabsorption spectroscopy, including low temperature spectroscopy, by Professor John R. Loofbourow and associates. Important colloidal properties of globular proteins have been investigated by Professor David F. Waugh. Enzymology has been well represented by the work of Professor Irwin W. Sizer and associates in their studies of the action of enzymes on each other and on hormones. Professor H. Stanley Bennett did original work in cytochemistry, particularly in characterizing the chemical structure of muscle. Microbiological chemistry represents a major aspect of the Department's program and Professor Bernard S. Gould has been actively developing this field in collaboration with Professor George T. Johnson, who has stressed the cytogenetic aspects. Classical zoology is represented by Professor Charles H. Blake, whose studies have concerned the coloration and mechanisms of flight of birds.

The Department is fortunate in having in its midst a division under Professor Kurt S. Lion, interested in the teaching of and research in methodology as applied to biology. This group's research has been concerned with Geiger counters, supersonics in biology, and various other physical problems.

Grateful acknowledgment of financial support for research is made to the Rockefeller Foundation, American Cancer Society, Armour and Company, Eli Lilly Company, Baruch Committee for Physical Medicine, A. C. Lawrence Leather Company, and the Illuminating Engineering Society; the work on collagen was under contract with the Office of the Quartermaster General.

The undergraduate teaching laboratories are not unduly cramped but embarrassment is being felt by the Department,

as it is unable to accommodate properly its thesis students and research fellows. Additional space retains top priority in the Department's needs.

FRANCIS O. SCHMITT

### CHEMISTRY

A number of changes in the undergraduate curriculum went into effect during the 1947-1948 academic year, particularly in physical chemistry. Course V (Chemistry) students were segregated in a separate section for junior-year physical chemistry, taught by Professor Walter H. Stockmayer. This section, listed as a separate subject, proceeds at a somewhat accelerated pace and covers thermodynamics more thoroughly than other sections which are composed largely of engineering students, many of whom receive instruction in applied thermodynamics in their field of specialization. This change permits Course V students to register for two of three electives in physical chemistry during their senior year: Kinetics, Professor Isadore Amdur in charge; Atomic and Molecular Structure, Professor Richard C. Lord in charge; Surface and Colloid Chemistry, Professor George Scatchard in charge. Interested seniors may also register for the introductory graduate course in Thermodynamics taught, as an elective subject, by Professor James A. Beattie.

A steadily increasing number of Course V seniors have elected to continue with graduate work in Chemistry, either at the Institute or elsewhere. Related to this trend is the tendency on the part of Course V juniors and seniors to devote their recently increased amount of elective time to advanced subjects in Chemistry, Physics, and Mathematics in preparation for subsequent graduate work.

During the year the Department adopted a plan by which all graduate students engaged in research prepare progress reports each semester for circulation to their thesis committees. This plan affords the students additional experience in writing, and has proved useful both to the students and to the staff, who can follow the progress of current research in the Department to better advantage through the medium of these reports. Research in the Department

continues at a high level of activity, as evidenced by the staff publications for the year listed in a separate section of this President's Report.

Staff changes during the year include the appointment of Dr. Lockhart B. Rogers as Assistant Professor of Chemistry, with special interest in inorganic analysis; the resignation of Associate Professor George G. Marvin, who is now Head of the Material Unit in the Division of Production, Atomic Energy Commission, Washington, D. C., and the retirement from active teaching of Professor Miles S. Sherrill, who has been associated with the Department during a long and illustrious career in physical chemistry.

ARTHUR C. COPE

#### FOOD TECHNOLOGY

This is the first complete year that the Food Technology Department has had the opportunity to function as a unit in the new quarters in Building 20. The construction and moving program was completed at the beginning of the year, with the exception of the constant temperature rooms for the work in Industrial Microbiology and Bacteriology. The installation of the constant temperature equipment is still to be finished.

Cooperation continued from our industrial sponsors for the research work in Food Technology and the Biochemistry of Nutrition. We are particularly appreciative of the fact that many of our sponsors have sent members of their staffs to work with us for periods during the year, as this materially assisted in maximum benefits from the general program. Last year's report listed the sponsors to whom we are indebted, and this year we add the names of the Vitamin Foundation, W. K. Kellogg Foundation, and Procter and Gamble Company.

It is worth noting that interest in the work of the Department is becoming international in character. Eight foreign countries were represented in our student body during the past year, and visitors from England, Australia, South Africa, the Netherlands, the Dutch East Indies, India, France, and Scandinavia spent time with us. Professor Robert S. Harris, who directs our work in the Biochemistry of Nutrition, has

continued to act as consultant for the Institute of Nutrition of Central America and Panama. Professor Bernard E. Proctor, in charge of our Food Technology work, was invited to lecture in the four Scandinavian countries this summer.

A Northeast Branch of the Society of American Bacteriologists was organized during the year, through the efforts of Professor Cecil G. Dunn.

To the program of research outlined in the report for last year, there have been added studies on amino acids, particularly as obtained from fish by-products; on the metabolism of iso-oleic acids; on the demonstration of an unknown nutrient in liver concentrate; on the absorption and the metabolism of radio-active calcium; on the vitamin losses in enriched cereal during cooking; on biological tests employed to determine any toxicity of plastics used in packaging foods; and on the vitamin retention in vegetables during radar blanching.

We again wish to emphasize our appreciation for the cooperation received from the other Departments at the Institute, both in furthering our research program and in assisting in our graduate and undergraduate instruction. The word that college transfers in a limited number will again be accepted at the Institute will have a favorable effect on our enrollment.

WILLIAM L. CAMPBELL

#### GEOLOGY

Undergraduate and graduate enrollment in the Department of Geology during the past year shows a very satisfactory increase equalling the largest enrollment prior to the war period, and indications for the enrollment for the coming fall term show that there will be a marked increase over that of last year.

The most important improvement in facilities and curriculum for undergraduate instruction in geology has been the setting up of facilities for summer field instruction. Largely through the effective endeavors of Associate Professor Walter L. Whitehead, a cooperative arrangement was entered into between the Department of Geology and the Government

of Nova Scotia. This arrangement makes available excellent living quarters and class room facilities near Antigonish on Antigonish Harbor on the north coast of Nova Scotia. This geology Summer School embraces eight weeks during July and August and attendance is required of all undergraduates in Course XII at the end of the second year. During the summer term just ended, 19 students from M. I. T. attended the school and three from Nova Scotia universities. The region provides widely varied types of geology.

Graduate research in the Department included the continuation into its sixth year of a project on the origin of petroleum sponsored by the American Petroleum Institute and important projects sponsored by the Geological Society of America. During the close of the year contracts were made with the Office of Naval Research for three projects which will be important in the training of a considerable number of graduate students serving as Research Assistants.

Assistant Professor John N. Adkins, was granted a leave of absence during the second term to serve as Head, Geophysics Branch, Physical Sciences Division, Office of Naval Research. Dr. Louis H. Ahrens, who has been with the Department during the past year on a post-doctorate fellowship from South Africa, has been added to the department staff as Research Associate and will serve in connection with one of the Office of Naval Research projects.

WARREN J. MEAD

### MATHEMATICS

Registration continued at the high figure which it reached soon after the beginning of the post-war period. During the first term the Department offered 104 sections of which 19 were in graduate "A" subjects. During that term there were 53 Course XVIII graduate students and 54 Course XVIII undergraduate students. The undergraduate course curriculum was changed to allow more flexibility for the students in the third and fourth years. The two options, Option 1, Pure and Applied Mathematics, and Option 2, Applied Statistics, were combined into a single course in mathematics. Sufficient electives, both professional and general, were introduced into the program to afford each

student an opportunity of fulfilling his individual needs. The same general principle was followed in a revision of the requirements for the master's degree and for the doctorate.

Two new graduate subjects were added, one in algebra under Professor Warren Ambrose, and one in Theoretical Hydromechanics under Professor Chia-Chiao Lin, both of whom joined the staff this year. After discussion by the Departmental Graduate Committee and the Institute Committee on Applied Mathematics, new fellowships and research assistantships in mathematics were established replacing the special fellowships in applied mathematics.

For the spring term the Department taught on an experimental basis a special section in M12, the mathematics subject required of first year second term students. This special section, planned and taught by Professor Henry Wallman, stressed the fundamental concepts of the subject. Over 100 members of the first year class requested admission to the section, from this group 25 were accepted. The results obtained were highly successful, demonstrating the ability of a select group to study the more fundamental parts of mathematics at a very early stage.

In order to prepare Course XVIII students better for work in the third and fourth years, a special section in M22 was set up and taught by Professor Warren Ambrose for second year second term students in Course XVIII.

During the second half of the summer of 1947, the Department under the direction of Professor Eric Reissner conducted a special seven-week program in applied mathematics. Four new subjects were given during this session. The object was to enable our students to obtain intensive and fundamental training in elasticity and fluid dynamics, and to stimulate further research on the part of graduate students and staff in this direction. The subjects given in the program were taught by Professors Prescott D. Crout, Francis B. Hildebrand, Chia-Chiao Lin, Eric Reissner and Dirk J. Struik. In addition, three visiting lecturers participated in the program.

During the fall and spring terms Professors Witold Hurewicz and Norman Levinson conducted a seminar on topological methods in non-linear problems. The Department also had four sets of three lectures, each on current mathe-

matical topics, given respectively by Professors Emil Artin of Princeton University, Kurt O. Friedrichs of New York University, John von Neumann of the Institute for Advanced Study, and Harald Bohr of the University of Copenhagen.

Professors Warren Ambrose and Norman Levinson were awarded Guggenheim Fellowships. Professor Ambrose's grant was for 1947-1948 but was postponed at his request until 1948-1949 in order that he might begin his appointment here as Assistant Professor. Professor Levinson's award was for 1948-1949.

Professor Witold Hurewicz was on leave during the spring term, as Visiting Professor of Mathematics at Princeton University. Professor Reissner served as Chairman of the Board of Editors of the Proceedings of the First Annual Symposium on Applied Mathematics of the American Mathematical Society. During June he lectured at the National Advisory Committee for Aeronautics at Langley Field, Virginia. Professor Raphael Salem was on leave during the spring term as visiting professor at the Sorbonne in Paris. He also gave lectures at Amsterdam, Copenhagen and Uppsala. Professor Norbert Wiener spent the fall term at the National Institute of Cardiology in Mexico City where he continued his joint work with Dr. Arturo Rosenblueth of the National Institute. The collaboration between Professor Wiener and Dr. Rosenblueth was made possible, in part, by a five-year grant from the Rockefeller Foundation.

As mentioned briefly in last year's report, Professor Henry B. Phillips retired on June 30, 1947, after forty years of service with the Department. He is continuing as Lecturer. Professor Phillips was in charge of the Department from 1934 until his retirement. It is not possible to enumerate all of the many contributions which he made to the Department and to the Institute but two of the most significant ones are his strengthening of the undergraduate and graduate offerings of the Department, and his influence and leadership in the development of a Department in which good teaching and fundamental research were both stressed. For these and many other contributions the Department is deeply indebted to him.

WILLIAM T. MARTIN

## PHYSICS

The current year is the first since the war in which the department has approached normal operation. No new major projects or changes of policy have been introduced, and for the first time the number of students leaving has approached the number entering. In the graduate school, particularly, the quota of 150 graduate students, which has been in effect since the war, was based on the assumption that about 50 graduate students would enter and an equal number finish their work each year. In the year from July, 1947, to June, 1948, the department granted 16 master's degrees (two of the candidates stayed on to take doctor's degrees), and 37 doctor's degrees, or a total of 51 students completing their graduate work. Among the undergraduates, this state of equilibrium has not yet quite been reached; the graduating senior classes have been smaller than the large groups of second and third year students coming along.

Among the men taking doctor's degrees, a number of the most able of the predoctoral research associates appointed immediately after the war were included. These represented some of the ablest young men of their generation in the country, and the department has appointed several of them to fill vacancies in its lower ranks. Four men, all with several years' experience in war laboratories, stay on as assistant professors: Professors David H. Frisch, Matthew L. Sands, Malcom W. P. Strandberg, and Robert W. Williams. Dr. Melvin A. Herlin has joined the D. I. C. staff, Drs. Darragh E. Nagle and Lester A. Siegel have been appointed instructors, and Drs. James B. French and Edward N. Strait, Jr., stay on for a time as post-doctoral research associates. By these appointments, the department secures continuity in its large research programs, which were started largely with the help of the research associates, and at the same time adds much needed younger men to the teaching staff. The other 42 men finishing their graduate work, aside from these nine, have all found positions elsewhere, divided about equally between academic and industrial positions. The great shortage of physicists left by the war continues, and our graduates, both from the undergraduate years of Course VIII and from the

graduate school, have had many positions from which to choose.

Two changes in teaching have occupied the department during the year. A revision of the third year of Course VIII had been considered at various times in the last few years, and the revision was finally completed and approved, to take effect in the year 1948-1949. This revision includes certain shifts of subjects from one term to another, with consolidation of laboratories; it provides a choice of nuclear physics as an alternative to optics in the third year; and it provides for small recitation sections in atomic physics, nuclear physics, thermodynamics and statistical mechanics, and electronics, which have all grown to the proportions of large subjects and will now be handled, as are first- and second-year physics, in moderately large lectures and small recitation groups. This should mean a considerable improvement in the teaching of the third-year subjects, and the small sections will allow many more members of the staff to take part in third-year instruction.

The other change has been a revision of the procedure for the general doctor's examinations. These examinations, consisting of written and oral parts, had become so difficult that students were putting them off later and later in their graduate work, with consequent postponement of the time of starting their thesis work. The examinations have now been divided: the written paper becoming more elementary, operating as a qualifying examination and coming early in the graduate career; the oral examination coming later, after the thesis is in progress. This new system, tried first in the spring of 1948, appears to be a considerable improvement.

The research of the graduate students and staff members has been more active than ever before. The larger part of it is carried on in the Research Laboratory of Electronics, the Laboratory for Nuclear Science and Engineering, the Acoustics Laboratory, and the Spectroscopy Laboratory, and most of it is described in reports of these laboratories. Among research projects not included in these laboratories, one may mention work on X-ray crystal structure under Professor Bertram E. Warren, crystal growth under Professor Donald C. Stock-

barber, and applied optics under Professors Arthur C. Hardy and Seibert Q. Duntley; in all of these fields, as in the major ones represented by the various interdepartmental laboratories, there has been governmental or industrial support, without which research on the scale at which the Institute is now operating would be quite impossible.

Members of the Department contributed papers to journals, gave contributed and invited talks at scientific meetings, served as officers of learned societies and on committees, governmental and otherwise, on a scale too large to describe in detail. A number of members attended meetings abroad as well as in this country. In April, the Department sponsored the conference on Physical Electronics, under the direction of Professor Wayne B. Nottingham, which by now has become an annual institution and proved to be a highly successful gathering of several hundred workers in that field. A conference on high energy acceleration of particles, held in June under the joint auspices of the Physics and Electrical Engineering Departments, was likewise very successful and drew a large attendance. Various other conferences at other places were partly organized by members of the Department.

The Department had several guests during the year, including Dr. Maurice Desirant of Belgium, and Dr. William J. Horvath of government services in Washington, working on the low temperature program in the Research Laboratory of Electronics. Other guests, research associates, and research students were present from European universities.

JOHN C. SLATER

## SCHOOL OF ARCHITECTURE

### ARCHITECTURE

Fall educational activities of the Department began with a meeting of the Visiting Committee of the School of Architecture and Planning: Mr. Ralph Flanders, Chairman, and Messrs. Harry Carlson, John Howard, George Fred Keck and William Hartmann. This meeting was made interesting because of the active participation of members of the Institute's Educational Survey Committee and of invited members of the student body.

During the year, staff members engaged in activities supplementary to their teaching work. Dean William W. Wurster was the principal architectural spokesman for the Institute, giving talks at numerous professional societies and schools.

Dean Wurster also served as member of a special five-man committee to survey and advise the School of Architecture and Design at the University of Michigan, was chairman of the seven-man jury for the architectural award of the Jefferson National Expansion Memorial Competition in St. Louis, visited the California Institute of Technology to study their instruction in industrial design, and participated in the annual meeting of the Association of Collegiate Schools of Architecture at Salt Lake City. He has also been appointed by President Truman as one of the four citizen members of the National Capital Park and Planning Commission which meets monthly as a planning commission for the city of Washington.

Professor Gyorgy Kepes presented a paper on "Visual Forms - Structural Forms" at the annual architectural conference at Ann Arbor, Michigan. Professors Lawrence B. Anderson, Ernest N. Gelotte, Robert W. Kennedy and Dean William W. Wurster took part in a discussion meeting at Yale University of members of the Association of Collegiate Schools of Architecture in the New England and New York region. Professor Carl Koch spent six weeks on loan to Yale University for a special teaching assignment. Professor

Robert W. Kennedy has been awarded a Guggenheim Fellowship for his current study of "New Teaching Methods in Architecture."

Professor Herbert L. Beckwith continues his activities as member of an Institute committee to study artificial lighting. The lighting problems in Institute classrooms are found to be so closely related to acoustic problems as to require a simultaneous solution, and this committee has, therefore, cooperated closely with members of the Acoustics Laboratory in the effort to perfect an ideal treatment for the typical classroom.

Professors Vernon A. DeMars, William H. Brown, Robert W. Kennedy, Ralph Rapson and Carl Koch are associated in the design of a proposed apartment house project for the housing of Institute staff members.

Two resignations affect the Department. Miss Florence W. Stiles has resigned as Librarian of the Rotch Library and Professor Arthur D. McVoy of the design teaching staff has resigned to become Director of the City Planning Commission of the City of Baltimore.

A well organized program in which the students cooperated brought a distinguished list of speakers to the Department, including Messrs. George Fred Keck, Max Abramovitz, Isadore Rosenfield, Walter Gropius, John Gaus, Jean Maunoury, Herbert Read, Henry Dreyfuss, George Nelson, and J. J. Sweeney.

As an exploratory project to fill a long-felt need, Professor Christopher Tunnard of Yale University was invited to present a special short problem in landscape design participated in by a selected group of students in both architecture and planning. The response to this program is such as to indicate that the effort should be continued and expanded and that all students should have at some time in their course an introduction to landscape design.

Because of the high desirability of liberal arts education for architectural practice, the Department now cooperates with the Admissions Office in the Institute's arrangements for the Combined Plan. Methods have been worked out for overcoming the technical difficulties of the Course IV-A

curriculum so that the purely professional work can in these special cases be included in a three-year program for the degree of Bachelor in Architecture. A gratifying number of students in the associated liberal arts colleges have elected to work in this six-year combined curriculum and the Department looks forward to the admission of unusually well-qualified persons through these arrangements.

LAWRENCE B. ANDERSON

#### CITY AND REGIONAL PLANNING

During its first full year as a department in its own right, the Department of City and Regional Planning has operated with capacity or near-capacity enrollments. Graduate students continue to comprise a distinct majority of the city planning enrollment, and it appears likely that for some years to come the Department will have more graduate than undergraduate students. This situation is all to the good, and it may be that planning can best be taught as a graduate subject. Nevertheless, the undergraduate course enrollment is as high as it has ever been and there seems to be no cause to doubt that the undergraduate program serves a vital function.

Only two staff changes have occurred during the year. Due to the untimely death of Professor Albert A. Schaefer, of the Department of Business and Engineering Administration, it became necessary for Mr. Flavel Shurtleff to take over the instruction in Government and Public Administration, and thus give more time as a lecturer in the Department of City Planning than had been anticipated. At the end of the year Professor Arthur D. McVoy resigned from the staff to accept the important position of Planning Director of the Baltimore City Planning Commission. To fill Professor McVoy's position will be very difficult, but the Department is confident that a recent graduate, Mr. Kevin A. Lynch of Greensboro, North Carolina, will be able to serve admirably as Professor McVoy's successor. He will work with design students in both architecture and planning, emphasizing the interrelationship of the two disciplines.

The Urban Redevelopment Field Station studies of the

South End, Boston, have continued this year. Professor Burnham Kelly and Mr. Lawrence Livingston have organized much of the material previously assembled in a form which should lead to publication at an early date.

Professor Adams gave the series of Lowell Lectures at the Boston Public Library during the Fall of 1947, on the History and Principles of City Planning. In January, 1948, he was honored by election as President of the American Institute of Planners, the nation-wide professional organization of city and regional planners. Professor Draveaux Bender is again serving as executive secretary of that Institute, and Professor Roland B. Greeley has again been appointed managing editor of its *Journal*. Professor Frederick J. Adams also was re-elected to the board of directors of the American Society of Planning Officials and to honorary membership in the City Planning Institute of Peru.

Several members of the staff, but particularly Professors Burnham Kelly and Lloyd Rodwin, were effective in support of the so-called Sears Bill for Public Veterans Housing in Massachusetts, and rendered much assistance to the State Housing Board in launching its program for carrying out the terms of that act. Crystallization of Planning and subdivision standards has been greatly advanced by publication of a book *Planning the Neighborhood*, prepared by the American Public Health Association Committee on the Hygiene of Housing subcommittee of which Professor Adams was Chairman and Professor Greeley a member. Professor Greeley has served on a committee of the Greater Boston Community Council which has studied in some detail the plans and needs of youth agencies and settlement houses in Boston.

One of the significant elements of the teaching program during the current year has been Professor Rodwin's practice of inviting as guest speakers in his Housing Seminar, nationally-known experts in the field of housing. These sessions, attended by most of the students in the School of Architecture and Planning, have been addressed by such leaders as Charles Abrams, Catherine Bauer, Ernest Bohn, Frank S. Horne, Elizabeth Wood, John Burchard, John Kiley, A. S. Bigelow and Robert W. McLaughlin.

The Department continues to accept as its primary responsibility the training of technically qualified practitioners in the field of City and Regional Planning and housing rehabilitation. The demand for men trained in the field of Planning still exceeds the number of men available for such positions, and at the present time, no change seems in sight.

FREDERICK J. ADAMS

## DIVISION OF HUMANITIES

### ECONOMICS AND SOCIAL SCIENCE

In June, 1948 the first students to complete Course XIV received the bachelor's degree. These four men had transferred from other departments as have most of the class which will graduate in 1949. There are now about 60 undergraduates enrolled in this program. We are pleased with the progress that has been made toward meeting our assigned quota and are fairly well satisfied with the quality of the men. We hope that as the Course becomes more widely known, the average scholastic rating of the students will rise. The more experience we have with this program, the more convinced we become that it meets a real need at the Institute.

The Visiting Committee of the Department made a study of our undergraduate curriculum directing their attention especially to Economic Principles (EcII). They recommended the use of additional material to supplement the textbook. Acting on this advice, we plan to introduce a set of readings presenting points of view somewhat different from that taken by the author of the book, Professor Paul A. Samuelson. We believe that this device will improve our instruction in this important subject. Incidentally, the textbook, which was published last spring, has already been adopted by more than fifty universities and colleges.

Our graduate division will have about 50 students enrolled for the year 1948-1949. An important change has been made in our program for the master's degree. We have abandoned the five-year course which was formerly open to graduates of all the departments of the Institute. Under the new requirements only a student who has completed Course XIV can expect to obtain the master's degree in five years from entrance: others will have to spend an additional year in preparing for advanced study in our field. Those now working under the former program, however, will be allowed to complete it.

The members of the staff have had an active year in research and as consultants to business and government. Professor Samuelson continues to add to his long list of significant publications. At the last annual meeting of the American Economic Association, he received the John Bates Clark Medal

awarded to the economist under 40 who has contributed the most to the advancement of economic thought and knowledge. Professor Richard M. Bissell, Jr., has been loaned to the Economic Cooperation Administration as a deputy administrator. Professor Norman J. Padelford has spent some time in Washington as consultant to the State Department on the Danube problem. Professor Charles A. Myers has been asked by the Social Science Research Council to serve as chairman of a committee on research in labor-management relations. Professor Paul Pigors is engaged in collecting and preparing a new set of cases in personnel administration and labor relations, to supplement those included in the textbook, *Personnel Administration*, which he wrote with Professor Myers. This was published in October, 1947, and has since been adopted by a large number of colleges and universities.

In May, Professor Harold A. Freeman, together with Professor Edward R. Schwarz of Textile Technology, organized a statistical conference which was attended by representatives from business and educational institutions. Mr. L. H. C. Tippett, the British textile statistician, contributed to the success of the conference. Arrangements have been made to publish the papers. Of the research projects mentioned in last year's report, the investigations into technological change, made by Professor W. Rupert MacLaurin under a Rockefeller grant, have been completed. He has begun a study of innovation in the building industry. Professors Alex Bavelas and Mason Haire have been experimenting with new applications of psychological techniques in industry. For further study of these and other problems a psychological laboratory is planned, which we believe will become a fruitful venture.

As a result of the resignation of two of our psychologists and the leave of absence of two of our economists, it will be necessary to make drastic readjustments in teaching assignments during the coming year. A change will have to be made also in the administration of the Industrial Relations Section. These problems arise in a year which marks an all-time peak in the number of students enrolled in our classes. We believe, however, that with the aid of some excellent additions to the staff, our difficulties will be satisfactorily overcome.

RALPH E. FREEMAN

### ENGLISH AND HISTORY

At a meeting of the Visiting Committee last year the problem of teaching English composition was discussed in detail. As a result Professors Duncan S. Ballantine and William C. Greene, assisted by other members of the Department, this year organized and taught a new course to about one hundred and twenty-five freshmen. This course, which sought to offer an introduction to the humanities, placed major emphasis on subject matter drawn from the fields of sociology, economics, history, and literature. The experiment was to determine whether or not enough of the entering students were sufficiently trained in the fundamentals of composition to justify our giving more attention in the first year to a study of the humanities than to the mechanics of writing. Although the students in the experimental group were given considerable practice in writing and received detailed criticism of their papers in conference, they were not given the instruction in the technique of communicating ideas that is the major concern of the regular course in composition.

One year's trial of the experiment is an inadequate basis for judgment, but at least three tentative conclusions can be drawn. The level of student interest was high. More than half the students in the experimental group seemed to show as much improvement in their ability to write as might have been expected of them had they taken the regular course. Some of the students were clearly in need of definite instruction in self-expression.

During the coming year the experiment will be repeated with a larger group. Additional instruction in the fundamentals of composition will be made available to those students who need it.

As part of the new program of humanities in the Graduate School this Department provided three seminars: one in history, one in literature, and one in philosophy.

A new elective in technical writing was added to the Department's program. The subject was especially planned to give students advanced training in technical writing as well as in popular scientific exposition. Professor Joseph N. Ulman, Jr., a trained mechanical engineer and a part-time member of

the editorial staff of the Servomechanisms Laboratory, has been in charge of this subject.

The reading seminar mentioned in last year's report has continued to grow under Theodore Wood's supervision until the enrollment is well over one hundred. There is every indication that this method of studying literature will continue to appeal to many students.

Under the direction of Professor Klaus Liepmann changes have been made in the fourth-year humanities elective in music. Assisted by Gregory Tucker, Lecturer in Music, Professor Liepmann has introduced "live music" to illustrate the structure of compositions of different musical eras. The purchase of additional record-playing equipment has made possible a regular schedule of supervised listening hours during which students could become better acquainted with the compositions discussed and illustrated in the classroom.

Professor Duncan S. Ballantine's book, *U. S. Naval Logistics in the Second World War*, was published by the Princeton University Press. Professor Robert S. Woodbury was granted leave of absence for eighteen months to serve the Navy as Director of The Naval Research Reserve. Professor Elting E. Morison has continued as an administrative consultant to the Research and Development Board in the National Defense Establishment. Professors Lynwood S. Bryant and Joseph N. Ulman, Jr., have continued their work on the editorial staff of the Servomechanisms Laboratory.

Three members of the Department have given many hours to student activities: David A. Dudley in arranging weekly broadcasts for the student radio station WMIT, John L. Bastian as Director of the Drama Shop, and Robert T. Marsh as Director of the Debating Society.

HOWARD R. BARTLETT

#### MODERN LANGUAGES

This has been the year of the largest undergraduate enrollment in the history of the Department of Modern Languages. Nevertheless, high standards of accomplishment were maintained, thanks to the fact that the staff is composed entirely of experienced teachers. A new instructor, Mr. Charles

W. Steinmetz, came from an assistant professorship in Ursinus College, and Dr. Herman Klugman, who had been teaching part-time, took on full-time work.

Our graduate, one-semester scientific language courses showed increased attendance. Several graduate students from Harvard were enrolled with us, as Harvard does not offer this type of language course.

The two sound-treated rooms for listening to phonograph records, each equipped with recording apparatus so that the men can listen to their own imitation of a foreign language original, were in demand throughout the fall and winter. To the French record collection were added the Army language teaching records and numerous song and prose selections.

Also along the line of interest in oral language was another development which should extend over the next few years. Jointly with the Department of Electrical Engineering, the Department of Modern Languages has undertaken a project financed by the Carnegie Scientific Aids to Learning grant. The purpose of this project is to study applications of recently developed equipment showing energy distribution in speech sounds against frequency and time. It is hoped that out of this study may come new equipment better adapted to the needs of phoneticians and other students of language. Research along these lines was started during the summer by Mr. John G. King working with Professor William N. Locke.

This year for the first time, a doctoral candidate has had a Minor approved in Modern Languages. There is some indication that a trend is developing in the direction of broadening the interests of graduate students through taking Minors in humanities.

At the request of the Rockefeller Foundation, Professor William N. Locke went to Paris in the summer of 1947 to be assistant to the Director and technical advisor of the English School which is conducted under the auspices of the Modern Language Association of France for French teachers of English who wish to perfect their spoken English. Professor Locke and three assistants represented the American English group and demonstrated the applications of American mechanical aids to language teaching.

The death of Professor Francis M. Currier in February 1948, after a brief illness, came as a shock to the members of the Department. He was one of the men instrumental in developing the unique graduate scientific language courses which we have at the Institute.

WILLIAM N. LOCKE

## INTERDEPARTMENTAL LABORATORIES

### ACOUSTICS LABORATORY

The Acoustics Laboratory has completed its third year as an interdepartmental research center sponsored jointly by the Departments of Architecture, Electrical Engineering and Physics. The Laboratory is administered through the Dean of Engineering by a Supervisory Committee: Professor Richard H. Bolt, Department of Physics, Director; Professor Leo L. Beranek, Department of Electrical Engineering, Technical Director; Professor Richard D. Fay, Department of Electrical Engineering; Professor Philip M. Morse, Department of Physics, (on leave of absence); and Professor Julius A. Stratton, Research Laboratory of Electronics.

The Laboratory provides facilities for research in acoustics as related to several fields of basic science and engineering. Its staff offers guidance in special research problems and thesis work, and collaborates with the sponsoring Departments in the teaching of laboratory courses. About eighteen graduate students and research associates are engaged in research and study. In addition to the members of the academic departments, the Laboratory has ten Division of Industrial Coöperation staff members and approximately twenty-four non-staff, including part-time employees.

Financial support of Laboratory activities during the fiscal year 1947-1948 was derived from an Institute appropriation, a Navy contract supplied by the Bureau of Ships and the Office of Naval Research, and an Air Forces contract. In addition, the Celotex Corporation granted a fund which carries a stipend of 1,200 dollars for an unmarried man or 1,800 dollars for a married one, plus tuition, to be awarded to an advanced thesis student pursuing research relative to architectural acoustics.

Around the classical domain of acoustics, the physics of sound, lies a fluid frontier which merges with many fields of science and technology. The relation with architecture — in the control of noise and the provision of good hearing conditions in buildings — is obvious. Equally apparent are the electrical

engineering aspects of acoustics in microphones, sound reproduction and audio communications. The pursuit of these subjects leads to complex problems in the reactions of a person to his acoustic environment; techniques of psychology are then needed to evaluate speech intelligibility under arbitrary conditions of distortion or to evolve criteria for acoustic design of rooms. Reaching in a different direction, we find that the techniques of acoustics apply to basic physical and chemical studies of the properties of materials under a wide range of dynamic conditions. This then is the setting into which the program of the Acoustics Laboratory has evolved.

The program of the Laboratory is characterized by a wide diversity of problems together with a close interweaving of techniques and findings of the various projects. The activities are divided arbitrarily into five divisions:

*Dynamic Properties of Materials and Structures.* An extensive study has been directed to the elastic and dissipative properties of synthetic rubber and other visco-elastic materials. Methods have been developed for accurately controlled preparation of these materials from raw ingredients. Some dozen experimental techniques have been evolved during the last two years to cover a wide range of temperatures and ten decades of vibration frequency. Theoretical studies of the molecular mechanisms are being pursued but the complicated behavior of these materials is not yet adequately explained. There is also a continuing interest in the properties of porous sound absorbing materials.

*Sound Field Behavior and Control.* General properties of sound waves in fields with arbitrary shape and boundary properties are being studied by extensions of wave theory methods and by generalized vector field analyses. Work has continued on the field influence of flexural vibrations in boundary walls. A complete analysis of the unrestricted motion of a string has been developed and confirmed experimentally. Some work has been completed on ultrasonic transmission through solutions and gelatins. New instruments are being developed for research on chemical and physical effects produced by intense ultrasonic radiation. A large-scale precision method for measuring sound transmission through panels and

structures has been designed, and construction of the basic component was commenced during the summer.

*Acoustics Instrumentation and Calibration.* Efforts along this line are usually directed to specific needs of other parts of the program, but emphasis is placed on basic advances of general applicability. During the year, further contributions were made to the methods of measuring acoustic and mechanical impedance. One device, developed for the rubber program, proved to yield certain measurements on fabrics which appear to correlate with crease resistance as reported by the Slater Textile Laboratory. Considerable equipment has been developed for room acoustics research. Instrumentation for the new transmission program has commenced and will draw major attention during the next year.

*Communication Acoustics.* A study is being made of the psychophysical factors limiting the quantity of information that can be transmitted through a speech communication system per unit time and band width. The program includes a correlation of performance criteria and studies of speech compression and certain types of distortion. The influence of acoustic transients on intelligibility is another topic of investigation.

*Architectural Acoustics.* The experimental studio, mentioned in the Report of October 1947, was completed and instrumented during the year. Detailed studies of reverberation and transient response were made and several problems are continuing with the use of this room which was developed collaboratively by students in Architecture, Electrical Engineering and Physics.

During the year the Laboratory received several visitors from Europe and, in turn, members of the Laboratory visited acoustics research centers in eight European countries. Papers were presented by Professor Richard H. Bolt at the International Marconi Congress at Rome, Italy, in September 1947, and by Professor Leo L. Beranek at the International Conference on Sound Transmission and Noise at London, England, in July 1948.

The Laboratory published regular quarterly progress reports in addition to a number of papers in scientific journals.

Weekly acoustics seminars were held and their subject matter was published in the form of notes and distributed by the Laboratory.

RICHARD H. BOLT

#### RESEARCH LABORATORY OF ELECTRONICS

The Laboratory enters its third year with a continued balance of effort in the "pure" and "applied" aspects of electronics. Some twenty-five faculty members of the Departments of Physics and Electrical Engineering are now engaged in research in the Laboratory, and working directly with them are nearly eighty graduate students. These students are drawn in approximately equal numbers from the two departments and a predominating number are candidates for the Doctor's degree.

During the past year there has been a notable increase in effort applied to the general problem of the transmission of information. This work includes the application of statistical methods to the study of transmission problems, examination of new methods of modulation, and investigation of microwave communication systems. Intensive studies have been made of inherent limitations on the rate at which intelligence can be transmitted in a communication system; and these investigations are being supplemented by comparative analysis of a variety of present-day systems employing amplitude modulation, frequency modulation, television and the like. This research is of fundamental importance to modern communications and the progress is being followed attentively by many co-workers in industry.

Construction of the linear accelerator is rapidly nearing completion. All of the major radio frequency problems appear to have been overcome, and the two million electron volt Van de Graaff generator for the injection of electrons is in place and operating. As soon as injection problems are solved, it will be possible to determine shielding requirements and to begin exploration of the most useful types of experiments which can be done with the machine.

In the field of gas discharges, the Laboratory has produced

very significant results in predicting theoretically and proving experimentally the fundamental mechanism of microwave gas discharge breakdown. This mechanism, which is the balance between production of electrons by the electric field and their loss due to diffusion, has been used to explain previously baffling behavior of high-frequency breakdown phenomena from 10,000 megacycles down to one megacycle.

The low temperature research program is now fully under way, with two Collins cryostats supplying liquid helium. Particular attention has been given to the study of fundamental properties of liquid helium, and electronic pulse techniques have been successfully applied to the problem of determining velocity and attenuation of mechanical waves in liquid helium at temperatures below 2.19° K (Helium II).

Our cryogenic facilities have also made possible an important investigation of the electrical conductivity of metals at microwave frequencies and low temperatures. Data on conductivity as a function of temperature have been obtained for lead and tin in the normal and superconducting states, shedding new light on the problem of superconductivity which remains one of the most elusive of modern physics. Typical of the information obtained are the number of "free" electrons per atom of the conducting metal, the magnetic penetration depth, and the basic relation between the currents and fields in a superconducting medium. Experiments at low temperatures are also being performed on normal conductors which show anomalous behavior at high frequencies, yielding data which contribute to the understanding of superconductors as well as normal conductors.

The technique of molecular beams has been advanced in several ways. The halogens, heretofore never observed in this manner, have been successfully employed. Extremely accurate absolute values of nuclear electric quadrupole moment have been obtained. Techniques for handling beams of extremely dilute isotopic concentration have been developed and have proved especially useful for work with radioactive isotopes.

The work in microwave spectroscopy has been carried out along two general lines: (1) the precise determination of nuclear hyperfine structure splitting in such atoms as cesium and hydro-

gen; and (2) the study of the pure rotational and inversion spectra of molecules. In the first field results are now being secured. In the second, much data has been accumulated which gives very accurate information concerning the structure of the HDO, O<sub>2</sub>, OCS, OCSe and other molecules. By the development and use of frequency standards and sensitive detection equipment, information is available for the determination of isotopic mass differences and abundances, and nuclear spin and quadrupole coupling.

Two projects in connection with Project Meteor are being conducted in the Laboratory. One is devoted to the development of missile guidance equipment; the other is concerned with telemetering and instrumentation.

The demand from industry and the Government Services for our graduate students specializing in the field of electronics continues to be extraordinarily great. Every effort has been made to assist in the placing of these graduates in positions where their aptitude and experience may be applied to the best advantage.

JULIUS A. STRATTON

#### LABORATORY FOR NUCLEAR SCIENCE AND ENGINEERING

An approximate idea of what proportions of the Laboratory's effort are currently devoted to research and construction may be had from the following breakdown. Of eleven research groups, six have been in full operation throughout the year. All of these have published, or submitted for publication, results of considerable significance in their respective fields. Two other groups were initiated early in the year and are just beginning effective research. The three remaining groups now represent construction projects begun from one to two years ago. All of these should be completed by the end of next year. At that time, the facilities in operation here will rank the Laboratory as one of the two or three best equipped centers of nuclear research in the country.

Despite the fact that during the year almost half of the Laboratory staff have been concerned with construction rather than research, there appeared in that period one hundred profes-

sional papers and addresses on work carried out here. Brief summaries of the principal accomplishments are given below.

The number of graduate students participating, essentially all candidates for the doctorate, now stands at about fifty. With twenty-five faculty members carrying on research with the Laboratory, the very closest relationship is being maintained between staff and students.

The level of expenditures continues about the same, major support being received from the joint program of the Office of Naval Research and the Atomic Energy Commission. The basis of support remains broad and within the field any promising line of research may be followed. Industrial support is constantly increasing. It is anticipated that this trend will continue and effect a new and more intimate relationship between industry and nuclear research at the Institute that will be of important benefits to both. Funds have also been received from the American Cancer Society and the Godfrey M. Hyams Foundation.

The most pressing capital need continues to be that for a new building to house the bulk of the Laboratory work. The designing of this building now awaits further funds. The space problem has been to a small extent relieved by the acquisition of a 46-acre site in Lexington with an existing permanent laboratory-type building providing approximately 12,000 square feet of air-conditioned, electrically and vibrationally quiet research space. The building is proving especially suitable for cosmic ray experimentation.

The last report outlined the special emphasis that is being given here to cosmic ray research under Professor Bruno B. Rossi and Professor George E. Valley, Jr. It has only been within very recent years that a reasonably accurate qualitative picture of these high-energy phenomena has been evolved. Only a matter of weeks before the end of this year, work in the Laboratory placed a definite, very small upper limit on the electronic component of the primary rays, a result unanticipated by many investigators. It had long been thought the presence of many super-energy electrons in the atmosphere necessitated their comprising a fair share of the primary rays. It is now known that these electrons are the result of nuclear

interactions and their production has indeed been quantitatively observed in cloud chambers here during the year. Such interactions have not yet been observed with laboratory particle accelerators, presumably because the particle energies thus far achieved are not sufficient.

In addition to the above, the dependence of the meson lifetime upon the absorbing element was further investigated. Energy measurements have been made on the meson decay electron. The meson component of cosmic radiation was extensively studied. The altitude variations of penetrating showers and shower production by penetrating particles have been measured. An experimental and theoretical study of the origin and structure of the decay of large air showers was completed. Most of the above studies were carried out in part in Colorado during the annual summer expedition.

Construction of the 300,000,000 electron volt synchrotron under Professor Ivan A. Getting and Professor J. Earl Thomas has been completed and adjustments are now in progress to produce the desired high-energy electrons. A large cloud chamber is being constructed by Dr. Robert W. Williams to observe the production and behavior of the mesons expected. The photographic plate technique recently developed to observe such nuclear events is being studied here under Professor Bernard T. Feld for use with the synchrotron.

After careful deliberations by the Steering Committee, it was decided that the 12,000,000 volt electrostatic generator mentioned in the last report would indeed be a very valuable addition to this Laboratory's facilities and well worth the effort and expense required for its construction and use. Professor John G. Trump, who had already designed the device in its most essential details, commenced the construction at once. Professor Herbert L. Beckwith and Professor Lawrence B. Anderson of the Department of Architecture provided a very functional and enlivening building design. Construction of the building is scheduled to commence in the fall and to be completed the following spring.

A third accelerator under construction by Dr. David H. Frisch for the past year is a 1,000,000 volt electrostatic generator built to perform two functions: (1) give certain informa-

tion about neutron-proton and proton-proton scattering at various low energies with a precision heretofore unattained, and (2) serve as the pilot generator with which to test voltage control and measurement schemes and a scattering chamber to be employed with the 12,000,000 volt generator.

Under Professor Robert J. Van de Graaff and Professor William W. Buechner, the 2,000,000 volt air-insulated electrostatic generator has been employed exclusively during the past year for precision studies of nuclear energy levels, especially of the light nuclei, lithium and boron. The 5,000,000 volt generator has been employed for a precise experiment on the photodisintegration of the deuteron, designed to measure separately the magnetic and electric effects of the impinging photon. The experiment, under Professor William M. Woodward (now resigned), is of considerable theoretical interest.

Last year the cyclotron was moved and reshielded. Its renewed operation was delayed by injury to one of its parts during the relocation. The accelerator is now again in operation, however, and the radiation levels outside the shielding are very close to those planned. Equipment to utilize the emergent beam to study the Oppenheimer-Phillips process is ready. Other important work under Professor Robley D. Evans and Professor Martin Deutsch has included the following: a study of the angular correlation and polarization of gamma rays from radioactive transitions; investigations of high-efficiency scintillation detectors; general counter research to enable one to predict the best combinations of gases for specified characteristics; and studies of the decay schemes of numerous important isotopes. There has continued close cooperation with medical workers in the Boston area on the use of radioactive tracers in studying biological functions and in diagnosis and therapy.

The theoretical group under Professor Victor F. Weisskopf and Professor Herman Feshbach has been actively participating in the recent developments in the fields of quantum electrodynamics, the phenomenological theory of nuclear forces, and the theory of nuclear reactions. In the last two categories, the group is principally interested in the correlation and distillation of experimental nuclear data into a consistent

scheme and the suggestion of new areas of investigation. The new electrodynamics involves problems of a fundamental nature. Their solution gives a clearer understanding of the electromagnetic field and the associated Coulomb forces, and therefore of the general question of the interactions of particles and fields. Once the nature of the mesons which occur is clearer, it may be expected that it will be possible to formulate a sensible field theory of nuclear forces.

The program in inorganic nuclear chemistry under Professor Charles D. Coryell and Professor John W. Irvine, Jr., continued significant research on the distribution of nuclear charge in fission and on the exchange of sulfide ion with carbon disulfide through the thiocarbonate ion.

The organic nuclear chemistry research under Professor John D. Roberts has been giving particular attention to carbonium ion reactions, which are of special importance in laboratory and industrial syntheses, and has used Carbon-14 in determining the structure of aldotetene dimers.

An investigation into the chemistry of the fission elements was started during the year by Professor David N. Hume. The results will be of significance in many applications of fission product radioelements and in problems involving fission product mixtures.

The Institute was host to over 150 visitors participating in its international conference on electrostatic and high-energy accelerators June 7 through 10, 1948. A number of the addresses were given by the Institute staff.

The health monitoring service has now been undertaken by the Medical Department and is, therefore, more appropriately concerned with radioactivity hazards throughout the Institute as a whole.

Mr. Malcolm M. Hubbard, who from the beginning has shared in shaping administrative policies and who has exercised surveillance over fiscal matters and direct supervision of the shops and services, was appointed Assistant Director of the Laboratory.

Professor Charles D. Coryell was appointed to the Physical Sciences Advisory Committee of Associated Universities, Inc.

Professor Robert J. Van de Graaff, for his "invention

and development of the electrostatic high-tension generator," was awarded the Duddell Medal of The Physical Society of London by Ambassador Lord Inverchapel.

JERROLD R. ZACHARIAS

### COSMIC TERRESTRIAL RESEARCH

The major emphasis of the program of the Cosmic Terrestrial Research Laboratory at Needham has continued to be placed upon the basic studies of radio wave propagation, both ionospheric and tropospheric. For this purpose the laboratory's accumulating records of field intensities have proved invaluable.

In addition to the six field intensity recorders reported in operation last year, a seventh recorder has been constructed and put into operation for recording transmission at 92,100 kilocycles from Station W2XEA at Alpine, New Jersey, 167 miles distant. This new recorder has already yielded valuable records relative to over-the-horizon reception in the newly-assigned FM band. Studies of the records of this frequency again emphasize the dependence of tropospheric transmission upon changes in atmospheric refraction and accompanying lapse rates. These records have made possible an interesting comparison with simultaneous recordings on 44,100 kilocycle reception from W2XMN over the same path. In general, reception at the higher of these two frequencies has been inferior to that of the lower frequency, but on occasion when meteorological conditions were especially favorable, the higher frequency fields have exceeded in value those of 44,100 kilocycles.

To test the extent of the area for which variations in the measured field intensities determined at Needham may be significant in ionospheric reception, it was stated in last year's report that an auxiliary recording equipment was being installed in the White Mountains at Intervale, New Hampshire, 90 miles farther from Washington than is Needham. This recorder was in operation during July and August in 1947 on WWV five and ten megacycles. The results, making allowance for the increased distance, were so closely in accord with the

simultaneous records obtained at Needham that it was decided to make further tests at another suitably located site some 100 miles nearer the Washington transmitter than at Needham.

Through the courtesy of Dr. H. S. Burr of Yale University, apparatus was set up and put into operation on Loomis Place, near the Yale Observatory grounds, on October 16, 1947. Comparison of the records obtained at New Haven with those at Needham show again that for the WWV five megacycle frequency, the diurnal pattern at New Haven was essentially the same as at Needham, Needham fields being somewhat stronger, presumably on account of the more oblique angle of reflection from the  $F_2$  layer. On March 9, another recorder was put into operation in Westchester County, New York, for recording simultaneously with New Haven and Needham WWV on five megacycles and later on ten megacycles. The operation of these three simultaneous recorders at given distances along the transmission path has afforded valuable data for evaluating the effect of distance upon field intensities for given frequencies from records of actual performance. The receivers and the antennas at all three stations have been calibrated to make possible reduction of the records to a standard basis.

The high sunspot activity reported last year appeared to culminate in August, 1947, with probably the highest sunspot number in 140 years. The amount of upper atmosphere ionization accompanying such marked solar activity probably accounts for the persistence of the summertime pattern of diurnal variations in ionospheric reception to which attention was called in last year's report. It is to be anticipated that with declining solar activity, the seasonal change in the diurnal pattern of reception will again appear.

A study of field intensities with sunspot activity has yielded results of unusual interest. While daytime fields in the five megacycle frequency from WWV have continuously degenerated with increased sunspot activity, presumably due to absorption in the lower ionized layers, night reception from WWV (five megacycles) increased over 300 per cent from the beginning of 1945 to October, 1946, when the sunspot number averaged 110. Thereafter, night field intensities

decreased while sunspots were still rising to a value of 150. This inversion in the curve for night fields accompanying extraordinarily high solar activity may be attributed to attenuation in the received waves introduced by absorption in the highly ionized E layer.

A study of our reception data from XEWW, Mexico City, 2300 miles distant from Needham, analyzed by Mr. Greenleaf W. Pickard, has revealed a nearly linear ratio between field intensities expressed in log microvolts and critical frequencies in the E layer determined at Baton Rouge, an ionospheric station near the mid-point of the transmission path. While continuing our studies of tropospheric reception, Mr. Pickard has also made an extended analysis of over 30,000 hours of our field intensity records from the point of view of any possible effect of meteorological conditions upon ionospheric transmission. This has yielded the somewhat surprising result that variations of from 10 to 30 per cent in recorded fields may be experienced in ionosphere-supported transmission dependent upon changing refraction indices and the existence of inversions and air mass interfaces in the lower atmosphere. It is apparent that the waves reflected from the ionosphere must twice traverse the troposphere in passing from transmitter to a distant reception point.

The possibility of a lunar effect on the ionosphere that might result in variations in radio transmission has been previously investigated at this laboratory and results published from analyses of field intensity records in the broadcast band. With the accumulation of data from WWV 5 megacycles, a preliminary analysis has been made of our existing data, the results of which appear to confirm in large measure previous findings. Preliminary results reveal characteristic differences in reception depending upon whether the moon is above or below the transmission path over which WWV night fields are received. As was found in the earlier investigation of the 780 kilocycles frequency, field intensities appear also to show a definite correlation with the angle of elongation of the moon from the sun.

During the year, Mr. Angus W. Mackiernan has designed and constructed an automatic recorder that will register

continuously the ratio of A/N from the Boston Air Beacon, hourly values of which have been observed manually for a number of years during the day. An analysis of our A/N observations over the last three years based on data selected from five days before to five days after snowfall has shown that a high ratio of A/N exists two days before the passing of the storm center, with the lowest ratio occurring at the day of snowfall taken as an epoch. Recovery takes place for five succeeding days when high ratios are again maintained. If data are restricted to heavy snowfalls defined as those with a water equivalent of 0.5 inches or greater, for which there were 20 cases, there is a fall from a maximum of 3.81 prior to the storm to a minimum of 3.33 on the epoch date, representing a drop of 17 per cent.

Because of the importance of relating the incidence of magnetic storms and other geomagnetic disturbances to field intensity and ionospheric data, plans have been made for the installation of a self-recording variometer which has been designed by Mr. Mackiernan and is in the process of construction. Some essential parts for the declinometer itself have been supplied through the courtesy of the Coast and Geodetic Survey who have previously established the magnetic elements and marker at a site selected on the laboratory grounds.

The laboratory has continued to receive its support partly from the Cosmic Terrestrial Research Fund and partly from contracts placed through the Division of Industrial Cooperation with the Office of Naval Research and the National Bureau of Standards.

In addition to publications appearing in technical journals and papers presented at several technical societies during the year, four quarterly reports have been issued and briefer monthly reports supplied to the Central Radio Propagation Laboratory of the National Bureau of Standards for publication in their Monthly Report of activities of cooperating laboratories.

HARLAN T. STETSON

## **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, 1948 (pages 188 and 189) and the related statements of income and expense (pages 190 and 191), surplus from operations (page 192) and certain reserve funds (page 175) for the year ended June 30, 1948, have reviewed the system of internal control and the accounting procedures of the Institute and, without making a detailed audit of the transactions, have examined or tested accounting records and other supporting evidence, by methods and to the extent we deemed appropriate. Our examination was made in accordance with generally accepted auditing standards and included all procedures which 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, 1948, and the results of its operations for the year then ended, in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

LYBRAND, ROSS BROS. & MONTGOMERY

Boston, Massachusetts

September 1, 1948

## 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, 1948 and their certificate is submitted herewith.

Respectfully,

PHILLIPS KETCHUM

HAROLD BUGBEE

HENRY E. WORCESTER, *Chairman*

September 18, 1948

## TREASURER'S STATEMENT

*To the Corporation:*

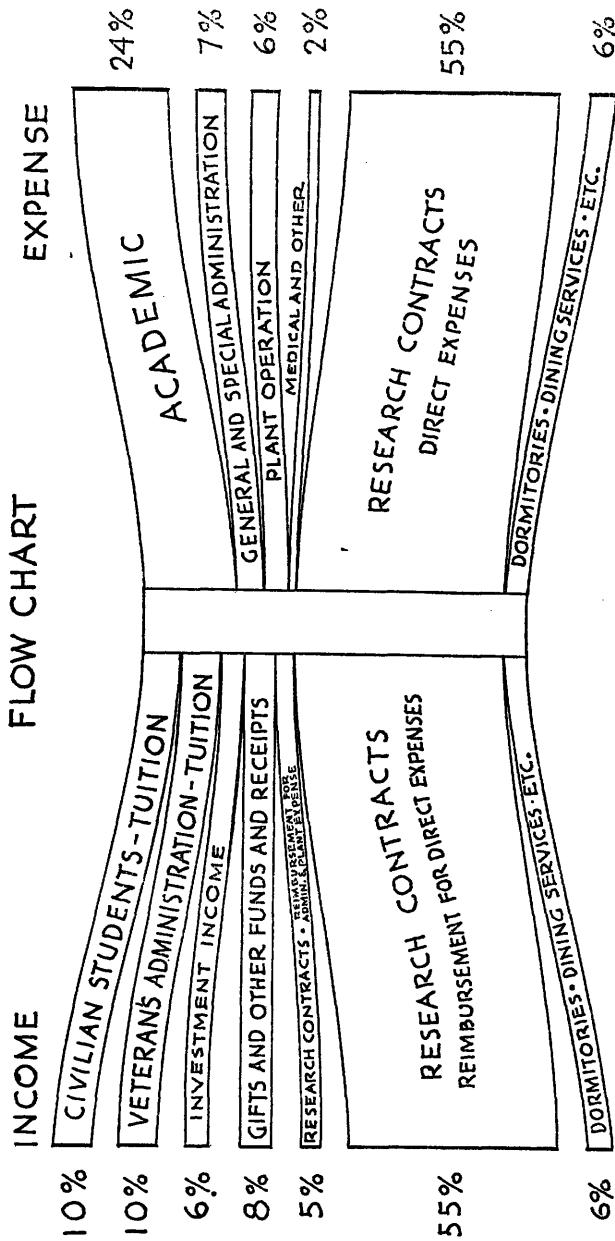
The statements and schedules submitted herewith, in accordance with Section VI of the By-Laws of the Corporation, show the financial condition of the Institute as at June 30, 1948, also the financial transactions during the year ended on that date.

Three major schedules present (A) BALANCE SHEET, (B) STATEMENT OF INCOME AND EXPENSE, (C) SURPLUS FROM OPERATIONS. The first two are broken down into supporting schedules designated A-1, B-1, etc.

### EDUCATIONAL PLANT

Total plant assets \$19,589,000 (Schedule A-19) have increased \$1,220,000 during the year. This increase is accounted for by the completion of the Gas Turbine and Sloan Automotive Laboratories, by the application of \$458,000 contributed by the Alumni Fund to the new Senior Dormitory construction and by substantial additions to the Electrical distribution system.

CURRENT OPERATIONS \$ 21,000,000.  
1947-1948



### THE YEAR'S OPERATIONS

The flow chart opposite shows the sources of all income and expenses for the year ended June 30, 1948. Total income and expense was \$21,000,000 — \$4,000,000 in excess of 1947, largely accounted for by the increase in research contract revenues for the year.

Income from students, including loan and scholarship awards, \$4,068,000, was \$638,000 over last year. Income from investments increased over 1947 by \$163,000, reflecting increased dividends received on common stocks.

Research Contract revenues, \$13,301,000, compare with \$9,825,000 last year (see page 174).

Academic expenses, \$5,039,000, were \$351,000 over last year. General Administrative Expenses were \$271,000 over 1947 and Plant Operation, including repairs and alterations, was \$1,335,000, or \$130,000 less than last year.

Other Expenses, Medical and Undergraduate Activities increased \$53,000 over the previous year.

Total Income exceeded Expenses by \$204,456. Against this excess was a total of \$184,000 in appropriations made, but not expended at the end of the year. The Cumulated Operating Deficit (Schedule C) now stands at \$21,119.

### CONTRACT OPERATIONS

There follow two summaries of contract operations of the Division of Industrial Coöperation, of which the first shows the contract revenues and direct costs for the year ended June 30, 1948, and the second presents a comparison of operations over the past five years. The number of contracts in force as at June 30, 1948, was 176 (153 last year).

## D. I. C. OPERATIONS FOR 1947-48

## Costs reimbursed:

Salaries and Wages.....	\$ 5,212,788.01
Materials and Services.....	5,611,638.07
Travel, Communications, Shipping, etc.....	188,938.58
Other.....	92,442.63
	<hr/>
	\$11,105,807.29
Overhead allowances under contracts for administrative and plant expenses and for the use of Institute facilities and funds (see page 190) .....	2,195,339.79
Total Contract Revenues.....	<hr/> <u>\$13,301,147.08</u>

The following is a five-year summary of the operations of the Division of Industrial Coöperation:

	<i>Fiscal 1948</i>	<i>1947</i>	<i>1946</i>	<i>1945</i>	<i>1944</i>
Total Volume (Revenues).....	\$13,301,100	\$ 9,824,900	\$24,294,500	\$39,970,900	\$25,461,300
Dollar increase over previous year	3,476,200	14,469,600*	15,676,400*	14,509,600	10,509,500
Percentage increase over previous year.....	35%	60%*	39%*	57%	70%
Salaries and Wages.....	5,212,800	4,009,000	8,409,000	12,529,700	9,412,100
Overhead Allowances.....	2,195,300	1,806,600	1,547,100	1,312,300	1,142,500
Percentage of Salaries and Wages..	42%	46%	18%	10.5%	12.2%
Percentage of Revenues.....	16.5%	18.5%	6.3%	3.3%	4.5%

\*Decrease

## ENDOWMENT AND OTHER FUNDS

The book value of the Endowment and other funds stands at \$48,047,800 — an increase of over \$500,000, principally from gifts.

An analysis of the principal Reserve Funds is shown below:

**ENDOWMENT RESERVE FUND**

(Accumulated net gain on general investments)

BALANCE June 30, 1947 .....	\$2,396,649.93
Net gain from sales of securities .....	<u>95,972.57</u>
<b>BALANCE June 30, 1948 .....</b>	<b><u>\$2,492,622.50</u></b>

**INDUSTRIAL FUND**

BALANCE June 30, 1947 .....	\$403,320.54
Add:	
Allocation from general investment income .....	13,964.00
Appropriation from 1948 industrial research contract revenues .....	<u>132,095.00</u>
	<b><u>\$549,379.54</u></b>
Deduct:	
Special appropriations, principally for equipment .....	\$70,874.76
Salary and other payments .....	<u>4,875.00</u>
	<b><u>75,749.76</u></b>
<b>BALANCE June 30, 1948 .....</b>	<b><u>\$473,629.78</u></b>

**RESERVE FOR USE OF FACILITIES**

BALANCE June 30, 1947 .....	\$145,998.91
Add:	
Appropriation from 1948 research contract revenues .....	<u>302,411.00</u>
	<b><u>\$448,409.91</u></b>
Deduct:	
Special appropriations for repairs, alterations and improvements:	
Laboratories .....	\$93,656.14
Buildings and grounds .....	<u>154,090.16</u>
	<b><u>247,746.30</u></b>
<b>BALANCE June 30, 1948 .....</b>	<b><u>\$200,663.61</u></b>

**UNDISTRIBUTED INVESTMENT INCOME**

BALANCE June 30, 1947 .....	\$23,631.90
Transfer to 1947-1948 General Investment income .....	<u>23,215.78</u>
<b>BALANCE June 30, 1948 .....</b>	<b><u>\$416.12</u></b>

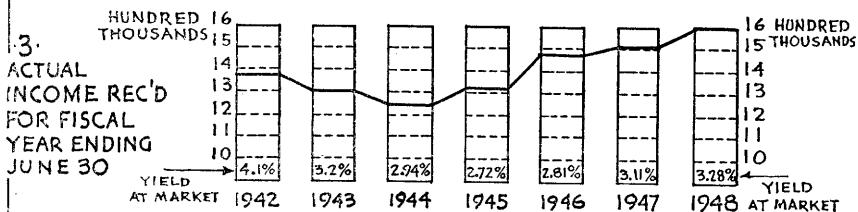
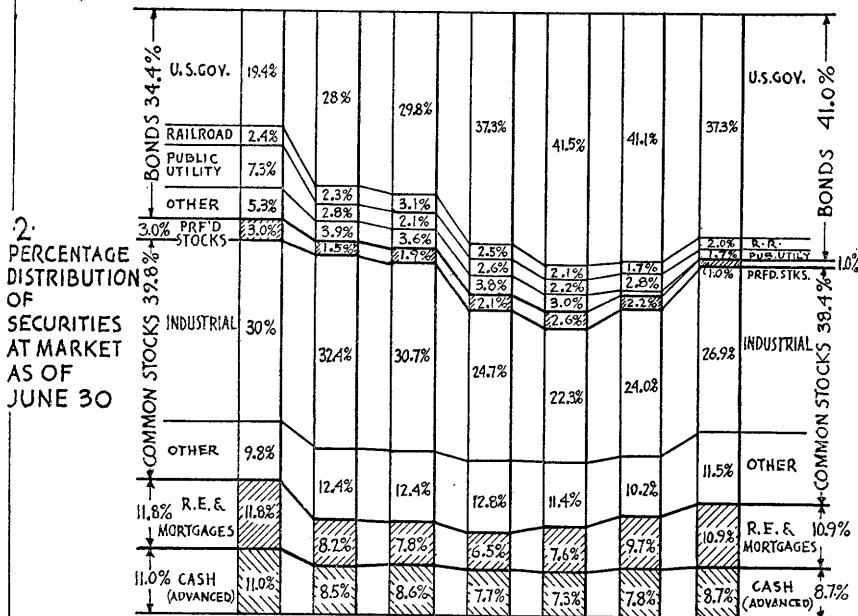
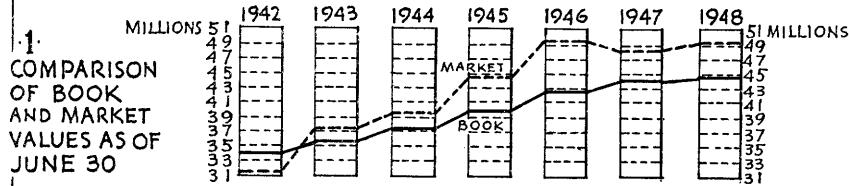
## INVESTMENTS

## SUMMARY OF INVESTMENTS AS AT JUNE 30, 1948

<i>General Investments</i>	<i>Book</i>	<i>Market</i>	<i>Per Cent at Market</i>
<b>Bonds —</b>			
United States Government . . . . .	\$18,205,207	\$18,182,530	37.3
Public Utility and Others . . . . .	849,078	847,820	1.7
Railroad . . . . .	894,652	920,119	2.0
<b>Total . . . . .</b>	<b>\$19,948,937</b>	<b>\$19,950,469</b>	<b>41.0</b>
<b>Preferred Stocks —</b>			
Public Utility . . . . .	\$352,279	\$337,125	0.6
Railroad and other . . . . .	153,064	176,750	0.4
<b>Total . . . . .</b>	<b>\$505,343</b>	<b>\$513,875</b>	<b>1.0</b>
<b>Common Stocks —</b>			
Industrial . . . . .	\$8,729,681	\$13,244,468	26.9
Public Utility . . . . .	1,085,196	1,107,099	2.2
Railroad . . . . .	334,499	418,900	0.8
Bank and Finance . . . . .	2,421,832	2,205,675	4.4
Insurance and Other . . . . .	1,719,374	2,022,950	4.1
<b>Total . . . . .</b>	<b>\$14,290,582</b>	<b>\$18,999,092</b>	<b>38.4</b>
<b>Real Estate . . . . .</b>	<b>5,216,091</b>	<b>5,216,091</b>	<b>10.6</b>
<b>Mortgages . . . . .</b>	<b>165,653</b>	<b>165,653</b>	<b>0.3</b>
<b>Cash — Advanced (Schedule A) . . . . .</b>	<b>3,922,399</b>	<b>3,922,399</b>	<b>8.7</b>
<b>Total General Investments . . . . .</b>	<b>\$44,049,005</b>	<b>\$48,767,579</b>	<b>100.00</b>
Students' Notes . . . . .	368,282	368,282	
<b>Total General Investments including Students' Notes . . . . .</b>	<b>\$44,417,287</b>	<b>\$49,135,861</b>	
<b>Special Investments . . . . .</b>	<b>3,630,554</b>	<b>3,851,771</b>	
<b>ALL INVESTMENTS . . . . .</b>	<b>\$48,047,841</b>	<b>\$52,987,632</b>	

Trends in the pooled or general investments during the past seven years are shown in the one hundred per cent component bar graph presented on the opposite page.

## MASSACHUSETTS INSTITUTE OF TECHNOLOGY GENERAL INVESTMENTS



### INVESTMENTS

Bond holdings decreased 5.1 to 41.0 per cent, with Governments down from 41.1 to 37.3 per cent. Common stocks were up 4.2 to 38.4 per cent, with real estate investments increased 1.2 per cent.

The book value of all of the Institute's investments (including advances for Current Operations) increased \$560,000 to \$48,047,000. The market value increased \$1,000,000 to \$52,988,000 or \$4,941,000 in excess of book — a ratio of 110 per cent.

### INVESTMENT INCOME

The income allocation to funds sharing the general investments was at 4.0 per cent. Last year the allocation was at 3.75 per cent. This allocation (\$1,613,284.00) includes the interest on funds advanced by the Institute for D. I. C. operations and also \$23,215.78 from the undistributed income reserve of previous years.

### GENERAL

On the pages immediately following will be found (1) a record of the gifts and bequests received by the Institute during the year, (2) a report of the Trustees of the M. I. T. Pension Association, (3) a report of the operation of the Technology Loan Fund Committee.

Respectfully submitted,

HORACE S. FORD, *Treasurer*

JOSEPH J. SNYDER, *Assistant Treasurer*

August 30, 1948

**GIFTS AND BEQUESTS RECEIVED DURING THE YEAR ENDED  
JUNE 30, 1948**

**GIFTS FOR ENDOWMENT***Funds for General Purposes*

Henry Clay Frick Estate for Henry Clay Frick Fund (additional) . . . . .	\$377,429.50
Harriette Nevins Estate for George Blackburn Memorial Fd. (add'l) . . . . .	780.38
Marion Westcott Estate for Marion Westcott Fund (additional) . . . . .	1,350.00
	<hr/>
	<b>\$379,559.88</b>

*Funds for Designated Purposes*

Anonymous for Tillotson Fellowship . . . . .	\$1,900.00
Class of 1909 (additional) . . . . .	504.40
Class of 1922 (additional) . . . . .	115.00
William A. Conant Estate for William A. Conant Fund (additional) . . . . .	15,328.16
Edith M. Hobbs Estate for Fellowship and Library . . . . .	10,000.00
Mary Towles Kirk Seghers Estate for Paul D. Seghers, Jr. Scholarship	4,800.00
William T. Kneisner for Amelia S. Kneisner Scholarship Fund (add'l) . . . . .	2,000.00
Jacob and Jennie Lichter for J. and J. Lichter Fund (additional) . . . . .	5,000.00
M.I.T. Club of Chicago for Scholarships (additional) . . . . .	355.00
Alexander G. Mercer Trust for Hall-Mercer Scholarship Fund (add'l) . . . . .	902.24
Annie J. Pecker Estate for Frank S. Pecker Scholarship Fund . . . . .	33,621.81
Frank S. Pecker Estate for Frank S. Pecker Scholarship Fund . . . . .	26,100.37
Odette S. Price for Raymond B. Price Memorial Fund . . . . .	5,000.00
Elizabeth R. Stevens Estate for Albert G. Boyden Fund (additional) . . . . .	277.76
James Thompson, Jr. Estate for William Barton Rogers Schlp. Fund	5.00
	<hr/>
	<b>\$105,918.74</b>
<b>TOTAL GIFTS FOR ENDOWMENT . . . . .</b>	<b><hr/>\$485,478.62</b>

**GIFTS FOR STUDENT LOAN FUNDS**

Contributions to William H. Timbie Fund . . . . .	\$4,860.50
Elizabeth H. Lamson Estate for Lamson-Virgin Loan Fund (add'l) . . . . .	2,000.00
Mr. and Mrs. L. R. VanBburgh for Technology Loan Fund . . . . .	500.00
	<hr/>
<b>TOTAL GIFTS TO STUDENT LOAN FUNDS</b>	<b><hr/>\$7,360.50</b>

**GIFTS FOR BUILDING FUNDS**

Henry W. Ballou for Hydrodynamics Laboratory . . . . .	\$100.00
Charles B. Breed for Hydrodynamics Laboratory . . . . .	100.00
Arthur J. Conner Estate for Arthur J. Conner Fund (additional) . . . . .	175,821.62
Thomas C. Desmond for Hydrodynamics Laboratory (additional) . . . . .	1,666.67
Phelps Dodge Corp. for Metals Processing Laboratory . . . . .	50,000.00
	<hr/>
Sloan Foundation (additional) . . . . .	71,667.00
A. O. Smith Corp. for Metals Processing Laboratory . . . . .	10,000.00
Beauchamp E. Smith for Hydrodynamics Laboratory . . . . .	5,618.75
Society of Naval Architects and Marine Engineers for Hydro- dynamics Laboratory . . . . .	1,000.00
Albert and Jessie D. Wiggin Foundation for New Library (add'l) . . . . .	1,000.00
	<hr/>
<b>TOTAL GIFTS FOR BUILDING FUNDS . . . . .</b>	<b><hr/>\$316,974.04</b>

## OTHER GIFTS (Principal available for expenses)

*Unexpended Balance of Endowment Fund Income  
for Designated Purposes*

Committee on Economic Development for Sloan Professorship in Industrial Management (additional) . . . . .	\$6,300.00
Charles Hayden Foundation for Charles Hayden Memorial Special (additional) . . . . .	7,500.00
	<u>\$13,800.00</u>

*Funds for General Purposes — Invested*

Contributions to New Era Fund . . . . .	\$18,425.10
Jasper B. Carr . . . . .	\$2,400.00
Forbes Lithograph Mfg. Co. . . . .	5,000.00
Mr. and Mrs. St. John Garwood . . . . .	1,000.00
Morgan Construction Co. . . . .	1,077.60
Gordon S. Rentschler . . . . .	5,000.00
Edwin S. Webster . . . . .	2,325.00
Miscellaneous . . . . .	1,622.50
Sir Douglas Alexander (additional) . . . . .	10,000.00
Helen Collamore Estate for Helen Collamore Fund (additional) . . . . .	210.45
George Giuffrida . . . . .	500.00
William T. Henry Trust for William T. Henry Fund (additional) . . . . .	15,645.00
Frederick W. Hosbach for Ernest R. Hosbach Fund . . . . .	1,000.00
Carl T. Keller for Keller Fund . . . . .	100.00
George A. Sloan (additional) . . . . .	100.00
Herman W. Tamkin Estate for Tamkin Fund . . . . .	13,500.00
Towle Manufacturing Company for Towle Fund (additional) . . . . .	2,500.00
Harry C. Wiess for Wiess Fund (additional) . . . . .	22,800.00
Belle A. Williston Estate for Williston Fund . . . . .	17,118.68
	<u>\$101,899.23</u>

*Funds for Designated Purposes — Invested*

Contributions to	
M.I.T. Alumni Fund 1947-48 . . . . .	\$84,627.48
M.I.T. Alumni Fund 1948-49 . . . . .	95,620.11
Boston Stein Club Fund (additional) . . . . .	5,405.32
Class of 1918 Organ Fund (additional) . . . . .	1,122.00
Cosmic Terrestrial Research Fund (additional) . . . . .	8,000.00
Industrial Relations Fund (additional) . . . . .	26,250.00
Industrial Economics Fund . . . . .	8,750.00
Carl P. Dennett . . . . .	\$250.00
Sun Oil Company . . . . .	5,000.00
Albert and Jessie D. Wiggin Foundation . . . . .	1,000.00
Westinghouse Educational Foundation . . . . .	2,500.00
American Can Company for Food Technology Fund . . . . .	10,000.00
Carnegie Corporation of New York for S.A.L. Center . . . . .	25,000.00
Donald F. Carpenter for Athletics . . . . .	1,000.00
A. V. Clarke for A. V. Clarke Scholarship . . . . .	1,462.50
Dow Chemical Company for Food Technology Fund (additional) . . . . .	10,000.00
Goodyear Tire & Rubber Company for Fellowship . . . . .	2,500.00
International Tel. & Tel. for Electronics Laboratory . . . . .	10,000.00

Edward H. Lorenz for A. Norton Kent Fund (additional) . . . . .	\$100.00
John R. Macomber for John R. Macomber Fund (additional) . . . . .	3,780.00
C. Lillian Moore Estate for John A. Grimmons Fund (additional) . . . . .	2,892.58
Radio Corporation of America for Industrial Fellowship in Electronics . . . . .	10,000.00
Socony Vacuum Oil Company for Fellowship . . . . .	5,000.00
Standard Brands, Inc. for Fellowship . . . . .	10,000.00
Anonymous for Albert Fund (additional) . . . . .	3,000.00
Texas Corporation for Nuclear Science Fund . . . . .	50,000.00
Tau Beta Pi for Scholarships (additional) . . . . .	1,259.77
U. S. Smelting & Refining Co. for Fellowship . . . . .	1,000.00
Union Carbide & Carbon Company for Fellowship . . . . .	20,000.00
	<hr/>
	\$396,769.76

*Funds for Designated Purposes — Not Invested*

## Contributions to —

Structural Laboratory . . . . .	\$ 275.60
Corporation Flower Fund . . . . .	545.00
Foreign Student Summer 1948 Project . . . . .	17,130.15
Poughkeepsie Fund . . . . .	955.00
President's Fund "L" . . . . .	25.00
President's Fund . . . . .	685.60
Robert S. Williams Portrait Fund . . . . .	975.50
Allied Chemical & Dye Corporation for Fellowship (additional) . . . . .	6,275.00
American Brake Shoe Co. for Metals Processing Laboratory . . . . .	7,000.00
American Cancer Society for Research (additional) . . . . .	80,290.00
American Chemical Society for Library Fellowship . . . . .	7,190.00
American Cyanamid Corporation for Fellowship . . . . .	2,000.00
American Petroleum Institute for Research (additional) . . . . .	12,380.00
American Philosophical Society for Research (additional) . . . . .	1,200.00
American Society of Mechanical Engineers for Research (add'l) . . . . .	10,161.50
Anonymous for Special Fellowship . . . . .	3,000.00
Armour & Company for Research (additional) . . . . .	29,000.00
Bituminous Coal Research, Inc., for Research . . . . .	15,000.00
Lemuel R. Boulware for Boulware Fund . . . . .	150.00
Bristol Laboratories, Inc., for Research . . . . .	3,450.00
Carnegie Corporation of N. Y. for Aerodynamic Research (add'l) . . . . .	20,000.00
Chrysler Corporation for Wear Fund . . . . .	1,000.00
Continental Can Company for Spectroscopy Research (additional) . . . . .	20,000.00
Corn Industries Research Foundation, for Research (additional) . . . . .	5,500.00
Dewey & Almy Chemical Company for Dewey & Almy Fund . . . . .	4,581.11
Douglas Aircraft Company for Fellowship (additional) . . . . .	3,500.00
Lammot duPont for President's Fund . . . . .	4,500.00
E. I. duPont de Nemours & Co. for Fellowships (additional) . . . . .	15,400.00
Eastman Kodak Company for Fellowships (additional) . . . . .	2,400.00
Engineering Foundation for Research (additional) . . . . .	2,048.92
Federation of Sewage Works Association, for Research . . . . .	4,900.00
J. M. Forbes & Company for Nova Scotia Coal Research . . . . .	50.00
Foundry Educational Foundation for Scholarship & Research . . . . .	34,500.00
General Ceramics & Steatite Corp., for Clay Research . . . . .	150.00

## REPORT OF THE TREASURER

General Electric Company, for Cascade Research . . . . .	\$12,500.00
General Machinery Corporation, for Cascade Research . . . . .	2,500.00
General Motors Corporation, for Wear Conference . . . . .	1,000.00
Geological Society of America, for Research (additional) . . . . .	1,875.00
Gottesman Foundation for Fellowship . . . . .	2,500.00
Gulf Oil Corporation, for Fellowship (additional) . . . . .	2,200.00
Harshaw Chemical Company, for Research (additional) . . . . .	10,000.00
Hartford Empire Company, for Spectroscopy Research . . . . .	10,000.00
Charles Hayden Foundation, for Medical Office . . . . .	11,000.00
Delos G. Haynes, for Student Aid . . . . .	2,000.00
Houston Endowment, Inc., for William S. Knudsen Fund . . . . .	2,500.00
Sinju Hsiao for Edgerton Film . . . . .	40.00
Humble Oil & Refining Company, for Research . . . . .	25,000.00
Jerome C. Hunsaker for Aeronautical Engineering Department . . . . .	1,000.00
Patrick M. Hurley, for Geological Society of America . . . . .	1,000.00
Godfrey M. Hyams Trust, for Research (additional) . . . . .	12,000.00
Illinois Clay Products Company, for Research . . . . .	5,000.00
International Nickel Company, for Fellowship (additional) . . . . .	2,200.00
A. C. Lawrence Leather Company, for Research (additional) . . . . .	2,500.00
Henry Loomis for Dean's Fund Special . . . . .	900.00
Newman Marsilius for Marsilius Fund (additional) . . . . .	1,000.00
Thomas McConica, III, for Thomas Midgeley Fund (additional) . . . . .	500.00
M.I.T. Detroit Alumni Club, for Scholarship . . . . .	750.00
James C. Melvin Trust for Scholarship (additional) . . . . .	9,800.00
Adrian C. Minton for Minton Fund . . . . .	150.00
National Academy of Sciences, for Welch Fund (additional) . . . . .	1,000.00
National Lime Association, for Research (additional) . . . . .	6,000.00
National Live Stock & Meat Board, for Fat Research (additional) . . . . .	3,975.00
National Vitamin Foundation, for Research . . . . .	5,200.00
Niles-Bement-Pond Co., for Instrumentation Research . . . . .	10,000.00
Nutrition Foundation, for Research (additional) . . . . .	4,000.00
Stewart Perry for Howard D. Williams Fund . . . . .	500.00
Plastic Materials Mfg. Assn., for P.M.M.A. Fund (additional) . . . . .	30,000.00
Procter & Gamble Co., for Research (additional) . . . . .	6,200.00
Augustus L. Putnam, for Sailing Pavilion . . . . .	400.00
Republic Steel Corporation, for Republic Steel Fund (additional) . . . . .	10,000.00
Research Corporation, for Research (additional) . . . . .	21,380.00
Revere Copper & Brass Company, for Research (additional) . . . . .	2,500.00
Rockefeller Foundation, for Biology Research . . . . .	107,279.57
Sharp & Dohme, for Research (additional) . . . . .	3,200.00
Sheffield Foundation, for Research (additional) . . . . .	1,569.20
Shell Fellowship Committee, for Fellowship . . . . .	2,200.00
Alfred P. Sloan, Jr. for Sloan Laboratory (additional) . . . . .	1,065.35
Socony Vacuum Oil Company, for Fellowship (additional) . . . . .	2,000.00
Spool Cotton Company, for Clark Thread Fellowship (additional) . . . . .	5,400.00
Standard Brands, Inc., for Fellowship (additional) . . . . .	500.00
Standard Oil of California, for Fellowship in Bus. Adm., (add'l) . . . . .	1,100.00
Standard Oil of California, for Fellowship in Chem. Eng., (add'l) . . . . .	1,000.00
Standard Oil of Indiana, for Fellowship (additional) . . . . .	1,900.00
Standard Oil of New Jersey, for Research . . . . .	50,000.00
Steel Founders Society of America, for Research & Scholarship . . . . .	16,500.00

Sugar Research Foundation, for Sugar Research (additional).....	\$25,000.00
Teagle Foundation, for Teagle Fund (additional).....	5,450.00
Titanium Alloy Mfg. Co., for Titanium Alloy Fund (additional).....	1,500.00
Neal E. Tourtellotte, for Boat House Equipment.....	1,842.37
Unexcelled Chemical Company, for Research (additional).....	1,800.00
Union Bay State Chem. Co., for Research (additional).....	500.00
Union Carbide & Chemical Company, for Fellowship.....	2,000.00
United Engineering Trustees, for Research (additional).....	4,865.00
United Fruit Company, for United Fruit Fund.....	15,189.00
United Shoe Machinery Corp., for Director of Libraries.....	150.00
U. S. Rubber Company, for Scholarship.....	2,800.00
U. S. Steel Corp., for U. S. Steel Fund (additional).....	570.00
Vanadium Alloy Steel Co., for Fellowship (additional).....	3,375.00
Ralph Walker, for Ralph Walker Fund.....	250.00
Warwick Malleable Company, for Fellowship.....	1,500.00
Westinghouse Electric & Mfg. Company, for Cascade Research.....	12,500.00
Julia P. Whitney, for Granger Whitney Fund (additional).....	200.00
	<hr/>
	\$810,493.87
<b>TOTAL OTHER GIFTS.....</b>	<b>\$1,322,962.86</b>

## MISCELLANEOUS GIFTS

*Deposits and Advances Held for Investment*

Class of 1923 (additional).....	\$41,352.78
Class of 1924 (additional).....	2,391.76
Class of 1926 (additional).....	3,985.77
Class of 1936.....	58.33
M.I.T. Alumni Class of 1898.....	5,882.84
M.I.T. Women's Dormitory Fund.....	1,075.25
	<hr/>
	\$54,746.73

*Conditional Gifts*

Anonymous for Anonymous "Y" Fund.....	\$100.00
George S. Witmer, for Witmer Fund (additional).....	4,200.00
	<hr/>
<b>TOTAL MISCELLANEOUS GIFTS.....</b>	<b>\$59,046.73</b>

## SUMMARY

## Gifts for Endowment

Funds for General Purposes.....	\$379,559.88
Funds for Designated Purposes.....	105,918.74

\$485,478.62

## Gifts for Student Loan Funds.....

7,360.50

## Gifts for Building Funds.....

316,974.04

## Other Gifts (principal available for expenses)

Unexpended Balances of Endowment Fund Income.....	\$ 13,800.00
Funds for General Purposes — Invested.....	101,899.23
Funds for Designated Purposes — Invested.....	396,769.76
Funds for Designated Purposes — Not Invested.....	810,493.87

1,322,962.86

## Miscellaneous Gifts

Deposits and Advances held for Investment.....	\$ 54,746.73
Conditional Gifts.....	4,300.00
	<hr/>
	\$2,191,822.75

## REPORT OF THE TREASURER

REPORT OF THE TRUSTEES OF THE  
M. I. T. PENSION ASSOCIATION  
COMPARATIVE BALANCE SHEET

ASSETS	<i>June 30, 1947</i>	<i>June 30, 1948</i>
Cash.....	\$15,217.46	\$45,302.41
Investments (page 185).....	1,924,454.61	2,129,230.42 <sup>1</sup>
Total.....	<u>\$1,939,672.07</u>	<u>\$2,174,532.83</u>

<sup>1</sup> Market Value June 30, 1948, \$2,305,553.98.

LIABILITIES	<i>June 30, 1947</i>	<i>June 30, 1948</i>
Teachers' Annuity Fund (5% salary deduction, plus interest).....	\$1,153,243.27	\$1,282,704.39
*M.I.T. Pension Fund (3% appropriation, plus interest).....	750,721.77	861,128.19
Special Reserves for Annuity Payments.....	26,070.43	22,134.65
Total Liabilities.....	<u>\$1,930,035.47</u>	<u>\$2,165,967.23</u>
Reserve Fund (including undistributed income).....	9,636.60	8,565.60
Total.....	<u>\$1,939,672.07</u>	<u>\$2,174,532.83</u>

\*The Institute appropriates annually the equivalent of the 5% salary deduction, using 2% for payment of group insurance premiums.

## RECEIPTS AND EXPENDITURES FOR 1947-1948

RECEIPTS	<i>June 30, 1948</i>
5% salary deductions added to Teachers' Annuity Fund.....	\$151,018.55
3% appropriations added to M.I.T. Pension Fund.....	90,735.63
Income from investments (Net).....	69,416.87
Profit on sale of security.....	1,045.20
Total Receipts.....	<u>\$312,216.25</u>

EXPENDITURES	<i>June 30, 1948</i>
Paid on account of withdrawal or decease of members.....	\$61,258.28
Used to purchase annuities for retiring members.....	10,661.21
Pensions paid directly to retired former members.....	5,287.02
Losses on sales of securities.....	148.98
Total Expenditures.....	<u>\$77,355.49</u>
Net Increase of Ledger Assets.....	<u>\$234,860.76</u>

## TRUSTEES OF THE M.I.T. PENSION ASSOCIATION

Karl T. Compton	Horace S. Ford	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

Par Value or Shares				Book Value	Net Income <sup>1</sup>
\$75,000	U. S. Treasury.....	2s	1951-53	\$75,000.00	\$1,500.00
125,000	U. S. Treasury.....	2½s	1968	126,400.00	2,760.84
100,000	U. S. Treasury.....	2½s	1964-69	100,900.00	2,272.69
60,000	U. S. Treasury.....	2½s	1967-72	60,440.00	1,445.88
660,000	U. S. Savings, "G" ..	2½s	1954-60	660,000.00	13,687.50
35,000	Alabama Power.....	3½s	1972	35,000.00	1,225.00
50,000	Am. Tel. & Tel.....	2¾s	1961	54,800.00	925.00
50,000	Am. Tel. & Tel.....	2¾s	1980	50,200.00	1,275.00
50,000	Comm. Edison.....	3s	1977	52,600.00	1,400.00
47,000	Louisiana Pr. & Lgt..	3s	1974	48,300.00	1,303.92
50,000	Pac. Gas & Elec.....	3s	1974	51,700.00	1,400.00
50,000	Philadelphia Electric.....	2¾s	1974	50,400.00	1,275.00
35,000	So. California Edison	3s	1965	36,800.00	950.00
25,000	Balt. & Ohio.....	4s	1975	24,987.50	1,000.00
200	du Pont.....			29,504.20	1,600.00
1,000	Eastman Kodak.....			28,500.00	1,600.00
1,500	General Electric.....			63,519.71	1,920.00
600	General Motors.....			29,332.24	1,800.00
455	Int. Business Machines.....			26,401.93	1,690.00
1,600	Sears Roebuck.....			29,391.89	2,800.00
500	Standard Oil, Ind.....			23,621.75	1,187.50
820	Standard Oil, N. J.....			39,798.13	2,400.00
1,500	Union Carbide and Carbon.....			41,575.54	2,000.00
1,500	United Fruit.....			38,575.21	6,000.00
500	United Shoe.....			35,910.62	1,750.00
200	Am. Telephone & Telegraph.....			33,496.34	1,800.00
1,000	Cleveland Electric Illuminating.....			37,410.95	.....
480	Bankers Trust, N. Y.....			23,687.50	864.00
625	Chemical Bank and Trust, N. Y.....			25,187.50	1,125.00
500	First National Bank, Boston.....			27,500.00	1,125.00
55	Guaranty Trust, N. Y. ....			12,424.50	660.00
400	Fireman's Fund Insurance.....			31,350.00	806.25
200	Hartford Fire.....			18,300.00	600.00
250	Insurance Co. of North America.....			16,000.00	750.00
400	Phoenix Insurance.....			33,775.00	700.00
	Real Estate, Albany, N. Y.....			56,439.91	2,573.83
	Income from investments sold or called				1,244.46
<i>Total Pension Association.....</i>				<b>\$2,129,230.42</b>	<b>\$69,416.87</b>

<sup>1</sup> Net after premium amortization

## REPORT OF THE TREASURER

REPORT OF THE TECHNOLOGY LOAN FUND COMMITTEE  
COMPARATIVE BALANCE SHEET

	ASSETS			
	June 30, 1947		June 30, 1948	
Cash.....	\$53,211.52		\$28,065.29	
Investments (Schedule A-2).....	<u>1,463,958.59</u>	<u>\$1,517,170.11</u>	<u>1,563,939.47</u>	<u>\$1,592,004.76</u>
Student Notes Receivable:				
Loans 1930 to date.....	\$1,931,809.75		\$1,980,609.75	
Less Repayments (including \$6,005.31 written off) to date.....	<u>1,563,426.38</u>	<u>368,383.37</u>	<u>1,626,340.91</u>	<u>354,268.84</u>
<b>TOTAL ASSETS.....</b>	<b><u>\$1,885,553.48</u></b>		<b><u>\$1,946,273.60</u></b>	
	LIABILITIES			
Technology Loan Fund:				
Total Subscriptions.....		\$1,450,785.18		\$1,451,285.18
Add:				
Investment Income (net).....	\$451,308.16		\$501,966.21	
Interest from Loans.....	212,171.83		219,462.43	
Class of 1895 Memorial Fund.....	<u>1,824.00</u>	<u>665,303.99</u>	<u>2,824.00</u>	<u>724,252.64</u>
<b>Deduct:</b>				
Net Loss on Securities.....	\$192,567.92		\$191,019.82	
Written Off, Deceased Borrowers.....	2,577.95		2,727.95	
Legal Settlements.....	3,150.73		3,277.36	
Life Insurance Premiums.....	<u>32,239.09</u>	<u>230,535.69</u>	<u>32,239.09</u>	<u>229,264.22</u>
	<b><u>\$1,885,553.48</u></b>		<b><u>\$1,946,273.60</u></b>	

## RECEIPTS AND EXPENDITURES FOR 1947-1948

## RECEIPTS

Income (Investments) . . . . .	\$50,658.05
Interest (Loans) . . . . .	7,290.60
Net Gain on Sales of Securities . . . . .	1,548.10
Class of 1895 Memorial Fund . . . . .	1,000.00
Gift . . . . .	500.00
Repayments on Loans (plus charge-offs) . . . . .	\$62,914.53
Less: Loans Made . . . . .	48,800.00
	<hr/>
	\$75,331.28

## EXPENDITURES

Deceased Borrowers.....	\$150.00
Legal Settlements.....	126.63
<b>NET INCREASE IN CASH AND INVESTMENTS.....</b>	<b>276.63</b>

# TECHNOLOGY LOAN FUND COMMITTEE

Karl T. Compton, *Chairman*

Gerard Swope  
Edwin S. Webster

Pierre S. du Pont

William C. Potter  
Horace S. Ford

## BURSAR'S STATEMENT

*To the Treasurer:*

The following principal Schedules

BALANCE SHEET	(A)
EDUCATIONAL AND ADMINISTRATIVE OPERATIONS	(B)
SURPLUS FROM OPERATIONS	(C)

together with their respective supporting schedules (A-1, B-1, etc.) have been drawn from the Institute's books of account. These summarize the financial condition of the Institute as at June 30, 1948, as well as the transactions during the year.

D. L. RHIND, *Bursar.*

W. A. HOKANSON, *Assistant Bursar.*

August 15, 1948

## SCHEDULE A

## BALANCE SHEET

JUNE 30, 1948

## INVESTMENTS

## General Investments:

U.S. Government Bonds.....	\$18,205,207.00
Other Bonds.....	1,743,730.04
Preferred Stocks.....	505,342.75
Common Stocks.....	14,290,581.83
Real Estate (including \$1,915,729.39 Campus properties) and Mortgages.....	5,381,744.42
Advances for Current Operations (per contra).....	3,922,398.55
 Total General Investments.....	 \$44,049,004.59
 Investments of Funds Separately Invested.....	 (A-2) 3,630,553.78
Students' Notes Receivable.....	(A-12) 368,282.94
 \$48,047,841.31	 <hr/>

## CURRENT AND DEFERRED ASSETS

## Cash:

For General Purposes.....	\$2,117,781.60
For Students' Safe-Keeping Deposits.....	85,579.49
 Accounts Receivable, U.S. Government and Other..(A-13)	 1,307,957.79
Contracts in Progress.....(A-14)	1,981,050.56
Inventories, Prepaid Expenses and Deferred Charges.(A-15)	923,623.36

---

\$6,415,992.80

## EDUCATIONAL PLANT

Land, Buildings and Equipment.....(A-19)	\$19,588,960.80
 \$74,052,794.91	 <hr/>

## SCHEDULE A

## BALANCE SHEET

JUNE 30, 1948

## INVESTED FUNDS

## Endowment Funds — Income Available:

For General Purposes.....	(A-3)	\$26,767,620.27
For Designated Purposes.....	(A-4)	8,010,250.92
Student Loan Funds.....	(A-5)	2,069,099.36
Building Funds — Principal and Income Available.....	(A-6)	2,532,956.58
Other Invested Funds — Principal and Income Available:		
For General Purposes.....	(A-7)	643,154.26
For Designated Purposes.....	(A-8)	3,633,935.46
Unexpended Balances of Endowment Fund Income for		
Designated Purposes.....	(A-4)	978,711.97
Deposits and Advances Held for Investment.....	(A-9)	523,056.47
Conditional Gifts, Income not yet available.....	(A-10)	396,433.52
Accumulated Net Gain on General Investments.....	(A-11)	2,492,622.50
		<hr/>
		\$48,047,841.31

## CURRENT LIABILITIES, FUNDS AND SURPLUS

Advances from Invested Funds (per contra).....		\$3,922,398.55
Accounts Payable and Accrued Wages.....		559,586.94
Students' Advance Fees and Deposits.....	(A-16)	199,573.92
Students' Safe-Keeping Deposits.....		85,579.49
Federal Tax Withholdings, Savings Bond and Other		
Deposits.....	(A-17)	334,476.32
Total Current Liabilities.....		\$5,101,615.22

## Unexpended Balances for Designated Purposes:

Investment Income not Distributed to Funds (Page 175)		416.12
Gifts and Other Receipts for Current Expenses — not		
invested (including \$183,933.39 unexpended balances of		
appropriated income).....	(A-18)	1,335,080.31
Surplus from Operations (Deficit).....	(Schedule C)	21,118.85
		<hr/>
		\$6,415,992.80

## EDUCATIONAL PLANT CAPITAL

Endowment for Educational Plant.....	(A-20)	\$19,588,960.80
		<hr/>
		\$74,052,794.91



## SCHEDULE B

STATEMENT OF INCOME AND EXPENSE FOR YEAR ENDED  
JUNE 30, 1948

## EXPENSES

## EDUCATIONAL AND GENERAL

## ACADEMIC EXPENSES

Salaries and Wages.....(B-5)	\$3,833,238.32
Departmental Expenses (including research expenses of academic departments).....(B-6)	1,014,999.96
Library and Museum Expenses.....(B-7)	<u>190,503.49</u>

## RESEARCH CONTRACTS

Salaries, Wages, Materials, Services and other costs directly incurred.....(B-3)	\$11,105,807.29
Administrative Expenses of Division of Industrial Cooperation.....(B-3)	<u>348,580.59</u>

## GENERAL EXPENSES

Salaries of Officers.....	\$265,977.64
Clerical and Office Expense, Administration.(B-8)	369,725.85
General Administrative Expense.....(B-9)	<u>781,661.60</u>

## PLANT OPERATION

Department of Buildings and Power.....(B-10)	\$941,593.22
Repairs, Alterations and Improvements (including approximately \$187,000 for improvements to educational plant).....(B-10)	<u>393,382.29</u>

## OTHER EXPENSES

Medical Department.....(B-11)	\$153,426.39
Undergraduate Budget Board.....(B-12)	<u>206,583.36</u>
Total Educational and General.....	\$19,605,480.00

## AUXILIARY ACTIVITIES—Dormitories, Dining Services and Housing Projects.....(B-13).....

Total Operating Expenses.....	\$20,831,408.77
Excess Income over Expenses.....(Schedule C).....	<u>204,456.82*</u>
	\$21,035,865.59

\* Of this amount \$183,933.39 represents unexpended balances of the year's appropriations from current income, reserved for future expenditure (see Schedule C).

*SCHEDULE C***SURPLUS FROM OPERATIONS (DEFICIT)****YEAR ENDED JUNE 30, 1948**

DEFICIT June 30, 1947.....	\$41,642.28
Excess of income over expenses for the year ended June 30, 1948.....	\$204,456.82
Less unexpended balances of 1947-48 appro- priations from current income:	
New student program.....	\$46,504.20
Gas Turbine Laboratory construction.....	45,852.90
Additional power supply to Building 35.....	19,979.33
Special equipment for Electrical Engineering Department.....	18,606.71
Structural Laboratory in Civil Engineering Department.....	9,965.90
1948 Alumni Register.....	8,126.97
Fund raising.....	3,714.38
Departmental research programs.....	8,957.36
For alterations and improvement of buildings and grounds.....	22,225.64
	<u>183,933.39</u>
	<u>20,523.43</u>
DEFICIT June 30, 1948.....	<u><u>\$21,118.85</u></u>

## SCHEDULE A-1

## GENERAL INVESTMENTS

## U.S. GOVERNMENT BONDS

Par Value				Book Value	Net Income <sup>1</sup>
\$3,000,000	U.S.A. Certificate of Indebt. "B".	1 1/8s	1949	\$3,000,000.00	\$2,542.47
1,000,000	U.S.A. Certificate of Indebt. "C".	1 1/8s	1949	1,000,000.00	485.87
100,000	U.S.Treasury.....	2s	1954-52	100,000.00	2,000.00
6,000,000	U.S.Treasury.....	2 1/4s	1959-56	6,120,000.00	67,440.24
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	1,002,800.00	24,300.00
1,500,000	U.S.Treasury.....	2 1/2s	1967-62	1,565,000.00	28,559.26
417,000	U.S.Savings "G".	2 1/2s	1953-56	417,000.00	10,425.00
550	U.S.Savings "F".		1957	407.00	.....
	Income from bonds sold.....				121,351.86
	<i>Total U.S.Government Bonds.....</i>			<u>\$18,205,207.00</u>	<u>\$363,548.02</u>

## MUNICIPAL AND GOVERNMENT BONDS

Income from bonds sold.....	.....	<u>\$162.67</u>
-----------------------------	-------	-----------------

## CANADIAN BONDS

Income from bonds sold.....	.....	<u>\$6,000.00</u>
-----------------------------	-------	-------------------

## PUBLIC UTILITY AND OTHER BONDS

\$250,000	American & For.Pr.	5s	2030	\$246,478.00	\$12,500.00
200,000	Am.Tel.&Tel.....	2 3/4s	1975	200,000.00	5,500.00
100,000	Florida Pr. & Lt...	3 1/2s	1974	103,400.00	3,300.00
198,000	PugetSoundPr.&Lt.	4 1/4s	1972	203,200.00	8,215.00
96,000	Ry. and Light Sec.	3 1/4s	1955	96,000.00	3,120.00
	Income from bonds sold or called...				9,590.47
	<i>Total Public Utility and other bonds</i>			<u>\$849,078.00</u>	<u>\$42,225.47</u>

<sup>1</sup>Net after premium amortization

## SCHEDULE A-I -- (Continued)

## RAILROAD BONDS

<i>Par Value</i>				<i>Book Value</i>	<i>Net Income</i>
\$100,000	Baltimore & Ohio . . .	4s	1975	\$86,985.00	\$769.00
50,000	B.&O., P., L.E. & W.Va.	4s	1980	48,643.75	2,000.00
100,000	Boston & Maine . . . .	5s	1955	90,000.00	5,000.00
128,000	Delaware & Hudson	4s	1963	128,000.00	5,120.00
115,000	Northern Pacific . . . .	4s	1997	105,228.29	4,600.00
180,000	Northern Pacific . . . .	4½s	1975	180,000.00	8,213.13
150,000	Southern Pacific . . . .	4½s	1981	147,787.50	6,750.00
14,000	Texas & New Orleans R.R. Co. . . . .	3¾s	1970	13,007.50	157.27
95,000	Virginian Corp. . . . .	5s	1952	95,000.00	4,750.00
	Income from bonds sold . . . . .				384.67
	<i>Total Railroad Bonds . . . . .</i>			<b>\$894,652.04</b>	<b>\$37,744.07</b>

## INDUSTRIAL PREFERRED STOCKS

<i>Shares</i>					
1,500	Railway & Light Securities . . . .	4%		\$83,250.00	\$3,000.00
	Income from stocks sold or called . . . .				1,565.52
	<i>Total Industrial Preferred Stocks . . . .</i>			<b>\$83,250.00</b>	<b>\$4,565.52</b>

## PUBLIC UTILITY PREFERRED STOCKS

1,500	N.E. Gas & Elec. Assoc.				
	Cum. Conv. . . . .	4½%		\$154,500.00	\$6,750.00
1,000	Niagara Hudson Power . . . . .	5%		95,852.27	16,250.00
1,000	Public Service N.J. . . . .	5%		101,926.84	5,000.00
	<i>Total Public Utility Preferred Stocks . . . .</i>			<b>\$352,279.11</b>	<b>\$28,000.00</b>

## RAILROAD PREFERRED STOCKS

1,000	Atch., Top. & Santa Fe . . . . .	5%		\$69,813.64	\$5,000.00
	Income from stocks sold . . . . .				4,625.00
	<i>Total Railroad Preferred Stocks . . . .</i>			<b>\$69,813.64</b>	<b>\$9,625.00</b>

## SCHEDULE A-1 — (Continued)

Shares		Book Value	Net Income
<b>INDUSTRIAL COMMON STOCKS</b>			
1,000	Allied Chemical and Dye.....	\$169,177.26	\$7,200.00
3,000	American Can.....	294,888.57	9,000.00
2,000	American Tobacco.....	153,104.11	7,500.00
3,000	Anchor Hocking Glass.....	135,915.73	6,000.00
2,600	Armstrong Cork.....	117,427.19	2,220.00
2,000	Caterpillar Tractor.....	92,194.13	6,000.00
223	Christiana Securities.....	579,374.35	33,137.80
4,000	Chrysler Corp.....	131,644.60	12,800.00
4,000	Colgate Palmolive Peet.....	201,841.32	19,400.00
1,200	Consolidated Rendering.....	72,000.00	10,800.00
2,000	Draper Corp.....	96,132.10	8,000.00
184	E.I. du Pont de Nemours.....	34,711.88	1,272.00
35,050	Eastman Kodak.....	616,495.21	56,017.50
8,950	General Electric.....	233,067.47	14,320.00
4,050	General Motors.....	148,774.46	12,150.00
1,800	General Radio.....	57,150.00	1,350.00
3,500	Gulf Oil.....	184,894.62	9,918.75
4,000	Hercules Powder.....	164,519.94	7,584.00
6,500	Humble Oil & Refining.....	227,794.10	22,150.00
6,000	Inland Steel.....	199,974.49	15,600.00
1,837	International Business Machines.....	90,863.95	6,824.00
6,000	International Harvester.....	79,912.25	10,000.00
4,850	International Nickel.....	163,067.43	8,245.00
4,000	International Paper.....	180,221.60	7,250.00
6,000	Johns Manville.....	187,886.86	8,990.00
1,600	Kennecott Copper Corp.....	73,215.72	10,975.00
2,100	Liggett & Myers Tobacco.....	157,356.14	10,500.00
3,000	Liquid Carbonic.....	53,551.11	3,000.00
200	Lithomat Corp.....	1,800.00	.....
200	Mead Johnson.....	5,100.00	200.00
3,000	Merck & Co.....	109,633.44	7,200.00
6,000	Monsanto Chemical.....	132,927.64	12,000.00
4,000	Montgomery Ward.....	261,266.32	11,750.00
3,800	National Cash Register.....	139,047.62	7,900.00
4,000	National Lead.....	118,093.64	8,000.00
2,000	National Steel.....	149,488.34	8,000.00
4,000	Owens Illinois Glass.....	235,893.92	9,750.00
5,000	J. C. Penney.....	154,666.05	9,100.00
4,200	Phillips Petroleum.....	236,778.62	11,550.00
6,000	Pittsburgh Plate Glass.....	83,197.11	10,500.00

## SCHEDULE A-I — (Continued)

Shares		Book Value	Net Income
<b>INDUSTRIAL COMMON STOCKS (Continued)</b>			
5,000	Procter & Gamble.....	\$261,143.86	\$20,000.00
2,500	St. Joseph Lead.....	109,995.10	7,500.00
6,118	Sears Roebuck.....	121,355.79	10,684.00
2,000	Sherwin Williams.....	100,988.10	6,750.00
1,700	Standard Oil, Cal.....	91,240.78	6,290.00
5,000	Standard Oil, Ind.....	177,081.20	11,875.00
8,353	Standard Oil, N. J.....	343,500.71	24,450.00
2,075	Texas Co.....	117,030.07	4,786.25
13,650	Union Carbide and Carbon.....	267,023.10	18,200.00
12,000	United Fruit.....	185,613.18	48,000.00
3,037	United Shoe Machinery.....	208,842.06	10,560.13
4,000	U. S. Plywood.....	112,990.28	3,000.00
6,000	Westinghouse Electric.....	107,827.11	7,500.00
	Income from stocks sold.....		1,116.50
	<i>Total Industrial Common Stocks.....</i>	<u>\$8,729,680.63</u>	<u>\$604,865.93</u>
<b>PUBLIC UTILITY COMMON STOCKS</b>			
7,500	Am. Gas & Elec.....	\$303,501.96	\$17,858.70
1,460	American Tel. & Tel.....	189,406.96	12,937.50
4,060	Boston Edison.....	146,849.74	9,636.00
2,500	Cleveland Electric Illuminating.....	108,125.00	5,250.00
8,075	Commonwealth Edison.....	230,222.21	11,226.25
2,750	Pacific Gas & Electric.....	107,089.91	3,750.00
	Income from stock sold.....		45.00
	<i>Total Public Utility Common Stocks..</i>	<u>\$1,085,195.78</u>	<u>\$60,703.45</u>
<b>RAILROAD COMMON STOCKS</b>			
2,000	Atch., Top. & Santa Fe.....	\$180,079.31	\$12,000.00
2,000	Great Northern.....	95,877.13	6,000.00
1,600	Norfolk & Western.....	58,542.78	6,200.00
	Income from stock sold.....		249.75
	<i>Total Railroad Common Stocks.....</i>	<u>\$334,499.22</u>	<u>\$24,449.75</u>

## SCHEDULE A-I — (Continued)

Shares		Book Value	Net Income
<b>BANK AND FINANCE STOCKS</b>			
3,750	Bankers Trust, N. Y. ....	\$189,613.75	\$6,750.00
1,000	Bond Investment Trust of America..	101,620.00	4,150.00
2,000	Central Hanover Bk. & Tr., N.Y. ....	233,650.00	8,000.00
5,000	Chase National, N. Y. ....	261,212.50	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
1,147	Guaranty Trust, N. Y. ....	320,644.04	13,710.00
667	Harris Trust & Savings, Chicago. ....	146,587.00	8,004.00
2,200	Lincoln Rochester Trust. ....	102,800.00	4,100.00
5,800	National City, N. Y. ....	252,022.08	9,280.00
100	New England Trust, Boston. ....	40,000.00	3,000.00
6,000	Railway & Light Securities. ....	105,750.00	7,800.00
	Income from stocks sold. ....	.....	1,000.00
	<i>Total Bank and Finance Stocks</i> ....	<u>\$2,421,832.08</u>	<u>\$101,552.50</u>

## INSURANCE AND OTHER STOCKS

2,500	Boston. ....	\$162,915.80	\$5,612.50
3,000	Continental Casualty. ....	156,112.50	1,200.00
1,700	Continental Insurance. ....	68,383.05	3,400.00
2,550	Fireman's Fund. ....	204,450.00	7,650.00
2,450	Hartford. ....	157,303.85	6,025.00
3,500	Insurance Co. of North America. ....	212,146.66	10,500.00
7,500	National Union. ....	248,437.51	9,125.00
2,500	Phoenix. ....	194,179.60	7,250.00
1,700	Standard Accident Ins. Co. ....	51,000.00	616.25
2,700	U.S. Fidelity & Guaranty. ....	134,937.50	675.00
1,000	Stone & Webster, Inc. ....	29,507.65	1,500.00
4,000	American Research & Dev. Corp. ....	100,000.00	.....
	<i>Total Insurance and Other Stocks</i> ....	<u>\$1,719,374.12</u>	<u>\$53,553.75</u>

## SCHEDULE A-1 — (Continued)

## REAL ESTATE

	Book Value	Net Income <sup>1</sup>
111 Bay State Road, Boston .....	\$18,200.00	\$728.00
120 Bay State Road, Boston .....	31,512.75	314.16
Franklin Street, Boston .....	150,000.00	7,015.72
80 Memorial Drive, Cambridge .....	920,917.12	35,579.67
100 Memorial Drive, Cambridge (c) .....	153,510.85	8,271.06
333 Memorial Drive, Cambridge (c) .....	40,000.00	1,224.75
565 Memorial Drive, Cambridge (c) .....	200,560.50	8,022.00
Main and Vassar Sts., Cambridge (c) .....	47,500.00	.....
New Senior Dormitory (c) (see Schedule A-19) .....	345,016.98	.....
211 Massachusetts Avenue, Cambridge .....	119,253.38	5,318.00
Graduate House, Cambridge (c) .....	649,048.46	.....
Bexley Hall, Cambridge .....	164,004.80	7,592.35
Westgate, Veterans Housing (c) .....	479,492.60	5,002.71
Gloversville, N. Y. ....	217,971.39*	10,955.04
Harrisonburg, Va. ....	30,814.12	1,495.00
New Bedford, Mass. ....	42,917.51	2,736.33
New London, Conn. ....	248,207.79	11,889.73
Lexington, Mass. ....	55,864.00	1,651.54
Plattsburgh, N. Y. ....	199,731.59	9,125.98
Taunton, Mass. ....	203,251.94	9,225.42
Waltham, Mass. ....	194,500.00**	10,857.54
Willimantic, Conn. ....	165,659.12	7,466.23
Worcester, Mass., Main Street .....	201,064.23	9,125.38
Worcester, Mass., Federal Street .....	336,492.12	13,086.54
<i>Total Real Estate</i> .....	<u>\$5,216,091.25</u>	<u>\$147,691.53</u>

\* Not including first mortgage of \$10,100 with Connecticut Mutual Life Insurance Co.

\*\* Not including first mortgage of \$168,000 with Metropolitan Life Insurance Company.

(c) Campus properties.

<sup>1</sup>Net after amortization, including \$15,420.00 for interest on funds advanced.

## MORTGAGE NOTES

Spear and Wibird Streets, Quincy .....	\$4,150.00	\$208.75
Common Street, Belmont .....	7,250.00	340.32
Park Avenue, Arlington .....	9,709.13	447.25
Pequosett Road, Belmont .....	11,783.80	546.42
Ruby Avenue, Marblehead .....	7,500.00	348.76
Alpha Tau Omega .....	13,100.00	700.00
Beta Theta Pi .....	23,000.00	895.34
Delta Kappa Epsilon .....	25,000.00	1,375.97
Kappa Sigma .....	9,650.00	501.26
Lambda Chi Alpha .....	15,135.24	385.24
Pi Lambda Phi .....	12,500.00	662.50
Phi Gamma Delta .....	6,375.00	306.25
Phi Kappa Sigma .....	2,500.00	143.75
Phi Mu Delta .....	8,000.00	.....
Sigma Chi .....	3,500.00	175.00
Theta Chi .....	6,500.00	343.75
<i>Total Mortgage Notes</i> .....	<u>\$165,653.17</u>	<u>\$7,380.56</u>

## INVESTMENTS

199

## SCHEDULE A-1 — (Continued)

RECAPITULATION, GENERAL INVESTMENTS	Book Value	Net Income
U. S. Government Bonds.....	<u>\$18,205,207.00</u>	<u>\$363,548.02</u>
<b>Other Bonds</b>		
Municipal and Other Government.....	.....	\$6,162.67
Public Utility and Others.....	<u>\$849,078.00</u>	<u>42,225.47</u>
Railroad.....	<u>894,652.04</u>	<u>37,744.07</u>
	<u><b>\$1,743,730.04</b></u>	<u><b>\$86,132.21</b></u>
<b>Preferred Stocks</b>		
Industrial and Other.....	<u>\$83,250.00</u>	<u>\$4,565.52</u>
Public Utility.....	<u>352,279.11</u>	<u>28,000.00</u>
Railroad.....	<u>69,813.64</u>	<u>9,625.00</u>
	<u><b>\$505,342.75</b></u>	<u><b>\$42,190.52</b></u>
<b>Common Stocks</b>		
Industrial.....	<u>\$8,729,680.63</u>	<u>\$604,865.93</u>
Public Utility.....	<u>1,085,195.78</u>	<u>60,703.45</u>
Railroad.....	<u>334,499.22</u>	<u>24,449.75</u>
Bank and Finance.....	<u>2,421,832.08</u>	<u>101,552.50</u>
Insurance and Other.....	<u>1,719,374.12</u>	<u>53,553.75</u>
	<u><b>\$14,290,581.83</b></u>	<u><b>\$845,125.38</b></u>
<b>Real Estate</b> .....	<u>\$5,216,091.25</u>	<u>\$147,691.53</u>
<b>Mortgage Notes</b> .....	<u>165,653.17</u>	<u>7,380.56</u>
<b>Total General Investments</b> .....	<u>\$40,126,606.04*</u>	<u>\$1,492,068.22</u>
*Exclusive of cash advanced for Current operations.		
<b>Add:</b>		
Interest on Funds Advanced for Research Contracts (exclusive of \$15,420.00 credited to Real Estate income)		
Income of Prior Years Distributed to Funds.....		<u>128,000.00</u>
		<u>23,215.78</u>
		<u><b>\$1,643,284.00</b></u>
<b>Deduct:</b>		
Compensation of Financial Agent.....		<u>30,000.00</u>
		<u><b>\$1,613,284.00</b></u>

## SCHEDULE A-2

## INVESTMENTS OF FUNDS SEPARATELY INVESTED

Par Value or Shares		Book Value	Net Income
<b>INVESTMENTS, AVOCa FUND</b>			
2,400	General Radio.....	\$76,200.00	\$1,800.00
<b>INVESTMENTS, BABSON FUND</b>			
469	A. P. W. Products.....	\$126.10	\$58.63
80	United Stores Corp., Cum. Conv. Pfd. ....	8,034.54	480.00
80	United Stores Corp., 2d Pfd. ....	1,288.56	52.00
30	Standard Oil, Ind. ....	1,429.30	71.25
	<i>Total Babson Fund.....</i>	<u>\$10,878.50</u>	<u>\$661.88</u>
<b>INVESTMENTS, ALBERT FARWELL BEMIS FUND</b>			
	Miscellaneous building lots in Wellesley carried at.....	<u>\$11,300.00</u>	<u>.....</u>
<b>INVESTMENTS, MALCOLM COTTON BROWN FUND</b>			
\$2,500	U. S. Savings "G".....2½s 1954	\$2,500.00	\$62.50
30	General Electric.....	1,019.70	48.00
	<i>Total Brown Fund.....</i>	<u>\$3,519.70</u>	<u>\$110.50</u>
<b>INVESTMENTS, CLASS OF 1919 FUND</b>			
\$4,650	United States Savings "F" ....1956-57	\$3,441.00	.....
<b>INVESTMENTS, CLASS 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>	<u>.....</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	125.00
21,000	U. S. Savings "G" .. 2½s 1960	21,000.00	.....
5,000	Baltimore & Ohio..... 4s 1975	5,000.00	200.00
5,000	Central Pacific..... 4s 1949	4,866.66	200.00
5,000	Northern Pacific..... 4s 1997	4,598.31	200.00
5,000	Southern Pacific..... 4½s 1981	5,000.00	175.00
	Income from Bonds Sold.....		556.15
	<i>Total Draper Fund.....</i>	<u>\$104,364.97</u>	<u>\$2,803.65</u>

## SCHEDULE A-2 — (Continued)

Par Value or Shares			Book Value	Net Income
<b>INVESTMENTS, ARTHUR D. LITTLE MEMORIAL FUND</b>				
\$33,000	U. S. Treasury.....	2s 1953-51	\$33,000.00	\$660.00
20,000	U. S. Treasury.....	2s 1954-52	20,000.00	400.00
30,000	U. S. Treasury.....	2½s 1972-67	30,000.00	750.00
466	Arthur D. Little, Inc., Pfd.....		46,600.00	2,796.00
5,543	Arthur D. Little, Inc., Com.....		110,860.00	38,801.00
	<i>Total Little Fund.....</i>		<u>\$240,460.00</u>	<u>\$43,407.00</u>
<b>INVESTMENTS, RICHARD LEE RUSSEL FUND</b>				
\$1,000	Mortgage Note (participation).....		\$1,000.00	\$50.00
3,000	Mortgage.....		3,000.00	225.00
	<i>Total Russel Fund.....</i>		<u>\$4,000.00</u>	<u>\$275.00</u>
<b>INVESTMENTS, SOLAR ENERGY FUND</b>				
\$13,000	U. S. Treasury.....	2s 1951-49	\$13,000.00	\$260.00
13,000	U. S. Treasury.....	2s 1954-52	13,000.00	260.00
5,000	Godfrey L. Cabot, Inc.....		647,700.00	30,000.00
96	Columbian Carbon.....		3,408.00	201.60
153	B. F. Goodrich.....		10,662.75	612.00
574	United Carbon.....		21,920.50	1,148.00
104	Panhandle Eastern Pipe Line.....		5,733.00	234.00
	Income from Stocks Sold.....			59.50
	<i>Total Solar Energy Fund.....</i>		<u>\$715,424.25</u>	<u>\$32,775.10</u>
<b>INVESTMENTS, FRANCES E. AND SAMUEL M. WESTON FUNDS</b>				
\$6,950	Mortgage Note, Bartlett.....		<u>\$6,950.00</u>	<u>\$278.04</u>

## REPORT OF THE TREASURER

## SCHEDULE A-2 — (Continued)

Par Value or Shares					Book Value	Net Income <sup>1</sup>
INVESTMENTS, JONATHAN WHITNEY FUND						
\$401,000	U. S. Savings "G"...	2 1/2s	1954-60	\$401,000.00	\$8,275.00	
40,000	American & For. Pr...	5s	2030	37,178.70	2,000.00	
40,000	Pacific Gas & Elec..	3s	1974	41,400.00	1,150.00	
250	Boston Edison.....			8,250.00	600.00	
350	Bankers Trust, N. Y.....			16,612.50	630.00	
100	du Pont.....			15,279.10	800.00	
250	First National Bank of Boston.....			11,525.00	562.50	
500	General Electric.....			13,188.05	800.00	
66	Guaranty Trust, N. Y.....			18,087.30	792.00	
400	National City, N. Y.....			18,850.00	640.00	
307	Standard Oil, N. J.....			12,277.35	900.00	
450	United Fruit.....			10,690.25	1,800.00	
	Income from Bonds Sold.....				1,228.82	
	Total Whitney Fund.....			\$604,338.25	\$20,178.32	
INVESTMENTS, TECHNOLOGY LOAN FUND						
\$600,000	U. S. Savings "G"...	2 1/2s	1954-60	\$600,000.00	\$12,500.00	
100,000	U. S. Treasury.....	2s	1953-51	100,000.00	2,000.00	
96,000	U. S. Treasury.....	2 1/4s	1962-59	96,000.00	2,160.00	
80,000	U. S. Treasury.....	2 1/2s	1958-56	80,000.00	2,000.00	
80,000	U. S. Treasury.....	2 1/2s	1954	80,000.00	1,500.00	
35,000	American Tel. & Tel. ....	2 3/4s	1980	35,000.00	962.50	
20,000	New Orleans Pub. Serv. ....	3 1/8s	1974	20,000.00	625.00	
15,000	Pacific Gas & Elec..	3s	1974	15,000.00	450.00	
450	American Can.....			36,089.83	900.00	
1,000	Cleveland Electric Illuminating.....			39,637.47	2,290.00	
200	du Pont.....			29,304.00	1,600.00	
207	Engineers Pub. Serv., Pfd. ....			1.00	281.52	
1,000	General Electric.....			25,813.25	1,600.00	
177	Guaranty Trust, N. Y.....			50,333.82	2,124.00	
625	Gulf Oil.....			32,630.80	1,668.75	
1,000	National Cash Register.....			38,458.96	2,300.00	
1,100	National City, N. Y.....			40,650.00	1,760.00	
1,000	North American.....			21,842.40	1,000.00	
500	Procter & Gamble.....			29,511.45	2,000.00	
615	Standard Oil, N. J.....			24,862.79	1,800.00	
1,250	Stone & Webster, Inc. ....			36,698.75	1,875.00	
1,200	Union Carbide and Carbon .....			27,726.00	1,600.00	
900	United Fruit.....			21,360.20	3,600.00	
400	Hartford Fire Insurance of Conn. ....			44,725.00	.....	
450	Phoenix Insurance.....			38,293.75	.....	
	Income from Bonds and Stocks Sold..				1,761.28	
	Total Technology Loan Fund.....			\$1,563,939.47	\$50,658.05	

<sup>1</sup> Net after Premium Amortization

## SCHEDULE A-2 — (Continued)

Par Value or Shares			Book Value	Net Income <sup>1</sup>
	INVESTMENTS, JOSEPH HEWETT FUND			
\$10,000	U. S. Savings "G" . . .	2 1/2s 1958	\$10,000.00	\$250.00
50,000	U. S. Savings "G" . . .	2 1/2s 1954	50,000.00	1,250.00
15,000	Alabama Power . . .	3 1/2s 1972	15,000.00	525.00
15,000	Puget Sound Pr.&Lt. . .	4 1/4s 1972	15,175.00	612.50
12,000	Baltimore & Ohio . . .	4s 1975	12,000.00	480.00
10,000	Northern Pacific . . .	4s 1997	10,525.00	375.00
10,000	Southern Pacific . . .	4 1/2s 1981	10,270.00	420.00
12,000	Texas & New Orleans . . .	3 3/8s 1990	12,000.00	405.00
120	Bankers Trust, N. Y. . . . .		4,775.00	216.00
22	Guaranty Trust, N. Y. . . . .		5,078.70	264.00
50	Phoenix Insurance . . . . .		3,750.00	150.00
100	American Can . . . . .		7,520.00	300.00
50	du Pont . . . . .		8,271.55	400.00
300	General Electric . . . . .		8,107.50	480.00
150	National Cash Register . . . . .		5,428.99	375.00
200	Standard Oil, Ind. . . . .		9,498.65	475.00
205	Standard Oil, N. J. . . . .		8,177.60	600.00
300	Union Carbide and Carbon . . . . .		6,944.20	400.00
300	United Fruit . . . . .		7,120.00	1,200.00
	<i>Total Hewett Fund</i> . . . . .		<u>\$209,642.19</u>	<u>\$9,177.50</u>
	INVESTMENTS, GEORGE S. WITMER FUND			
\$9,800	U. S. Savings "G" . . .	2 1/2s 1945-59	\$9,800.00	\$195.00
5,000	Atlantic Coast Line . . .	4s 1952	4,854.44	200.00
3,000	Capital Transit . . .	4s 1964	3,000.00	120.00
4,000	Central Pacific . . .	4s 1949	4,000.00	135.00
5,000	Northern Pacific . . .	4s 1997	4,903.79	200.00
4,000	Southern Pacific . . .	4 1/2s 1981	3,942.68	180.00
50	Electric Power & Light 6% Pfd. . .		3,550.00	300.00
150	Commonwealth Edison . . . . .		5,082.43	210.00
121	Pacific Gas & Electric . . . . .		5,011.43	165.00
50	General Electric . . . . .		1,718.25	80.00
25	General Motors . . . . .		1,310.96	75.00
100	R. J. Reynolds Tobacco . . . . .		4,200.00	175.00
43	Standard Oil, Ind. . . . .		1,967.70	102.14
41	Standard Oil, N. J. . . . .		1,706.32	120.00
90	Union Carbide and Carbon . . . . .		2,051.85	120.00
65	Bankers Trust, N. Y. . . . .		3,071.50	117.00
15	Continental Ill.Nat. Bank, Chicago . . .		1,387.50	60.00
22	Guaranty Trust, N. Y. . . . .		5,920.20	264.00
	Real Estate, Sanford, Fla. . . . .		4,675.90	292.98
	Income from Bonds Sold . . . . .			99.48
	Income from Stocks Sold . . . . .			75.00
	<i>Total Witmer Fund</i> . . . . .		<u>\$72,154.95</u>	<u>\$3,285.60</u>
	<i>Total of Investments of Funds Separately Invested</i> . . . . .		<u>\$3,630,553.78</u>	<u>\$165,410.64</u>
	<i>Total General and Special Investments</i> . . . . .		<u>\$43,757,159.82*</u>	<u>\$1,778,694.64</u>

(Schedule A) (Schedule B)

\* Excluding Cash Advanced for Current Operations and Students' Notes Receivable.

1 Net after Premium Amortization.

## REPORT OF THE TREASURER

SCHEDULE A-3  
ENDOWMENT FUNDS

## INCOME FOR GENERAL PURPOSES

		PRINCIPAL			Balance, June 30, 1948
		Balance, June 30, 1947	Gifts and Other Receipts	Expended or Transferred	
101	George Robert Armstrong.....	\$5,000.00	.....	.....	\$5,000.00
103	George Blackburn Memorial .....	961,249.84	\$780.38	.....	962,030.22
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
111	Eben S. Draper.....	105,260.01	2,225.40	.....	107,485.41
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	.....	.....	299,650.64
129	Alexis H. French.....	5,000.00	.....	.....	5,000.00
131	Jonathan French.....	25,212.48	.....	.....	25,212.48
133	Henry C. Frick.....	1,831,053.42	377,429.50	.....	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
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
153	Richard Perkins.....	50,000.00	.....	.....	50,000.00
155	J. W. and B. L. Randall.....	83,452.36	.....	.....	83,452.36
157	William Barton Rogers Memorial.....	250,225.00	.....	.....	250,225.00
159	Saltonstall Fund.....	67,560.87	676.00(1)	.....	68,236.87
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
169	William J. Walker.....	23,613.59	.....	.....	23,613.59
171	Horace Herbert Watson.....	36,057.19	.....	.....	36,057.19
173	Albion B. K. Welch.....	5,000.00	.....	.....	5,000.00
175	Everett Westcott.....	171,394.00	.....	.....	171,394.00
177	Marion Westcott.....	242,802.00	1,350.00	.....	244,152.00
179	George Wigglesworth.....	26,659.65	106.80(2)	.....	26,766.45
181	Edwin A. Wyeth.....	254,703.94	.....	.....	254,703.94
<b>Totals.....</b>		<b>\$26,385,052.19</b>	<b>\$382,568.08</b>	.....	<b>\$26,767,620.27</b>

(1) One-fourth net income to Fund.

(2) One-tenth net income to Fund.

(Schedule A)

**ENDOWMENT FUNDS**  
**INCOME FOR GENERAL PURPOSES**

<b>INCOME AND EXPENDITURES</b>					<i>Unexpended Balance June 30, 1948</i>
<i>Unexpended Balance June 30, 1947</i>	<i>Investment Income</i>	<i>Other Income</i>	<i>Expended</i>	<i>Transferred</i>	
.....	\$200.00	.....	\$200.00	.....	.....
.....	38,480.00	.....	38,480.00	.....	.....
.....	500.00	.....	500.00	.....	.....
.....	688.00	.....	688.00	.....	.....
.....	1,436.00	.....	1,436.00	.....	.....
.....	2,803.65	.....	2,803.65	.....	.....
.....	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	.....	.....
.....	11,988.00	.....	11,988.00	.....	.....
.....	200.00	.....	200.00	.....	.....
.....	1,008.00	.....	1,008.00	.....	.....
.....	78,456.00	.....	78,456.00	.....	.....
.....	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	.....	.....
.....	600.00	.....	600.00	.....	.....
.....	1,000.00	.....	1,000.00	.....	.....
.....	1,000.00	.....	1,000.00	.....	.....
.....	2,000.00	.....	2,000.00	.....	.....
.....	3,340.00	.....	3,340.00	.....	.....
.....	10,008.00	.....	10,008.00	.....	.....
.....	2,704.00	.....	2,028.00	\$676.00	.....
.....	192.00	.....	192.00	.....	.....
.....	2,000.00	.....	2,000.00	.....	.....
.....	188.00	.....	188.00	.....	.....
.....	1,004.00	.....	1,004.00	.....	.....
.....	.944.00	.....	.944.00	.....	.....
.....	1,444.00	.....	1,444.00	.....	.....
.....	200.00	.....	200.00	.....	.....
.....	6,856.00	.....	6,856.00	.....	.....
.....	9,736.00	.....	9,736.00	.....	.....
.....	1,068.00	.....	961.20	106.80	.....
.....	10,188.00	.....	10,188.00	.....	.....
.....	<u>\$1,059,275.65</u>	.....	<u>\$1,058,492.85</u>	<u>\$782.80</u>	.....

## REPORT OF THE TREASURER

SCHEDULE A-4  
ENDOWMENT FUNDS  
INCOME FOR DESIGNATED PURPOSES

		PRINCIPAL			
	DEPARTMENTS AND RESEARCH	Balance, June 30, 1947	Gifts and Other Receipts	Expended or Transferred	
201	William Parsons Atkinson (English).....	\$13,082.20	.....	.....	\$13,082.20
203	Albert Farwell Bemis (Bemis Foundation)....	308,768.00	.....	.....	308,768.00
205	Frank Walter Boles Memorial (Architecture)...	25,200.00	.....	.....	25,200.00
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
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.)	157,460.00	.....	.....	157,460.00
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).....	.....	5,000.00	.....	5,000.00
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).....	179,538.17	.....	.....	179,538.17
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).....	647,700.00	.....	.....	647,700.00
255	Edmund K. Turner (Civil Engineering).....	285,615.26	2,821.00(1)	.....	288,436.26
257	William R. Ware (Architecture).....	15,000.00	.....	.....	15,000.00
		<b>\$2,821,324.98</b>	<b>\$12,821.00</b>	.....	<b>\$2,834,145.98</b>
LIBRARY					
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
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 Tod.....	2,500.00	.....	.....	2,500.00
277	Theodore N. Vail Memorial.....	67,506.27	.....	.....	67,506.27
		<b>\$122,006.27</b>	.....	.....	<b>\$122,006.27</b>

(1) One-fourth net income carried to Fund.

**ENDOWMENT FUNDS**  
**INCOME FOR DESIGNATED PURPOSES**

<b>INCOME AND EXPENDITURES</b>					
<i>Unexpended Balance June 30, 1947</i>	<i>Investment Income</i>	<i>Other Income</i>	<i>Expended</i>	<i>Transferred</i>	<i>Unexpended Balance June 30, 1948</i>
.....	\$512.00	.....	\$512.00	.....	.....
\$47,535.35	14,048.00	.....	9,548.33	.....	\$52,035.02
12,141.80	1,488.00	.....	1,578.66	.....	12,051.14
8,000.20	2,328.00	.....	2,500.00	.....	8,028.20
.....	276.00	.....	259.05	.....	16.95
458.69	84.00	.....	84.00	.....	458.69
.....	3,840.00	.....	3,840.00	.....	.....
.....	16,000.00	.....	16,000.00	.....	.....
887.23	416.00	.....	1,000.00	.....	303.23
.....	32.00	.....	.....	.....	32.00
4,013.78	3,028.00	.....	5,760.00	.....	1,281.78
13,774.47	3,156.00	.....	2,700.00	\$675.00	13,555.47
114,444.42	43,407.00	.....	20,000.00	5,156.20	132,695.22
.....	200.00	.....	200.00	.....	.....
956.25	208.00	.....	.....	.....	1,164.25
1,378.88	256.00	.....	256.00	.....	1,378.88
.....	15,788.00	.....	15,788.00	.....	.....
.....	100.00	.....	.....	.....	100.00
10,385.52	980.00	.....	2,000.00	.....	9,365.52
22,753.78	2,112.00	.....	2,112.00	.....	22,753.78
.....	7,176.00	.....	118.80	.....	7,057.20
.....	80.00	.....	80.00	.....	.....
.....	1,000.00	.....	1,000.00	.....	.....
46,810.39	32,775.10	.....	11,874.99	16,978.34	50,732.16
.....	11,284.00	.....	8,463.00	2,821.00	.....
788.57	624.00	.....	571.07	.....	841.50
<b>\$284,529.33</b>	<b>\$161,198.10</b>	.....	<b>\$106,245.90</b>	<b>\$25,630.54</b>	<b>\$313,850.99</b>

\$562.59	\$420.00	.....	\$350.00	.....	\$632.59
1,584.95	852.00	.....	700.00	.....	1,736.95
891.35	236.00	.....	180.00	.....	947.35
2,583.90	180.00	.....	140.00	.....	2,623.90
3,026.80	520.00	.....	400.00	.....	3,146.80
2,197.69	292.00	\$277.44	240.00	.....	2,527.13
1,382.54	156.00	.....	100.00	.....	1,438.54
3,015.06	2,820.00	.....	2,265.49	\$134.51	3,435.06
<b>\$15,244.88</b>	<b>\$5,476.00</b>	<b>\$277.44</b>	<b>\$4,375.49</b>	<b>\$134.51</b>	<b>\$16,488.32</b>

## REPORT OF THE TREASURER

## SCHEDULE A-4—(Continued)

## ENDOWMENT FUNDS

## INCOME FOR DESIGNATED PURPOSES — (Continued)

		PRINCIPAL			
		Balance, June 30, 1947	Gifts and Other Receipts	Expended or Transferred	Balance, June 30, 1948
	SALARIES				
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.....	300,000.00	.....	.....	300,000.00
295	Nathaniel Thayer.....	25,000.00	.....	.....	25,000.00
297	Elihu Thomson.....	23,680.87	.....	.....	23,680.87
		\$468,332.18	.....	.....	\$468,332.18

## GRADUATE SCHOLARSHIPS AND FELLOWSHIPS

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
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.....	518,000.00	168.00	.....	518,168.00
		\$1,692,169.73	\$7,068.00	.....	\$1,699,237.73

## ENDOWMENT FUNDS

**INCOME FOR DESIGNATED PURPOSES — (Continued)**

## REPORT OF THE TREASURER

## SCHEDULE A-4—(Continued)

## ENDOWMENT FUNDS

## INCOME FOR DESIGNATED PURPOSES—(Continued)

PRINCIPAL				
		Balance, June 30, 1947	Gifts and Other Receipts	Expended or Transferred
				Balance June 30, 1948
<b>UNDERGRADUATE SCHOLARSHIPS</b>				
351	Louie G. Applebee.....	\$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.....	35,890.37	\$1,510.12(1)	.....
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.....	571,414.49	277.76	571,692.25
371	Harriet L. Brown.....	6,024.79	.....	6,024.79
373	Mabel Blake Case.....	25,000.00	.....	25,000.00
375	Nino Tesher Catlin.....	2,265.07	.....	2,265.07
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
383	Class of 1909.....	3,918.58	504.80	4,423.38
385	Class of 1922.....	20,385.88	115.00	20,500.88
387	Class of 1922, Special.....	4,800.00	.....	4,800.00
389	Class of 1938.....	900.29	61.53	961.82
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.....	138,081.62	15,328.16	153,409.78
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
407	Isaac W. Danforth.....	5,000.00	.....	5,000.00
409	Ann White Dickinson.....	40,000.00	.....	40,000.00
411	Dormitory Fund.....	2,857.10	.....	2,857.10
413	Thomas Messinger 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.....	75,396.43	902.24	76,298.67
435	James H. Haste.....	241,074.18	.....	241,074.18

<sup>1</sup>One-half net income to fund.

## ENDOWMENT FUNDS

## INCOME FOR DESIGNATED PURPOSES — (Continued)

INCOME AND EXPENDITURES					
Unexpended Balance: June 30, 1947	Investment Income	Other Income	Expended	Transferred	Unexpended Balance June 30, 1948
\$92.37	\$20.00	.....	.....	.....	\$112.37
93.08	200.00	.....	\$175.00	.....	118.08
215.89	92.00	.....	100.00	.....	207.89
3,839.74	1,584.00	.....	250.00	\$1,510.12	3,663.62
698.24	1,992.00	.....	1,700.00	.....	990.24
157.50	264.00	.....	150.00	.....	271.50
282.15	404.00	.....	350.00	.....	336.15
132.10	400.00	.....	350.00	.....	182.10
101,732.03	26,760.00	.....	8,518.62	.....	119,973.41
342.96	256.00	.....	.....	.....	598.96
817.34	1,016.00	.....	800.00	.....	1,933.34
121.96	96.00	.....	.....	.....	217.96
278.72	204.00	.....	175.00	.....	307.72
.....	1,000.00	.....	.....	1,000.00	.....
4,614.31†	400.00	.....	.....	.....	5,014.31†
1,084.91	208.00	.....	.....	.....	1,292.91
1,479.01	1068.00	.....	5.38	.....	2,541.63
.....	.....	.....	.....	.....	.....
240.64	48.00	.....	.....	.....	288.64
210.26	204.00	.....	150.00	.....	264.26
6,123.23	1,656.00	.....	1,400.00	.....	6,379.23
12,411.20	6,548.00	.....	1,600.00	.....	17,359.20
1,777.89	1,056.00	.....	700.00	.....	2,133.89
349.58	152.00	.....	100.00	.....	401.58
29,350.77	3,172.00	.....	1,300.00	.....	31,222.77
212.48	204.00	.....	150.00	.....	266.48
378.38	1,588.00	.....	1,400.00	.....	566.38
1.32	116.00	.....	.....	.....	117.32
738.84	1,996.00	.....	1,700.00	.....	1,034.84
3,413.85†	4,060.00	.....	2,850.00	.....	4,623.85†
295.84	208.00	.....	150.00	.....	353.84
128.22	204.00	.....	100.00	.....	232.22
76.50	140.00	.....	100.00	.....	116.50
92.50	44.00	.....	.....	.....	136.50
6,070.18	3,756.00	.....	3,300.00	.....	6,526.18
775.25	432.00	.....	.....	.....	1,207.25
379.75	408.00	.....	350.00	.....	437.75
778.50	2,172.00	.....	1,750.00	.....	1,200.50
1,175.80	3,028.00	.....	2,500.00	.....	1,703.80
24,381.23	10,440.00	.....	9,000.00	.....	25,821.23

†Includes students' notes receivable.

## REPORT OF THE TREASURER

## SCHEDULE A-4—(Continued)

## ENDOWMENT FUNDS

## INCOME FOR DESIGNATED PURPOSES—(Continued)

		PRINCIPAL			
		Balance, June 30, 1947	Gifts and Other Receipts	Expended or Transferred	Balance June 30, 1948
	UNDERGRADUATE SCHOLARSHIPS (Continued)				
437	Charles Hayden Memorial.....	\$100,000.00	.....	.....	\$100,000.00
439	Charles Hayden Memorial, Special.....	.....	.....	.....	.....
441	George Hollingsworth.....	5,000.00	.....	.....	5,000.00
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
455	Amelia S. Kneisner.....	14,000.00	\$2,000.00	.....	16,000.00
457	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
465	M. I. T. Club of Chicago.....	6,000.00	355.00	.....	6,355.00
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
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.....	2,500.00	.....	.....	2,500.00
493	Charles A. Richards.....	31,719.32	.....	.....	31,719.32
495	John Roach.....	6,290.20	.....	.....	6,290.20
496	William B. Rogers.....	36,499.83	5.00	.....	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	.....	.....	600.01
511	Anna Spooner.....	10,896.14	.....	.....	10,896.14
513	Samuel E. Tinkham.....	2,338.16	.....	.....	2,338.06
515	F. B. Tough.....	465.00	.....	.....	465.00

## ENDOWMENT FUNDS

## INCOME FOR DESIGNATED PURPOSES—(Continued)

## INCOME AND EXPENDITURES

Unexpended Balance June 30, 1947	Investment Income	Other Income	Expended	Transferred	Unexpended Balance June 30, 1948
\$12,230.86	\$4,608.00	\$7,500.00	\$5,200.00	.....	\$19,138.86
105.73	200.00	.....	150.00	.....	155.73
267.25	308.00	.....	200.00	.....	375.25
47.76	120.00	.....	100.00	.....	67.76
256.08	208.00	.....	150.00	.....	314.08
2,371.99	1,076.00	.....	900.00	.....	2,547.99
127.50	1,656.00	.....	.....	.....	1,783.50
9,403.35	668.00	.....	350.00	.....	9,721.35
534.75	612.00	.....	450.00	.....	696.75
204.91	204.00	.....	200.00	.....	208.91
105.88	200.00	.....	150.00	.....	155.88
1,291.89	144.00	.....	100.00	.....	1,335.89
424.23	92.00	.....	150.00	.....	366.23
810.25	280.00	.....	350.00	.....	740.25
1,522.50	4,528.00	.....	.....	.....	6,050.50
10,234.13†	520.00	.....	.....	.....	10,754.13
1,090.75	3,028.00	.....	2,400.00	.....	1,718.75†
119.48	104.00	.....	100.00	.....	123.48
164.80	88.00	.....	.....	.....	252.80
92.77	200.00	.....	200.00	.....	92.77
291.40	208.00	.....	150.00	.....	349.40
334.88	208.00	.....	200.00	.....	342.88
.....	692.00	.....	600.00	.....	92.00
.....	1,724.00	.....	.....	.....	1,724.00
591.21	1,992.00	.....	1,750.00	.....	833.21
284.50	316.00	.....	250.00	.....	350.50
225.42	844.00	.....	500.00	.....	569.42
110.00	104.00	.....	110.00	.....	104.00
570.22	1,268.00	.....	1,100.00	.....	738.22
337.51	256.00	.....	100.00	.....	493.51
16,064.98†	2,036.00	.....	.....	.....	18,100.98
1,841.34†	208.00	.....	.....	.....	2,049.34†
2,071.01	1,804.00	.....	1,500.00	.....	2,375.01†
.....	32.00	.....	.....	.....	32.00†
.....	400.00	.....	.....	.....	400.00
548.48	216.00	.....	300.00	.....	464.48
501.25	416.00	.....	250.00	.....	667.25
2,612.54	1,420.00	.....	350.00	.....	3,682.54
185.88	32.00	.....	.....	.....	217.88
247.12	440.00	.....	350.00	.....	337.12
254.70	100.00	.....	100.00	.....	254.70
399.64	36.00	.....	.....	.....	435.64

†Includes students' notes receivable.

## REPORT OF THE TREASURER

## SCHEDULE A-4—(Continued)

## ENDOWMENT FUNDS

## INCOME FOR DESIGNATED PURPOSES—(Continued)

		PRINCIPAL			
		Balance, June 30, 1947	Gifts and Other Receipts	Expended or Transferred	Balance, June 30, 1948
	UNDERGRADUATE SCHOLARSHIPS (Continued)				
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
		\$2,730,716.42	\$85,590.79	.....	\$2,816,307.21

## PRIZES

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
557	William Emerson.....	2,145.00	.....	.....	2,145.00
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
569	Henry Webb Salisbury.....	1,000.00	.....	.....	1,000.00
571	Samuel W. Stratton.....	1,880.00	.....	.....	1,880.00
		\$34,222.00	.....	.....	\$34,222.00

## MISCELLANEOUS

575	Ednah Dow Cheney.....	\$13,921.66	\$43.50	.....	\$13,965.16
577	Jacob and Jennie Lichten.....	5,474.75	5,000.00	.....	10,474.75
579	Edward F. and Mary R. Miller.....	10,000.00	.....	.....	10,000.00
581	Alice Brown Tyler.....	1,559.64	.....	.....	1,559.64
		\$30,956.05	\$5,043.50	.....	\$35,999.55
	Totals.....	\$7,899,727.63	\$110,523.29	.....	\$8,010,250.92

(Schedule A)

## ENDOWMENT FUNDS

## INCOME FOR DESIGNATED PURPOSES — (Continued)

INCOME AND EXPENDITURES					
Unexpended Balance, June 30, 1947	Investment Income	Other Income	Expended	Transferred	Unexpended Balance, June 30, 1948
\$134.00	\$44.00	.....	.....	.....	\$178.00
45.35	44.00	.....	.....	.....	89.35
3,363.05	1,116.00	.....	\$900.00	.....	3,579.05
.....	2,388.00	.....	2,100.00	.....	288.00
59.09	388.00	.....	300.00	.....	147.09
1,064.75	2,204.00	.....	1,850.00	.....	1,418.75
476.30	544.00	.....	450.00	.....	570.30
167.36	160.00	.....	150.00	.....	177.36
3,398.85	335.02	.....	.....	.....	3,733.87
622.86	219.02	.....	200.00	.....	641.88
85.37	184.00	.....	100.00	.....	169.37
493.48	224.00	.....	.....	.....	717.48
5,139.53	2,820.00	.....	2,380.00	.....	5,579.53
<b>\$289,273.45</b>	<b>\$121,862.04</b>	<b>\$7,500.00</b>	<b>\$68,364.00</b>	<b>\$2,510.12</b>	<b>\$347,761.37</b>

\$2,422.32	\$661.88	.....	.....	.....	\$3,084.20
1,510.91	260.00	.....	.....	.....	1,770.91
320.71	32.00	.....	.....	.....	352.71
391.95	100.00	.....	\$20.00	.....	471.95
.....	40.00	.....	25.00	.....	15.00
1,409.13	164.00	.....	100.00	.....	1,473.13
3,490.97	340.00	.....	.....	.....	3,830.97
8,892.63	556.00	.....	.....	.....	9,448.63
321.64	52.00	.....	.....	.....	373.64
.....	72.00	.....	72.00	.....	.....
<b>\$18,760.26</b>	<b>\$2,277.88</b>	<b>.....</b>	<b>\$217.00</b>	<b>.....</b>	<b>\$20,821.14</b>

\$3,926.65	\$672.00	.....	\$2,386.48	.....	\$2,212.17
.....	320.00	.....	.....	.....	320.00
2,046.40	480.00	.....	.....	.....	2,526.40
483.63	80.00	.....	10.00	.....	553.63
<b>\$6,456.68</b>	<b>\$1,552.00</b>	<b>.....</b>	<b>\$2,396.48</b>	<b>.....</b>	<b>\$5,612.20</b>
<b>\$888,293.29</b>	<b>\$384,017.84</b>	<b>\$14,077.44</b>	<b>\$278,351.43</b>	<b>\$29,325.17</b>	<b>\$978,711.97</b>

(Schedule A)

## REPORT OF THE TREASURER

SCHEDULE A-5  
STUDENT LOAN FUNDS

		Balance, June 30, 1947	Gifts and Other Receipts
582	Bursar's.....	\$34,891.94†	\$70.44
583	Class of 1898.....	13,049.58	.....
585	Dean's.....	11,531.90†	68.22
587	Dennett, Carl P.....	1,927.83†	11.00
589	George, Nathan R.....	33,090.12	.....
591	Lamson-Virgin.....	8,231.50	2,000.00
592	Medical Department.....	5,269.47†	.....
593	Rogers, Minnie Hempel.....	1,271.54	.....
595	Summer Surveying Camp.....	2,893.72†	.....
597	Technology Loan.....	1,885,553.48†	9,338.70
598	William H. Timbie.....	.....	4,860.50
<i>Totals.....</i>		<u>\$1,997,711.08</u>	<u>\$16,348.86</u>

SCHEDULE A-6  
BUILDING FUNDS

## PRINCIPAL AND INCOME AVAILABLE

601	Arthur J. Conner.....	\$32,809.76	\$175,821.62
603	George Eastman.....	74,281.21	.....
605	Matilda A. Fraser.....	1,023.98	.....
607	Gas Turbine Laboratory.....	213,552.00	.....
609	Charles Hayden Memorial Library.....	2,295,490.00	.....
611	Hydrodynamics Laboratory and Towing Tank.....	37,485.06	8,485.42
613	Library Building.....	1,051.50	1,000.00
615	Metals Processing Laboratory.....	7,295.97	60,000.00
617	Senior Dormitory.....	458,110.65	.....
619	Sloan Foundation.....	.....	71,667.00
621	Charles D. Waterbury.....	16,576.65	.....
<i>Totals.....</i>		<u>\$3,137,676.78</u>	<u>\$316,974.04</u>

SCHEDULE A-7  
OTHER INVESTED FUNDS

## PRINCIPAL AND INCOME AVAILABLE

## GENERAL PURPOSES

623	Anonymous H.....	\$10,000.00	.....
625	Anonymous J.....	3,402.00	.....
627	Anonymous M.....	1,500.00	.....
629	Anonymous R.....	57,150.00	.....
633	Edmund Dana Barbour.....	20,736.94	.....
635	Stephen L. Bartlett.....	52,371.53	.....
641	Helen Collamore.....	49,500.00	\$210.45
643	Co-operative Foundation.....	1,577.44	.....
649	Erastus C. Gaffield.....	21,052.12	.....
651	William T. Henry.....	19,565.00	15,645.00

## STUDENT LOAN FUNDS

<i>Net Transfers</i>	<i>Investment Income</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance, June 30, 1948</i>
.....	\$1,264.00	.....	.....	\$36,226.38†
<b>\$650.00</b>	<b>520.00</b>	.....	.....	<b>12,919.58</b>
.....	408.00	.....	.....	12,008.12†
.....	28.00	.....	.....	1,966.83†
.....	<b>1,324.00</b>	.....	.....	<b>34,414.12</b>
.....	368.00	.....	.....	10,599.50
.....	108.00	.....	.....	5,377.47†
.....	52.00	.....	.....	1,323.54
.....	112.00	.....	.....	3,005.72†
<b>1,000.00</b>	<b>50,658.05</b>	.....	<b>\$276.63</b>	<b>1,946,273.60†</b>
.....	124.00	.....	.....	4,984.50
<b>.....</b>	<b>\$350.00</b>	<b>\$54,966.05</b>	<b>.....</b>	<b>\$2,069,099.36</b>

†Includes students' notes receivable.

## BUILDING FUNDS

## PRINCIPAL AND INCOME AVAILABLE

.....	\$3,280.00	.....	.....	\$211,911.38
<b>\$51,075.81</b>	<b>5,016.00</b>	.....	.....	<b>130,373.02</b>
.....	40.00	.....	.....	1,063.98
<b>213,552.00</b>	.....	.....	.....	
.....	89,160.00	.....	<b>\$304,547.16</b>	<b>2,080,102.84</b>
.....	1,544.00	.....	24,527.24	22,987.24
.....	72.00	\$1,050.00	.....	1,073.50
.....	908.00	.....	.....	68,203.97
.....	.....	.....	458,110.65	.....
<b>71,667.00</b>	.....	.....	.....	
.....	664.00	.....	.....	17,240.65
<b>.....</b>	<b>\$234,743.19</b>	<b>\$100,684.00</b>	<b>\$1,050.00</b>	<b>\$2,532,956.58</b>

(Schedule A)

## OTHER INVESTED FUNDS

## PRINCIPAL AND INCOME AVAILABLE

.....	\$400.00	\$400.00	.....	\$10,000.00
.....	136.00	136.00	.....	3,402.00
.....	60.00	60.00	.....	1,500.00
.....	2,288.00	2,288.00	.....	57,150.00
.....	828.00	828.00	.....	20,736.94
.....	2,032.00	2,032.00	.....	52,371.53
.....	1,984.00	1,984.00	.....	49,710.45
.....	64.00	64.00	.....	1,577.44
.....	844.00	844.00	.....	21,052.12
.....	1,128.00	1,128.00	.....	35,210.00

## REPORT OF THE TREASURER

## SCHEDULE A-7 — (Continued)

## OTHER INVESTED FUNDS

## PRINCIPAL AND INCOME AVAILABLE — (Continued)

GENERAL PURPOSES (Continued)		Balance, June 30, 1947	Gifts and Other Receipts
653	Ernest R. Hosbach.....	.....	\$1,000.00
659	Keller.....	.....	100.00
665	Alice Butts Metcalf.....	\$50,000.00	.....
667	John Wells Morss.....	50,000.00	.....
673	Herman W. Tamkin.....	.....	13,500.00
675	Towle.....	10,500.00	2,500.00
677	Charles A. Tripp.....	100,000.00	.....
679	Grant Walker.....	75,500.00	.....
683	Harry C. Wiess.....	11,500.00	22,800.00
684	Belle A. Williston.....	.....	17,118.68
685	New Era.....	9,400.00	29,025.10
Totals.....		<u>\$543,755.03</u>	<u>\$101,899.23</u>

## SCHEDULE A-8

## DEPARTMENTS AND RESEARCH

701	Anonymous (S).....	\$521,067.00	.....
703	Applied Mathematics.....	28,613.50	.....
709	Bemis — Land Account.....	11,300.00	.....
713	Center of Analysis.....	26,334.25	.....
715	Badger — Chemical Engineering.....	20,775.25	.....
717	Chemical Engineering Practice.....	269,928.05	.....
719	Cosmic Terrestrial Research.....	22,496.43	\$8,000.00
721	Electronics, Research Laboratory of.....	58,752.50	.....
722	Electronics, Industrial Fellowships in.....	33,226.25	25,000.00
723	Food Technology.....	145,998.40	30,000.00
725	John A. Grimmons.....	12,217.40	2,892.58
727	Group Dynamics Research.....	36,668.70	.....
729	Harvey Non-Ferrous Forgings.....	10,494.25	.....
731	Hayden Dental Clinic.....	3,096.34	.....
733	Industrial Economics, Graduate.....	24,369.55	11,250.00
737	Industrial Fund.....	403,320.54	132,095.00
739	Industrial Relations Section.....	191,764.44	27,250.00
741	Instrumentation Fund.....	346,987.76	.....
743	A. Norton Kent.....	.....	100.00
749	John Lawrence Mauran.....	3,444.76	.....
751	Susan Minns.....	40,000.00	.....
753	Forris Jewett Moore.....	29,649.70	.....

## OTHER INVESTED FUNDS

## PRINCIPAL AND INCOME AVAILABLE — (Continued)

Net Transfers	Investment Income	Expense	Other Charges	Balance, June 30, 1948
.....	\$24.00	\$24.00	.....	\$1,000.00
.....	.....	.....	.....	100.00
.....	2,000.00	2,000.00	.....	50,000.00
.....	2,000.00	2,000.00	.....	50,000.00
.....	272.00	272.00	.....	13,500.00
.....	436.00	2,936.00	.....	10,500.00
.....	4,000.00	4,000.00	.....	100,000.00
.....	3,020.00	3,020.00	.....	75,500.00
.....	840.00	840.00	.....	34,300.00
.....	160.00	160.00	.....	17,118.68
.....	980.00	980.00	.....	38,425.10
.....	<u>\$23,496.00</u>	<u>\$25,996.00</u>	.....	<u>\$643,154.26</u>

(Schedule A)

\$5,000.00	\$20,744.00	.....	.....	\$536,811.00
7,000.00	1,004.00	.....	.....	22,617.50
.....	.....	.....	.....	11,300.00
5,500.00	812.00	.....	.....	21,646.25
.....	788.00	\$1,260.79	.....	20,302.46
.....	10,596.00	10,000.00	.....	270,524.05
.....	1,056.00	.....	.....	31,552.43
.....	2,332.00	.....	.....	61,084.50
.....	1,436.00	6,000.00	\$1,850.00	51,812.25
52,407.83	5,192.00	1,000.00	.....	127,782.57
.....	532.00	10,376.00	.....	5,265.98
.....	888.00	29,381.62	.....	8,175.08
.....	408.00	494.25	.....	10,408.00
.....	124.00	100.00	.....	3,120.34
2,750.00	1,272.00	2,750.00	.....	36,891.55
70,874.76	13,964.00	4,875.00	.....	473,629.78
2,750.00	7,240.00	40,782.78	.....	182,721.66
80,000.00	11,500.00	7,395.00	.....	271,092.76
.....	.....	.....	.....	100.00
.....	136.00	125.00	.....	3,455.76
.....	.....	.....	.....	40,000.00
.....	1,184.00	.....	.....	30,833.70

## SCHEDULE A-8—(Continued)

## OTHER INVESTED FUNDS

## PRINCIPAL AND INCOME AVAILABLE—(Continued)

DEPARTMENTS AND RESEARCH (Continued)		Balance, June 30, 1947	Gifts and Other Receipts
755	Nuclear Science and Engineering.....	\$15,236.25	\$50,000.00
757	F. Ward Paine.....	5,914.25	.....
758	Theodore B. Parker Memorial.....	3,130.02	.....
759	Radioactivity Center.....	30,215.00	.....
761	Richards Memorial.....	996.55	.....
763	W. T. Sedgwick.....	56,273.87	.....
765	Servomechanism Laboratory.....	39,074.25	.....
767	Servomechanism Research.....	47,737.50	.....
769	Sloan Automotive Laboratory.....	4,880.17	.....
771	Special Research, Padelford.....	2,626.42	.....
773	Submarine Signal Co.....	25,909.87	.....
775	Henry N. Sweet.....	11,110.72	.....
777	Swift Amino Acid.....	15,232.50	.....
779	Swift Protein Research.....	15,338.50	.....
781	Nellie Florence Treat.....	653.00	.....
783	Twentieth Century Fox Film Corporation Research....	2,578.75	.....
785	William Lyman Underwood.....	13,447.92	.....
786	Union Carbide & Carbon Corporation.....	.....	20,000.00
		<u>\$2,530,860.59</u>	<u>\$306,587.58</u>
LIBRARY			
791	Boston Stein Club.....	\$19,261.16	\$5,405.32
792	Carnegie S. A. L. Center.....	.....	25,000.00
793	Frank Harvey Cilley.....	82,481.55	.....
795	Class of 1874.....	287.55	.....
797	Arthur Elson.....	552.50	.....
799	Library Growth.....	6,908.49	.....
		<u>\$109,491.25</u>	<u>\$30,405.32</u>
MISCELLANEOUS FUNDS AND DEPOSITS			
801	Albert.....	\$3,457.75	\$3,000.00
802	Athletics Fields Special.....	.....	1,000.00
803	Bess Bigelow.....	36,354.24	.....
804	A. V. Clarke Scholarship.....	.....	1,462.50
805	Class of 1917.....	.....	.....
806	Class of 1918 Organ.....	1,933.88	1,122.00
807	Davis R. Dewey Memorial.....	579.70	.....
808	Drama Club Theatre.....	552.39	.....
809	Oscar H. Horovitz.....	1,018.75	.....
811	Kurrelmeyer.....	2,033.29	.....
813	Arthur D. Little Memorial Lectureship.....	4,312.25	.....
814	John R. Macomber.....	.....	3,780.00
815	M. I. T. Alumni 1940-1948.....	119,051.28	84,627.48
819	M. I. T. Alumni 1948-1949.....	.....	95,620.11
821	M. I. T. Teachers Insurance.....	130,792.18	60,824.17

## 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, 1948</i>
.....	\$1,064.00	\$19,000.00	.....	\$47,300.25
\$2,500.00	212.00	.....	.....	3,626.25
.....	120.00	.....	\$300.00	2,950.00
.....	1,208.00	.....	.....	31,423.00
.....	40.00	91.75	.....	944.80
785.18	2,168.00	1,900.00	.....	55,756.69
5,000.00	1,564.00	.....	.....	35,638.25
765.83	1,900.00	.....	.....	50,403.37
.....	196.00	196.00	.....	4,880.12
.....	104.00	.....	.....	2,730.43
5,000.00	868.00	.....	.....	21,777.87
.....	444.00	1,000.00	.....	10,554.72
7,000.00	520.00	.....	.....	8,752.50
5,000.00	512.00	.....	.....	10,850.50
.....	28.00	.....	.....	681.00
.....	104.00	.....	.....	2,682.75
.....	536.00	400.00	.....	13,583.92
.....	132.00	.....	.....	20,132.00
<b>\$245,301.94</b>	<b>\$92,928.00</b>	<b>\$137,128.19</b>	<b>\$2,150.00</b>	<b>\$2,545,796.04</b>
.....	\$880.00	.....	.....	\$25,546.48
\$10,000.00	300.00	.....	.....	15,300.00
377.96	3,288.00	.....	.....	85,391.59
.....	12.00	\$10.00	.....	289.55
.....	24.00	17.00	.....	559.50
2,375.00	196.00	.....	.....	4,729.49
<b>\$12,752.96</b>	<b>\$4,700.00</b>	<b>\$27.00</b>	<b>.....</b>	<b>\$131,816.61</b>
.....	\$152.00	.....	\$2,099.25	\$4,510.50
.....	28.00	.....	.....	1,028.00
.....	1,456.00	.....	.....	37,810.24
.....	28.00	.....	.....	1,490.50
\$1,183.81	24.00	.....	.....	1,207.81
.....	68.00	\$2,975.00	.....	148.88
.....	24.00	.....	.....	603.70
.....	24.00	.....	.....	576.39
.....	40.00	.....	.....	1,058.75
.....	80.00	.....	.....	2,113.29
856.20	124.00	2,532.63	.....	2,759.82
.....	112.00	1,072.05	.....	2,819.95
.....	5,844.00	8,345.00	39,942.72	161,235.04
.....	408.00	715.00	18,661.49	76,651.62
.....	4,740.00	.....	45,295.55	151,060.80

## REPORT OF THE TREASURER

## SCHEDULE A-8—(Continued)

## OTHER INVESTED FUNDS

## PRINCIPAL AND INCOME AVAILABLE—(Continued)

	MISCELLANEOUS FUNDS AND DEPOSITS (Continued)	Balance, June 30, 1947	Gifts and Other Receipts
823	John D. Mitsch Memorial.....	\$2,635.00	.....
825	Henry A. Morss Nautical.....	624.90	.....
827	Charles Francis Park Memorial.....	5,586.25	.....
829	President's, Special.....	11,448.61	.....
831	William Patrick Ryan, Special.....	654.06	.....
833	Sedgwick Memorial Lecture.....	16,285.16	\$125.95
835	Tau Beta Pi Memorial Scholarship.....	1,121.23	1,259.77
837	Teachers' Fund.....	123,389.39	.....
839	Technology Press.....	82,541.40	.....
841	Towle Lecture.....	865.00	.....
		<u>\$545,236.71</u>	<u>\$252,821.98</u>
<b>RESERVES</b>			
861	Photo Service.....	\$16,742.75	.....
863	Use of Facilities.....	145,998.91	\$302,411.00
865	Walker Memorial.....	13,094.50	.....
867	Walker Memorial Dining Service.....	24,238.86	.....
		<u>\$200,075.02</u>	<u>\$302,411.00</u>
	<i>Totals</i> .....	<u>\$3,385,663.57</u>	<u>\$892,225.88</u>

## SCHEDULE A-9

## DEPOSITS AND ADVANCES HELD FOR INVESTMENT

	ALUMNI AND CLASS FUNDS		
881	Class of 1887.....	\$4,174.86	.....
883	Class of 1889.....	165.63	.....
885	Class of 1914.....	976.02	.....
889	Class of 1919, Special.....	3,441.00	.....
891	Class of 1920.....	4,147.25	.....
893	Class of 1921.....	4,516.75	.....
895	Class of 1923.....	18,241.13	\$41,354.78
897	Class of 1924, Anonymous.....	2,908.02	.....
899	Class of 1924.....	29,983.33	2,841.27
901	Class of 1925.....	18,648.02	444.19
903	Class of 1926.....	32,273.22	3,985.77
905	Class of 1927.....	22,706.56	.....
907	Class of 1928.....	45,138.22	.....
909	Class of 1929.....	18,294.15	4.14
911	Class of 1930.....	15,118.38	.....
913	Class of 1934.....	713.63	3,344.77
915	Class of 1934, Special.....	782.00	.....
917	Class of 1935.....	477.95	170.79
919	Class of 1936.....	1,140.52	176.46

## OTHER INVESTED FUNDS

## PRINCIPAL AND INCOME AVAILABLE — (Continued)

Net Transfers	Investment Income	Expense	Other Charges	Balance, June 30, 1948
.....	\$104.00	.....	.....	\$2,739.00
.....	16.00	\$585.00	.....	55.90
.....	224.00	.....	.....	5,810.25
.....	456.00	.....	.....	11,904.61
.....	20.00	.....	\$225.00	449.06
.....	648.00	.....	.....	17,059.11
.....	80.00	.15	.....	2,460.85
.....	4,800.00	6,675.00	.....	121,514.39
.....	3,576.00	6,321.52	19,044.99	98,840.87
.....	36.00	.....	.....	901.00
<b>\$2,040.01</b>	<b>\$23,112.00</b>	<b>\$29,221.35</b>	<b>\$87,179.02</b>	<b>\$706,810.33</b>
.....	\$668.00	.....	.....	\$17,410.75
<b>\$197,746.30</b>	<b>.....</b>	<b>\$50,000.00</b>	<b>.....</b>	<b>200,663.61</b>
.....	524.00	.....	.....	13,618.50
.....	868.00	7,287.24	.....	17,819.62
<b>\$197,746.30</b>	<b>\$2,060.00</b>	<b>\$57,287.24</b>	<b>.....</b>	<b>\$249,512.48</b>
<b>\$453,761.19</b>	<b>\$122,800.00</b>	<b>\$223,663.78</b>	<b>\$89,329.02</b>	<b>\$3,633,935.46</b>

(Schedule A)

## DEPOSITS AND ADVANCES HELD FOR INVESTMENT

.....	\$168.00	.....	.....	\$4,342.86
.....	8.00	.....	.....	173.63
.....	40.00	.....	.....	1,016.62
.....	.....	.....	.....	3,441.00
.....	.....	.....	.....	4,147.25
.....	180.00	.....	.....	4,696.75
.....	892.00	.....	\$41.56	60,444.35
.....	116.00	.....	.....	3,024.02
.....	1,240.00	.....	80.13	33,984.47
.....	756.00	.....	124.45	19,723.76
.....	1,372.00	.....	65.29	37,565.70
.....	908.00	.....	.....	23,614.56
.....	1,804.00	.....	.....	46,942.22
.....	732.00	.....	.....	19,030.29
.....	604.00	.....	.....	15,722.38
.....	40.00	.....	.....	4,098.40
.....	32.00	.....	.....	814.00
.....	20.00	.....	.....	668.74
.....	48.00	.....	.....	1,364.98

## REPORT OF THE TREASURER

## SCHEDULE A-9—(Continued)

DEPOSITS AND ADVANCES HELD FOR INVESTMENT  
(Continued)

ALUMNI AND CLASS FUNDS (Continued)		Balance, June 30, 1947	Gifts and Other Receipts
921	Class of 1939.....	\$1,048.42	\$101.30
923	Class of 1945.....	25.00	.....
925	Class of 1946.....	25.00	.....
927	Class of 1947.....	80.00	.....
928	Association of Class Secretaries.....	2,884.33	.....
929	M. I. T. Alumni Association, Permanent.....	105,705.12	.....
931	M. I. T. Alumni Association, Class of 1898.....	3,220.00	5,882.84
		<u>\$336,835.11</u>	<u>\$58,304.31</u>
STUDENT ACTIVITIES			
951	Alpha Chi Sigma House.....	\$5,234.77	\$215.00
953	Major Briggs.....	35,605.17	.....
955	Lillie C. Smith.....	6,395.11	.....
957	Walter B. Snow.....	17,475.04	.....
959	Technology Matrons' Teas.....	9,087.37	.....
960	M. I. T. Women's Dormitory.....	.....	1,075.25
961	W. B. S. Thomas.....	2,585.24	.....
963	Undergraduates Activities Trust.....	1,764.87	.....
965	Undergraduate Publications Trust.....	8,855.43	.....
967	Undergraduate Dues, Athletics.....	21,653.65	.....
969	Undergraduate Dues, Reserve and Contingent.....	19,633.75	.....
		<u>\$128,290.40</u>	<u>\$1,290.25</u>
	<i>Totals</i> .....	<u>\$465,125.51</u>	<u>\$59,594.56</u>

SCHEDULE A-10  
CONDITIONAL GIFTS  
INCOME NOT YET AVAILABLE

981	Anonymous Q.....	\$5,159.50	\$1,750.00
983	Anonymous X.....	19,670.12	.....
984	Anonymous Y.....	.....	100.00
985	Avoca.....	76,200.00	.....
987	Joseph Hewett.....	213,336.12	.....
989	George S. Witmer.....	73,523.86	4,200.00
	<i>Totals</i> .....	<u>\$387,889.60</u>	<u>\$6,050.00</u>

SCHEDULE A-11  
ACCUMULATED NET GAIN ON GENERAL INVESTMENTS

995	Endowment Reserve (see Page 175).....	\$2,396,649.93	\$96,045.64

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, 1948</i>
.....	\$44.00	.....	.....	\$1,193.72
.....	.....	.....	.....	25.00
.....	.....	.....	.....	25.00
.....	.....	.....	.....	80.00
.....	116.00	.....	.....	3,000.33
.....	4,164.00	.....	\$3,333.00	106,536.12
\$650.00	128.00	.....	120.00	9,760.84
<b>\$650.00</b>	<b>\$13,412.00</b>	.....	<b>\$3,764.43</b>	<b>\$405,436.99</b>

.....	\$212.00	.....	\$150.00	\$5,511.77
.....	1,424.00	.....	1,000.00	36,029.17
.....	256.00	.....	35.00	6,616.11
.....	388.00	.....	7,809.22	10,053.82
.....	356.00	.....	333.75	9,109.62
.....	8.00	.....	.....	1,083.25
.....	104.00	.....	.....	2,689.24
.....	72.00	.....	.....	1,836.87
.....	316.00	.....	3,409.20	5,762.23
.....	868.00	.....	.....	22,521.65
.....	772.00	.....	4,000.00	16,405.75
.....	<b>\$4,776.00</b>	.....	<b>\$16,737.17</b>	<b>\$117,619.48</b>
<b>\$650.00</b>	<b>\$18,188.00</b>	.....	<b>\$20,501.60</b>	<b>\$523,056.47</b>

(Schedule A)

## CONDITIONAL GIFTS

## INCOME NOT YET AVAILABLE

.....	\$216.00	.....	.....	\$7,125.50
.....	788.00	.....	.....	20,458.12
.....	.....	.....	.....	100.00
.....	1,800.00	.....	.....	78,000.00
.....	9,177.50	.....	\$8,041.98	214,471.64
.....	3,285.60	.....	4,731.20	76,278.26
.....	<b>\$15,267.10</b>	.....	<b>\$12,773.18</b>	<b>\$396,433.52</b>

(Schedule A)

## ACCUMULATED NET GAIN ON GENERAL INVESTMENTS

.....	.....	.....	\$73.07	\$2,492,622.50
<b>.....</b>	<b>.....</b>	<b>.....</b>	<b>\$73.07</b>	<b>\$2,492,622.50</b>

(Schedule A)

## SUMMARY OF INVESTED FUNDS

## RECEIVABLES

227

SCHEDULE A-12  
STUDENTS' NOTES RECEIVABLE

Fund	Notes Receivable June 30, 1947	Loans Made 1947-48	Loans Repaid 1947-48	Notes Receivable June 30, 1948	Interest Received 1947-48
Technology Loan.....	\$368,383.37	\$48,800.00	\$62,914.53*	\$354,268.84	\$7,290.60
Bursar's.....	3,049.91	2,955.00	2,364.34	3,640.57	70.44
Rogers.....	1,630.00	.....	.....	1,630.00	.....
Dean's.....	1,331.88	430.00	701.40	1,060.48	68.22
Summer Surveying Camp.....	60.00	.....	.....	60.00	.....
Dennett.....	465.00	1,408.00	10.00	1,863.00	11.00
May Scholarship.....	2,050.00	300.00	.....	2,350.00	.....
Medical.....	2,565.36	59.00	20.00	2,604.36	.....
Class of 1896.....	.....	300.00	.....	300.00	.....
Emerson.....	300.00	.....	.....	300.00	.....
Ryan Memorial.....	205.69	.....	.....	205.69	.....
<i>Totals</i> .....	<u>\$380,041.21</u>	<u>\$54,252.00</u>	<u>\$66,010.27*</u>	<u>\$368,282.94</u>	<u>\$7,440.26</u>

\*Includes Written Off.

(Schedule A)

SCHEDULE A-13  
ACCOUNTS RECEIVABLE

## United States Government:

Armed Services, N.A.C.A. and A.E.C. Research Contracts	\$914,426.56*
Veterans Administration.....	82,949.08
Navy — Radar School.....	22,339.00
Other Tuition Fees.....	59,100.08
U. S. Weather Bureau.....	4,875.00
<i>Total United States Government</i> .....	<u>\$1,083,689.72</u>

Industrial Corporations — Research Contracts..... 166,896.44\*

## Others:

Aeronautical Engineering Department —	
Wind Tunnel Accounts.....	\$13,328.53
Union Carbide and Carbon Co.....	8,482.54
Students' Fees and Deposits.....	1,160.40
Miscellaneous Accounts.....	34,400.16
<i>Total (Schedule A)</i> .....	<u>\$1,307,957.79</u>

\*Total under direction of Division of Industrial Cooperation \$1,081,323.00

*SCHEDULE A-14*

## CONTRACTS IN PROGRESS

*United States Government:*

Armed Services, N.A.C.A. and A.E.C. Research Contracts	\$1,609,768.43*
Weather Bureau Research Program.....	4,846.59
<i>Total United States Government.....</i>	<i>\$1,614,615.02</i>
Industrial Corporations — Research Contracts.....	135,498.97*
Rockefeller Foundation Research.....	8,288.64
Costs unallocated in above accounts, represented by	
Accounts Payable and Accrued Wages.....	219,382.34
Other.....	3,265.59
<i>Total (Schedule A).....</i>	<i>\$1,981,050.56</i>

\*Total under direction of Division of Industrial Coöperation \$1,745,267.40

## SCHEDULE A-15

## INVENTORIES, PREPAID EXPENSES AND DEFERRED CHARGES

*Inventories:*

Department of Buildings and Power:	
Maintenance Supplies.....	\$43,552.56
Coal.....	21,300.82
Oil.....	4,907.16
	<hr/>
Laboratory Supplies.....	\$69,760.54
Dining Halls, Food and Supplies including	67,366.41
Games Dept.....	13,907.97
Photographic Merchandise and Supplies.....	11,528.40
Dormitories, Room Service Supplies.....	14,753.42
Stationery and Stamps.....	3,252.46
Technology Store, Lecture Notes.....	901.00
Civil Engineering Summer Camp.....	262.28
	<hr/>
<i>Total Inventories</i> .....	\$181,732.48

*Prepaid Expenses and Deferred Charges:*

Deposits with Mutual Fire Insurance Companies	\$98,517.80
Unexpired Insurance Premiums.....	11,746.54
Coöperative Foundation Plan —	
Insurance Premiums.....	8,012.39
Building 18 used by Radar School,	
less Amortization.....	13,012.75
Barracks Dormitories, less Amortization.....	71,869.08
Westgate West, less Amortization (F.P.H.A.	
Project).....	120,028.85
Buildings under Construction:	
Nuclear Science and Engineering Building .....	10,747.11
12 M.E.V. Building.....	959.91
Rockwell Athletic Cage.....	151,595.22
Sloan Automotive Laboratory.....	58,456.68
Equipment acquired by Division of Industrial	
Coöperation, less Depreciation.....	67,231.56
Division of Industrial Coöperation:	
Due from Vendors.....	\$3,083.71
Deferred Charges to Operations.....	29,579.40
	<hr/>
Other Deferred Charges (principally accounts	
payable and accrued wages for expenses	
undistributed).....	97,049.88
	<hr/>
<i>Total Prepaid Expenses and Deferred Charges</i> .....	741,890.88
<i>Total (Schedule A)</i> .....	<u>\$923,623.36</u>

## REPORT OF THE TREASURER

SCHEDULE A-16  
STUDENTS' ADVANCE FEES AND DEPOSITS

1948 Summer Term:

Tuition Fees.....	\$125,547.17
Students' Deposits.....	4,617.84
Dormitory Rentals.....	62,043.10
Summer Surveying Camp.....	2,835.00
	_____
1947-48 Students' Deposits, Returnable.....	\$195,043.11
1948-49 Tuition Fees.....	3,330.81
	_____
Total (Schedule A).....	<u>\$199,573.92</u>

SCHEDULE A-17  
FEDERAL TAX WITHHOLDINGS, SAVINGS BOND  
AND OTHER DEPOSIT ACCOUNTS

	Balance June 30, 1947	Additions	Deduction	Balance June 30, 1948
Additional Group Insurance.....	\$597.92	\$15,158.33	\$15,756.25	.....
Blue Cross Hospitalization Program.....	6,130.15	78,410.57	78,058.27	\$6,482.45
Boat House Equipment Account.....	256.60	2,242.37	2,498.97	.....
Building Key Account.....	3,507.87	1,922.00	5,429.87	.....
Carnegie Foundation Pension Account.....	.....	63,249.85	63,249.85	.....
Consolidated Vultee Aircraft Corporation.....	5,510.00	.....	5,510.00	.....
Corporation Flower Fund.....	38.68	545.00	583.68	.....
Division of Industrial Coöperation Advance Payments or Billings.....	96,109.05	146,499.73	96,109.05	146,499.73
Division of Industrial Coöperation A.M.P. Royalty Account.....	7,538.93	.....	7,538.93	.....
Division of Industrial Coöperation Overhead Suspense.....	.....	62,463.98	42,673.02	19,790.96
Employees Union Dues.....	.....	8,189.50	8,189.50	.....
Faculty Flower Fund.....	132.25	428.15	560.40	.....
I. C. Y. R. A. Deposits Account.....	1,947.04	1,378.55	799.33	2,526.26
Iraqui Education Directorate Account.....	1,695.57	3,000.00	2,041.00	2,654.57
Lowell Institute.....	.....	2,427.00	2,427.00	.....
Y. W. Lee Fellowship.....	.....	1,900.00	.....	1,900.00
M. I. T. Physical Electronic Conference.....	17.62	784.82	653.62	148.82
Melvin Trust Scholarship.....	9,800.00	9,800.00	19,600.00	.....
Nautical Association.....	491.00	2,170.00	2,425.00	236.00
Radar School, Harbor Building.....	49,189.62	670,170.00	668,868.06	50,490.66
Kispert Special.....	.....	553.00	77.60	475.40
Teagle Foundation, Inc., Scholarships.....	350.00	5,450.00	5,800.00	.....
Technology Christian Association.....	.....	796.00	796.00	.....
Watumull Foundation Fellowship.....	.....	1,500.00	1,000.00	500.00
Undergraduate Dues.....	.....	72,262.00	72,262.00	.....
United States Saving Bonds.....	12,614.19	17,756.08	16,375.45	13,994.82
United States Withholding Tax.....	92,392.88	99,009.11	102,625.34	88,776.65
United States Government Contract No. W218-TNG(SCI) 34.....	.....	13,430.00	13,430.00	.....
United States Government Contract No. W30-291 AA1-22.....	.....	780.00	780.00	.....
United States Government Contract No. W30-093S (AA1)2.....	.....	2,275.00	2,275.00	.....
United States Government Contract No. NoA(S)-8616 (E3A and E3P).....	.....	660.36	660.36	.....
United States Navy V-5 Program.....	.....	4,122.46	4,122.46	.....
United States Navy Ordnance Engr. Aviation.....	.....	404.88	404.88	.....
Veterans Administration.....	.....	2,248,515.77	2,248,515.77	.....
War Reserve.....	274,002.61	.....	274,002.61	.....
United States Government Contract Navy D3R Ord. Engr. Electronics.....	.....	371.92	371.92	.....
United States Government Contract D3X Ord. Engr. Electronics Nuclear.....	.....	5,150.21	5,150.21	.....
United States Government Contract No1W30-TNG (AA-1)-42.....	.....	50.00	50.00	.....
United States Government Contract No A-(S) 9475.....	.....	155.23	155.23	.....
	\$562,321.98	\$3,543,981.87	\$3,771,827.53	\$334,476.32

(Schedule A)

## SCHEDULE A-18

UNEXPENDED BALANCES OF GIFTS AND OTHER RECEIPTS  
FOR CURRENT PURPOSES

Department Accounts	Balance June 30, 1947	Gifts and Other Receipts	Net Transfers	Expense	Other Charges	Balance June 30, 1948
<b>Aeronautical Engineering:</b>						
Aerodynamic Research.....	\$25,267.88	.....	\$16,879.87	\$7,966.46	.....	\$421.55
Aerodynamic Eng. Special (Hunsaker) .....	.....	\$1,000.00	.....	30.40	.....	969.60
Carnegie Aerodynamics Research.....	.....	20,000.00	267.88	.....	.....	20,267.88
Cascade Research.....	.....	27,500.00	.....	4,938.78	.....	22,561.22
Douglas Aircraft Co. Fellowship.....	.....	1,500.00	.....	.....	\$500.00	1,000.00
Elastic Research Lab. Alt. Spec. 2246 .....	2,805.00	.....	7,500.00	9,193.93	.....	1,111.07
Five Foot Wind Tunnel.....	34,632.52	.....	21,131.21	55,763.73	.....	.....
Goodyear Fellowship.....	6,038.50	.....	.....	.....	.....	6,038.50
Instrument Laboratory Maintenance.....	4,353.93	10,000.00	68,500.00	65,051.52	.....	17,802.41
Rotating Wing Research.....	.....	.....	711.99	711.99	.....	.....
Special Apparatus Wright Tunnel.....	10,000.00	.....	.....	.....	.....	10,000.00
Special Appro. No. 1990.....	4,320.88	.....	.....	1,936.36	.....	2,384.52
Special Appro. No. 2065.....	3,942.02	.....	.....	656.34	.....	3,285.68
Sperry Gyroscope Fund.....	5,259.75	.....	.....	500.00	.....	4,759.75
Structural Lab. Equipment.....	278.29	.....	500.00	778.29	.....	.....
Vibration Res. No. 1333.....	80.52	.....	.....	59.51	.....	21.01
Wright Bros. Wind Tunnel.....	61,651.85	85,299.00	4,231.21	68,576.86	.....	74,142.78
Wright Bros. Tunnel, Equip. ....	30,000.00	.....	.....	.....	.....	30,000.00
<b>Architecture:</b>						
Special Appro. No. 2238.....	5,050.91	.....	.....	494.02	.....	4,556.89
Special Appro. No. 2282.....	3,474.50	.....	.....	3,459.09	.....	15.41
Housing Research Special No. 1899.....	2,847.34	.....	.....	361.50	.....	2,485.84
Traveling Fellowship.....	1,500.00	.....	.....	.....	.....	1,500.00
Ralph Walker Fund.....	.....	250.00	.....	250.00	.....	.....
<b>Biology and Biological Engineering:</b>						
American Cancer Society.....	.....	10,290.00	.....	12,076.33	1,786.33	.....
Cancer Society—Denues.....	500.00	.....	500.00	.....	.....	.....
Armour & Co. Research — Waugh.....	1,259.07	12,000.00	.....	13,133.65	.....	125.42
Equipment Special No. 2247.....	4,874.20	.80	15,000.00	15,524.29	.....	4,350.71
Biological Shop Account.....	15.44	.....	.....	15.44	.....	.....
Baruch Fund.....	26,611.85	.....	.....	11,141.94	.....	15,469.91
Baruch Common Physical Medicine .. Fellowship.....	186.94	625.00	.....	625.00	.....	186.94
Corn Industries Research Found.....	6,197.81	5,500.00	.....	6,102.06	.....	5,595.75
Electron Microscope Research.....	16,273.20	.....	500.00	6,494.46	.....	10,278.74
Gillette Safety Razor Co.....	150.00	.....	.....	.....	.....	150.00
A. C. Lawrence Fund.....	1,059.08	2,500.00	.....	1,756.33	.....	1,802.75
Lilly P. I. Fund.....	2,116.78	.....	.....	1,340.31	.....	776.47
Rockefeller Fund for Biological Eng.....	.....	88,876.37	.....	50,288.64	38,587.73	.....
Submarine Signal Fund.....	.....	.....	5,000.00	3,303.39	.....	1,696.61
<b>Building Engineering and Construction:</b>						
Cabot Pigment Research.....	1,288.47	.....	.....	792.70	.....	495.77
National Lime Association.....	513.14	6,000.00	.....	3,223.15	.....	3,289.99
Plastic Materials Manufacturing Assoc.....	10,052.87	30,000.00	.....	28,967.27	.....	11,085.60
Research Corporation Building Material.....	1,664.26	.....	.....	1,640.77	.....	23.49
Revere Building Material Research.....	.....	2,500.00	120.00	1,912.70	.....	467.30
Ross Francis Tucker Memorial Fund.....	89.68	.....	.....	19.62	.....	70.06

## REPORT OF THE TREASURER

## SCHEDULE A-18 — (Continued)

Department Accounts (Continued)	Balance June 30, 1947	Gifts and Other Receipts	Net Transfers	Expense	Other Charges	Balance June 30, 1948
<b>Business and Engineering Administration:</b>						
Lemuel R. Boulware Fund.....	.....	\$150.00	.....	\$132.47	.....	\$17.53
Alvin Brown Fund.....	\$500.00	.....	.....	91.75	.....	408.25
R. E. Gilmor Fund.....	500.00	.....	.....	500.00	.....	.....
Human Relationships Account.....	30.62	.....	.....	30.62	.....	.....
Newman M. Marsilius Fund.....	.....	1,000.00	.....	823.39	.....	176.61
Adrian C. Minton Fund.....	.....	150.00	.....	150.00	.....	.....
Sloan Book Account.....	231.65	.....	.....	83.63	.....	148.02
Special Appro. No. 1850.....	454.47	.....	.....	.....	.....	454.47
Special Appro. No. 1931.....	22.11	.....	.....	.....	\$22.11	.....
Sponsored Fellowship, Operating.....	2,437.47	.....	.....	1,134.62	.....	1,302.85
Sponsored Fellowship, Research.....	2,352.54	16.00	.....	201.12	.....	2,167.42
Standard Oil of Cal. Fellowship.....	.....	1,100.00	\$50.00	1,050.00	.....	.....
Howard D. Williams Fund.....	23.89	500.00	.....	407.01	.....	116.88
<b>Chemical Engineering:</b>						
Allied Chemical & Dye Corp.						
Fellowship.....	300.00	6,275.00	.....	2,403.62	1,400.00	2,771.38
Alsfilm Research.....	199.86	.....	.....	.....	199.86	.....
American Cyanamid Co. Fellowship.....	.....	2,000.00	.....	1,200.00	200.00	600.00
Bituminous Coal Research.....	.....	15,000.00	.....	182.99	.....	14,817.01
Colloid Chemistry Special 1207.....	281.28	.....	.....	.....	281.28	.....
du Pont Fellowship.....	400.00	2,800.00	.....	1,800.00	.....	1,400.00
Eastman Kodak Fellowship.....	28.00	1,200.00	.....	1,200.00	.....	28.00
Fuels Research.....	2,354.26	.....	.....	80.06	.....	2,274.20
Humble Oil & Refining Co. Fellowship.....	6,250.00	.....	.....	1,250.00	200.00	4,800.00
Humble Oil & Refining Co. Research.....	.....	25,000.00	.....	.....	.....	25,000.00
S. C. Johnson & Son Colloid Chemistry Fellowship.....	2,852.50	.....	.....	1,200.00	700.00	952.50
Kimberly Clark Corp. Fellowship.....	1,900.00	.....	.....	1,200.00	700.00	.....
Thomas Midgley, Jr. Fellowship.....	1,007.00	500.00	.....	.....	.....	1,507.00
Pan American Refining Corp. Fellowship.....	1,900.00	.....	.....	1,200.00	.....	700.00
Paint Films Special No. 1992.....	2,760.02	.....	.....	.....	2,760.02	.....
Procter & Gamble Fellowship.....	2,400.00	3,000.00	.....	1,555.87	.....	3,844.13
Pittsburgh Consolidation Coal Co. Fellowships.....	2,520.00	.....	.....	2,038.80	.....	481.20
Standard Oil of Indiana Fellowship.....	1,900.00	1,900.00	.....	1,200.00	700.00	1,900.00
Standard Oil of Cal. Fellowship.....	300.00	1,000.00	50.00	1,350.00	.....	.....
Standard Oil Co. Fellowship Special.....	.....	3,000.00	.....	2,757.64	100.00	142.36
Standard Oil Development Co. Research Special Research No. 1421.....	15,640.85	.....	.....	2,914.11	.....	12,726.74
	388.40	.....	.....	.....	.....	388.40
<b>Chemistry:</b>						
American Academy of Arts and Sciences.....	4,022.00	.....	.....	3,309.52	.....	712.48
Alterations Special No. 2195.....	5,794.63	.....	1,107.76	4,686.87	.....	.....
Abbott Laboratories.....	4,257.02	.....	.....	1,050.00	.....	3,207.02
Bristol Laboratories Research.....	3,337.77	3,450.00	.....	2,117.23	525.00	4,145.54
Cope Research.....	4,300.00	.....	.....	495.00	125.00	3,680.00
Harshaw Chemistry Fund.....	2,593.05	.....	.....	778.35	.....	1,814.70
du Pont Fellowship.....	4,458.42	7,300.00	.....	6,054.14	700.00	5,004.28
du Pont Peroxide Research.....	2,000.00	.....	.....	.....	.....	2,000.00

## BALANCES FOR CURRENT PURPOSES

233

## SCHEDULE A-18—(Continued)

Department Accounts (Continued)	Balance June 30, 1947	Gifts and Other Receipts	Net Transfers	Expense	Other Charges June 30, 1948	Balance
<b>Chemistry: (Continued)</b>						
Journal Meetings.....	.....	\$75.00	.....	\$7.00	.....	\$68.00
Little, Arthur D. Special Fellowship 45-46	\$500.00	.....	.....	375.00	\$125.00	.....
Little, Arthur D. Special Fellowship 46-47	2,400.00	.....	\$4,300.00	6,000.00	700.00	.....
Physical Chemistry Royalties.....	5,507.46	.....	.....	1,670.03	.....	3,837.43
Polymerization Research.....	1,665.25	.....	.....	.....	.....	1,665.25
Procter & Gamble Fund.....	2,700.00	.....	.....	15.15	.....	2,684.85
Rockefeller Research Grant 45107.....	19,759.98	7,903.20	.....	14,535.93	.....	13,127.25
Research Corp. — Amdur.....	.....	5,000.00	.....	74.72	.....	4,925.28
Research Corp. Morton Fund.....	10,620.99	.....	.....	3,958.00	700.00	5,962.99
Research Corp. Vitamina A and D Research.....	.....	3,880.00	.....	2,933.72	.....	946.28
Royalty Receipts Pat. 665135.....	2,573.51	.....	.....	1,470.55	.....	1,102.96
Sharp and Dohme, Inc.....	200.00	3,200.00	.....	2,412.00	.....	988.00
Socony Vacuum Oil Co. Fellowship.....	2,000.00	2,000.00	.....	1,200.00	790.00	2,010.00
Special Appro. No. 2048 Freshman Laboratories.....	9,087.34	.....	2,996.16	6,091.18	.....	.....
Chemistry Special No. 2100.....	12.44	.....	.....	12.44	.....	.....
Chemistry Laboratories — Alterations.....	.....	.....	53,515.46	53,515.46	.....	.....
Chemistry Special No. 2170B.....	1,578.03	.....	.....	1,578.03	.....	.....
Special Appro. No. 2245A.....	8,892.54	.....	8,892.54	.....	.....	.....
Special Appro. No. 2245B.....	1,082.22	.....	.....	1,082.22	.....	.....
Sugar Research Fund.....	9,429.84	25,000.00	.....	21,584.45	1,775.00	11,070.39
Swift Amino Acid Fund.....	3,116.06	.....	7,000.00	4,783.45	475.00	4,857.61
Swift Protein Research.....	2,168.14	.....	5,000.00	5,897.88	710.00	560.26
Union Bay State — Milas.....	500.00	500.00	.....	340.95	.....	659.05
U. S. Rubber Co. Fellowship.....	2,800.00	2,800.00	.....	1,800.00	700.00	3,100.00
Welch Fund.....	150.25	1,000.00	.....	1,150.25	.....	.....
<b>City Planning:</b>						
Conference Account.....	.....	900.00	.....	780.09	.....	119.91
<b>Civil Engineering:</b>						
<b>Concrete Structural and Dynamics</b>						
Laboratory.....	.....	.....	10,000.00	34.10	.....	9,965.90
Equipment Special 1326.....	338.82	.....	.....	.....	.....	338.82
Freeman Hydraulic Research.....	800.00	.....	.....	.....	.....	800.00
Hydraulic Laboratory Special No. 2155.....	2,372.24	504.02	66.04	2,771.73	.....	38.49
Photogrammetry Laboratory.....	.....	.....	6,225.00	946.59	.....	5,278.41
River Hydraulic Laboratory.....	.....	294.90	2,066.04	2,360.94	.....	.....
Sanitary Engineering Lab. 2032.....	.....	.....	2,500.00	2,500.00	.....	.....
Sanitary Science Lab. Special No. 2087.....	1,274.74	.....	945.91	1,577.39	.....	643.26
Soil Mechanics Laboratory.....	.....	.....	600.00	591.44	.....	8.56
Sanitary Engineering Transportation.....	.....	360.00	.....	104.98	.....	255.02
Sanitary Science Laboratory Special No. 2173.....	10,000.99	.....	339.27	10,340.26	.....	.....
Sewage Federation Research.....	.....	4,900.00	.....	3,700.19	.....	1,199.81
Structural Laboratory.....	.....	.....	2,900.00	2,854.74	.....	45.26
Structural Laboratory Donations.....	181.40	275.60	.....	.....	.....	457.00
Summer Camp Construction Reserve.....	2,743.37	.....	.....	2,300.00	.....	443.37
Wallace and Tiernan Grant.....	1,978.47	.....	3,000.00	2,474.55	.....	2,503.92
Welding Research.....	403.28	2,600.00	.....	2,606.79	.....	396.49

## REPORT OF THE TREASURER

## SCHEDULE A-18 — (Continued)

Department Accounts (Continued)	Balance June 30, 1947	Gifts and Other Receipts	Net Transfers	Expense	Other Charges	Balance June 30, 1948
<b>Economics:</b>						
Map Project.....	.....	.....	\$5,900.00	\$4,874.96	.....	\$1,025.04
Rockefeller Foundation Grant 45082...	\$2,252.50	\$5,000.00	.....	3,710.85	.....	3,541.65
Rockefeller Public Opinion Survey.....	2,638.62	.....	.....	429.42	\$2,209.20	.....
Statistical Conference.....	.....	2,718.00	.....	2,096.68	.....	621.32
United States Steel Corp. Fund.....	.....	570.00	.....	570.00	.....	.....
<b>Electrical Engineering:</b>						
American Cancer Society Special						
Trump.....	.....	70,000.00	.....	18,965.83	.....	51,034.17
American Philosophical Society-Kopal.	588.56	1,200.00	.....	507.69	.....	1,280.87
Army Officers Aid.....	.....	2,535.20	.....	167.16	.....	2,368.04
Balsbaugh Research.....	5,217.27	.....	.....	4,004.43	.....	1,212.84
Center of Analysis.....	831.75	45,927.25	5,500.00	52,145.86	.....	113.14
Coating Metals Special No. 1946.....	598.00	.....	.....	.....	.....	598.00
Communications Lab. U. H. F. Research	567.54	.....	.....	421.16	.....	146.38
Course Revision Special No. 1250.....	566.74	.....	.....	80.82	.....	485.92
Course VI-A Travel Account.....	296.55	.....	1,178.47	1,475.02	.....	.....
Edgerton Film Research.....	1,901.75	40.00	.....	21.78	.....	1,919.97
Equipment Special.....	.....	43,000.00	.....	23,393.29	.....	18,606.71
Hyams Radiation Research.....	6,785.13	12,000.00	.....	17,532.75	.....	1,252.38
Int. Tel. & Tel. Research.....	865.70	.....	.....	.....	.....	865.70
Micro Wave Research.....	4,749.08	.....	.....	4,080.40	.....	668.68
Network Analyzer.....	23,094.80	10,772.25	.....	13,853.58	.....	20,013.47
Oil Gear Research.....	7,000.00	.....	.....	.....	.....	7,000.00
Photoelectric Cells Res. Spec. 1874A...	4,157.98	.....	.....	.....	.....	4,157.98
Radar School — Salaries.....	.....	59,897.78	.....	59,897.78	.....	.....
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
Rockefeller Electric Computer 46061...	19,757.11	.....	29,769.76	473.13	50,000.00	.....
Servos Royalty Account.....	823.47	.....	765.83	57.64	.....	.....
Servos Special Brown.....	6,645.97	.....	5,000.00	6,520.72	.....	5,125.25
Table of Planckian Radiation.....	.....	.....	675.00	673.56	.....	1.44
U. H. F. Dielectrics Res. Spec. 1874B...	6,000.00	.....	.....	.....	.....	6,000.00
<b>English and History:</b>						
International Relations Library.....	84.42	.....	.....	4.07	.....	80.35
<b>Food Technology:</b>						
Apple Fellowship.....	2,417.51	.....	.....	775.25	.....	1,642.26
Bruce's Juices Inc. Fellowship.....	4,000.00	.....	.....	1,500.00	.....	2,500.00
Campbell Special.....	2,498.33	200.00	.....	563.25	.....	2,135.08
Dewey and Almy Fund.....	.....	4,581.11	324.20	4,905.31	.....	.....
Fat Research Fund.....	33.61	7,975.00	.....	6,595.99	.....	1,417.62
Food Research.....	909.43	.....	52,407.83	53,317.26	.....	.....
Hoffman La Roche Fund.....	2,714.88	.....	.....	224.05	.....	2,490.83
Joe Lowe Corp. Research.....	3,539.95	.....	.....	1,602.00	.....	1,937.95
Moore, Emma B., Ration Research, Proctor.....	500.00	.....	.....	.....	.....	500.00
Moore, Emma B., Ration Research, Harris.....	313.17	.....	.....	277.11	.....	36.06
Nutrition Research.....	503.62	3,000.00	209.59	3,713.21	.....	.....
Procter and Gamble Research.....	.....	3,200.00	.....	2,674.95	.....	525.05

## SCHEDULE A-18—(Continued)

Department Accounts (Continued)	Balance June 30, 1947	Gifts and Other Receipts	Net Transfers	Expense	Other Charges	Balance June 30, 1948
<b>Food Technology: (Continued)</b>						
Quaker Nutrition Fund.....	\$8,902.92	.....	.....	\$4,568.94	.....	\$4,333.98
Royalties Receipts Pat. 665135.....	2,199.61	.....	.....	1,000.00	.....	1,199.61
Standard Brands Fellowship.....	1,700.00	\$500.00	.....	.....	.....	2,200.00
Swift Nutrition.....	.....	.....	\$1,080.78	337.12	\$743.66	.....
United Fruit Fund.....	19,367.44	15,189.00	1,614.57	15,365.30	.....	17,576.57
Vitamin Foundation Research.....	.....	5,200.00	.....	6.30	.....	5,193.70
<b>Geology:</b>						
American Petroleum Institute Fund...	49.84	12,380.00	.....	9,867.04	.....	2,562.80
Cabot Spectrographic Laboratory.....	.....	.....	800.00	529.29	.....	270.71
Geological Research Special 1863.....	4,530.75	.....	800.00	2,270.00	.....	1,460.75
G.S.A. 452-45.....	934.98	1,875.00	.....	2,640.11	.....	169.81
G.S.A. 466-45.....	2,762.58	.....	.....	2,123.17	.....	639.47
G.S.A. 472-45.....	797.50	1,000.00	.....	914.83	.....	882.68
Geophysical Research.....	41.79	.....	.....	24.09	.....	66.72
National Research Council, Research...	129.60	.....	.....	31.98	.....	97.61
Nova Scotia Coal Research.....	.....	50.00	250.00	122.29	.....	177.77
Owens Illinois Glass Co. Fellowship....	3,081.32	.....	.....	2,604.25	.....	477.07
Special Appro. No. 2229.....	2,983.05	201.27	.....	53.05	.....	3,131.27
Paine Fund Special No. 2213.....	1,931.72	.....	2,250.00	3,391.62	.....	790.01
<b>Graphics:</b>						
National Research Council Grant.....	180.01	.....	.....	.....	.....	180.01
<b>Industrial Relations:</b>						
Special Appro. No. 1955.....	676.59	.....	.....	75.00	.....	601.59
<b>Mathematics:</b>						
Applied Mathematics Program.....	655.04	.....	7,000.00	3,624.84	2,494.50	1,535.70
Journal of Mathematics and Physics...	3,835.98	.....	.....	655.77	.....	3,180.21
Special Appro. No. 2260.....	8,791.21	.....	.....	4,647.15	.....	4,144.06
Putnam Fund.....	509.29	.....	.....	3.15	.....	506.14
Rockefeller Fund 47009.....	2,599.87	5,500.00	2,500.00	3,599.87	.....	2,000.00
Rockefeller — Weiner.....	.....	.....	2,500.00	2,500.00	.....	.....
<b>Mechanical Engineering:</b>						
A. S. M. E. Research.....	1,037.86	10,161.50	.....	8,659.10	.....	2,540.26
A. S. R. E. Research.....	800.82	.....	.....	.....	.....	800.82
American Soc. of Tool Engineering...	517.50	.....	.....	100.00	.....	417.50
Cavitation Research.....	1,493.78	.....	.....	472.87	.....	1,020.91
Clark Thread Fellowship.....	3,987.50	5,400.00	.....	1,800.00	.....	7,587.50
deForest Research Special 1254.....	2,230.60	1,924.17	.....	1,924.17	.....	2,230.60
du Pont Predoctoral Fellowship.....	850.00	2,800.00	.....	1,839.60	200.00	1,610.40
Dynamics Special 2319.....	.....	.....	5,000.00	1,578.18	.....	3,421.82
Fatigue Lab. Special No. 2224.....	514.22	.....	.....	332.29	.....	181.93
Gas Turbine Building and Equipment ..	24,264.52	.....	276,552.00	.....	254,963.62	45,852.90
Heat Measurements Laboratory.....	.....	.....	2,000.00	1,072.77	.....	927.23
Lab. Rev. Special No. 2095.....	2,582.80	1,000.00	.....	633.45	.....	2,949.35
Low Temperature Research.....	.....	.....	2,380.00	.....	.....	2,380.00
Machine Tool Lab. Spec. No. 2201....	1,862.96	3,500.00	284.19	5,647.15	.....	.....
Machine Tool Lab. Spec. No. 2280....	7,000.00	.....	284.19	4,419.20	2,296.61	.....
Magnafux Research Fund.....	8,952.64	.....	.....	1,000.00	.....	7,952.64

## REPORT OF THE TREASURER

## SCHEDULE A-18 — (Continued)

Department Accounts (Continued)	Balance June 30, 1947	Gifts and Other Receipts	Net Transfers	Expense	Other Charges	Balance June 30, 1948
<b>Mechanical Engineering: (Continued)</b>						
Mechanics of Materials Spec. No. 2041	\$19,446.68	.....	.....	\$2,411.70	.....	\$17,034.98
Proprietors Locks and Canals.....	1,573.02	.....	.....	.....	.....	1,573.02
S. Slater & Sons, Inc., Fund.....	9,777.51	.....	.....	9,000.61	.....	776.90
Shell Fellowship.....	.....	\$2,200.00	.....	1,700.00	\$200.00	300.00
Shop Maintenance Account.....	3,385.47	.....	.....	1,401.23	.....	4,786.70
Special Appro. No. 2176.....	1,363.50	.....	\$2,500.00	1,917.12	.....	1,946.38
Testing Materials Lab. Special.....	1,734.40	.....	.....	91.30	.....	1,643.10
Textile Equipment Special.....	210.31	.....	.....	155.95	.....	54.36
Textile Foundation Research.....	2,453.63	.....	.....	.....	.....	2,453.63
Special Appropriation No. 2099.....	4,944.92	.....	.....	4,944.92	.....	.....
Special Appropriation No. 2132.....	1,040.32	.....	1,040.32	.....	.....	.....
Special Appropriation No. 2160.....	.....	1,065.35	20,591.19	.....	21,656.54	.....
Special Appro. 2169A.....	7,448.45	.....	.....	3,466.44	.....	3,982.01
Special Appro. 2169B.....	3,207.44	.....	1,822.54	1,384.90	.....	.....
Thermodynamic Research.....	1,271.94	.....	.....	303.98	.....	967.96
Wear Conference.....	.....	2,269.59	.....	1,406.37	.....	863.22
<b>Metallurgy:</b>						
American Brake Shoe Fellowship.....	.....	2,000.00	.....	.....	.....	2,000.00
American Brake Shoe — Operating.....	.....	5,000.00	.....	2.06	.....	4,997.94
American Smelting & Ref. Co. Fell.....	4,414.00	.....	.....	3,000.00	.....	1,414.00
Armour Dry Cyaniding.....	2,238.66	5,000.00	.....	4,109.68	.....	3,128.98
Armour Flotation Research — Gaudin	10,291.41	12,000.00	.....	12,680.38	1,425.00	8,186.03
Julian M. Avery Research.....	.....	.....	2,687.56	.....	.....	2,687.56
Chipman Research Special 1337.....	1,375.48	5,664.13	1,500.00	1,715.14	.....	6,824.47
Clay Research.....	613.41	150.00	.....	51.46	.....	711.95
Corrosion Research.....	12,273.50	.....	.....	7,970.76	120.00	4,182.74
Engineering Foundation—Bartholemew	.....	1,250.00	.....	1,711.66	461.66	.....
Engineering Foundation—Cohen.....	.....	2,265.00	.....	1,645.00	.....	620.00
Engineering Foundation Welding Res...	3,413.10	.....	.....	27.59	.....	3,385.51
Equipment Spec. No. 1234.....	558.40	524.00	.....	381.51	.....	1,463.91
Foundry Educational Foundation —	.....	.....	20,000.00	.....	2,525.17	.....
Research.....	.....	.....	20,000.00	.....	2,525.17	.....
Foundry Educational Foundation —	.....	.....	.....	.....	.....	17,474.83
Scholarship.....	.....	14,500.00	.....	1,400.00	2,100.00	11,000.00
Gray Iron Founders Society.....	596.75	.....	.....	128.85	.....	467.90
Illinois Clay Products Co. Research.....	.....	5,000.00	.....	2,975.24	.....	2,024.76
International Nickel Co. Fell.....	2,200.00	2,200.00	.....	1,941.69	.....	2,458.31
Loeb Foundation.....	9,943.00	.....	.....	6,734.90	.....	3,208.10
Metallurgy Special No. 2269.....	52.77	.....	.....	52.77	.....	.....
Modernization of Processing Laboratory	.....	.....	56,000.00	15,710.99	.....	40,289.01
Republic Steel Corp. Fund.....	9,750.87	10,000.00	2,500.00	10,988.43	825.00	5,437.44
Research Corporation — Uhlig.....	.....	2,500.00	.....	.....	.....	2,500.00
Research Corporation — Schuhmann...	.....	10,000.00	.....	4,212.15	120.00	5,667.85
Revere Copper and Brass Co. Res....	6,313.11	.....	.....	4,577.72	700.00	1,035.39
Sheffield Foundation Research.....	.....	1,569.20	.....	453.08	1,116.12	.....
Special Research No. 1818.....	.....	.....	2,000.00	1,320.87	.....	679.13
Special Appropriation 2297.....	.....	.....	10,000.00	9,572.23	.....	427.77
Steel Founders Society—Arc Furnace...	.....	12,000.00	.....	11,642.49	.....	357.51
Steel Founders Society—Scholarship ...	.....	4,500.00	.....	.....	4,500.00	.....
Titanium Co. Fund.....	241.63	1,500.00	.....	420.67	.....	1,320.96
Equipment Special No. 1259.....	1,150.60	.....	.....	740.02	.....	1,890.62

## SCHEDULE A-18 — (Continued)

Department Accounts (Continued)	Balance June 30, 1947	Gifts and Other Receipts	Net Transfers	Expense	Other Charges	Balance June 30, 1948
<b>Metallurgy: (Continued)</b>						
Unexcelled Mfg. Co. ....	\$671.68	\$1,800.00	.....	\$1,932.76	.....	\$538.92
Union Carbide and Carbon Fellowship. ....	.....	2,000.00	.....	600.00	\$350.00	1,050.00
Vanadium Corp. Fund. ....	605.73	3,375.00	.....	3,482.99	240.00	257.74
Warwick Malleable Co. Fellowship. ....	.....	1,500.00	.....	1,500.00	.....	.....
Wellman, S. K. Fund. ....	2,984.66	.....	.....	1,834.84	125.00	1,024.82
Williams, Robert Seton Fund. ....	.....	.....	\$200.00	200.00	.....	.....
Williams, Robert Seton Portrait Fund. ....	.....	975.50	.....	1,013.48	37.98	.....
<b>Meteorology:</b>						
Pamphlets Deposit Special. ....	164.00	.....	.....	.....	.....	164.00
Weather Bureau Research. ....	.....	9,750.00	.....	11,926.73	2,176.73	.....
<b>Military Science:</b>						
Freshman Equipment Account. ....	1,789.05	3,486.16	.....	.....	1,522.88	3,752.33
Senior Uniform Upkeep Account. ....	80.77	4,342.35	.....	.....	3,127.42	1,295.70
<b>Naval Architecture:</b>						
Propeller Tunnel Special No. 1548A ...	2,569.41	.....	.....	319.54	.....	2,249.87
Special Fund (Anonymous). ....	2,189.81	.....	.....	.....	.....	2,189.81
<b>Physics:</b>						
Acoustics Laboratory Special No. 2115. ....	13,752.87	.....	10,000.00	23,144.25	.....	608.62
Cabot X-Ray Fund. ....	6,000.00	.....	.....	.....	.....	6,000.00
Crystal Research. ....	599.51	1,437.63	.....	542.27	.....	1,494.87
du Pont Fellowship. ....	1,000.00	2,500.00	.....	1,500.00	200.00	1,800.00
Eastman Kodak Co. Fellowship. ....	.....	1,200.00	.....	1,075.00	125.00	.....
Evans Research. ....	401.58	.....	.....	161.90	.....	239.68
Glass Industry Fellowship. ....	250.00	.....	.....	.....	.....	250.00
Gulf Oil Corp. Fellowship. ....	.....	2,200.00	.....	1,850.00	.....	350.00
Harshaw-Stockbarger. ....	7,678.77	10,000.00	.....	8,714.74	100.00	8,864.03
Jewett, Frank B. Fellowship. ....	1,275.74	.....	.....	.....	.....	1,275.74
Magnetic Laboratory Special No. 1222. ....	993.46	2,685.00	3,588.00	6,844.42	.....	422.04
Methods of Theoretical Physics. ....	.....	.....	1,300.00	.....	.....	1,300.00
Nuclear Research. ....	9,140.46	.....	.....	237.27	.....	8,903.19
Radioactivity Center. ....	55,343.91	4,157.73	.....	10,084.51	.....	49,417.13
Rockefeller Foundation Grant 45050. ....	1,062.89	.....	.....	.....	1,062.89	.....
Special Appro. No. 2047. ....	19,913.38	.....	.....	226.00	.....	19,687.38
Special Appro. No. 2171. ....	2,573.54	.....	.....	1,623.68	.....	949.86
Spectroscopy — Loofbourow. ....	.....	.....	6,887.16	6,887.16	.....	.....
Spectroscopy Research. ....	19,997.00	30,545.77	6,887.16	20,207.89	.....	23,447.72
Spectroscopy Special. ....	6,197.24	1,479.40	.....	887.02	.....	6,789.62
Zeeman Effect Program Special 1755. ....	466.65	.....	.....	.....	.....	466.65
<b>Solar Energy Research:</b>						
Solar Energy — Chemistry. ....	368.01	.....	500.00	518.88	.....	349.13
Solar Energy — Elec. Eng. ....	2,256.44	.....	.....	.....	.....	2,256.44
Solar Energy — Geology. ....	485.83	.....	.....	.....	.....	485.83
Solar Energy — Headquarters. ....	.....	.....	10,119.92	10,119.92	.....	.....
Solar Energy — Metallurgy. ....	.....	.....	6,358.42	5,708.00	\$350.00	300.42

\$990,721.99 \$943,264.23 \$741,788.64 \$1,230,668.16 \$402,086.74 \$1,043,019.96

## REPORT OF THE TREASURER

## SCHEDULE A-18 — (Continued)

	Balance June 30, 1947	Gifts and Other Receipts	Net Transfers	Expense	Other Charges	Balance June 30, 1948
<i>Other Accounts</i>						
<i>Medical:</i>						
Homberg Infirmary Spec. No. 1976....	\$868.50	.....	.....	.....	\$868.50	.....
Hayden Foundation.....	.....	\$11,000.00	.....	\$11,000.00	.....	.....
	<b>\$868.50</b>	<b>\$11,000.00</b>	.....	<b>\$11,000.00</b>	<b>\$868.50</b>	.....
<i>Library:</i>						
American Chemical Society						
Library Fellowship.....	.....	\$7,190.00	.....	\$6,453.28	.....	\$736.72
Biology Library.....	\$1,888.16	.....	.....	1,038.81	.....	849.35
Carnegie S. A. L. Center.....	.....	.....	\$10,000.00	1,916.97	.....	8,083.03
Crafts Library.....	479.53	.....	.....	10.69	.....	468.84
Dewey Library.....	13.85	.....	.....	2.50	.....	11.35
Director of Library Fund.....	.....	150.00	102.72	252.72	.....	.....
German Chemical Documents.....	1,408.60	23.00	.....	.....	.....	1,431.60
Humanities Library Spec. No. 2103....	8.42	.....	.....	.....	.....	8.42
Library Growth.....	2,010.15	1,219.35	2,375.00	845.58	.....	4,758.92
Schenley Library Fellowship.....	1,778.64	.....	189.33	1,967.97	.....	.....
Rockefeller Foundation Grant 46037....	1,908.74	.....	.....	964.15	\$944.59	.....
Special No. 1.....	1,490.47	423.85	.....	1,914.32	.....	.....
Special No. 1853.....	767.24	.....	134.51	165.88	.....	735.87
Special Book Purchase Account.....	100.00	.....	100.00	.....	.....	.....
Special Appropriation No. 2240.....	187.07	.....	.....	1.55	.....	188.62
Walker Memorial Library.....	2,322.04	.....	377.96	2,652.12	.....	47.88
	<b>\$14,362.91</b>	<b>\$9,006.20</b>	<b>\$13,079.52</b>	<b>\$18,183.44</b>	<b>\$944.59</b>	<b>\$17,320.60</b>
<i>Research (other than those under Department Accounts):</i>						
All American Aviation, Inc. Richard C. du Pont Memorial.....	\$3,800.00	.....	.....	\$2,100.00	.....	\$1,700.00
Bush Research Fund.....	215.00	.....	.....	.....	.....	215.00
Cosmic Terrestrial Research.....	1,869.24	.....	.....	1,222.83	.....	646.41
General Radio Company Fund.....	2,000.00	.....	.....	.....	.....	2,000.00
	<b>\$7,884.24</b>	.....	.....	<b>\$3,322.83</b>	.....	<b>\$4,561.41</b>
<i>Reserves:</i>						
Bernie Real Estate.....	\$2,901.48	\$1,213.69	.....	.....	.....	\$4,115.17
Div. of Ind. Coöp.....	42,673.02	.....	\$42,673.02	.....	.....	.....
Division of Laboratory Supplies.....	.....	2,246.21	.....	.....	.....	2,246.21
O.S.R.D. Receivable.....	2,000.00	.....	.....	\$2,000.00	.....	.....
Radar School, Harbor Building.....	14,648.01	6,589.74	.....	10,000.00	.....	11,237.75
Special War Reserve Fund.....	.....	25,000.00	.....	1,996.28	.....	23,003.72
Trucking Reserve.....	.....	5,000.00	.....	.....	.....	5,000.00
	<b>\$62,222.51</b>	<b>\$40,049.64</b>	<b>\$42,673.02</b>	<b>\$13,996.28</b>	.....	<b>\$45,602.85</b>
<i>Miscellaneous:</i>						
Additional Power — Building 35.....	.....	.....	\$10,979.33	.....	.....	\$19,979.33
Alumni Register, 1948.....	\$7,370.20	\$14,257.57	8,126.97	\$21,627.77	.....	8,126.97
Boat House Equipment.....	.....	2,242.37	256.60	2,242.37	.....	256.60
Building Key Account.....	.....	412.50	3,507.87	2.31	.....	3,918.06
Building 5 Special 2333.....	.....	.....	2,571.97	.....	.....	2,571.97
Building 20 Grading.....	.....	.....	15,750.09	15,750.09	.....	.....
Building 20 Painting.....	.....	.....	25,000.00	16,752.53	.....	8,247.47
Building 20 Power Lines.....	.....	.....	2,500.00	.....	.....	2,500.00
Class of 1917.....	1,183.81	.....	1,183.81	.....	.....	.....

BALANCES FOR CURRENT PURPOSES

289

SCHEDULE A-18 — (Continued)

Other Accounts (Continued)	Balance June 30, 1947	Gifts and Other Receipts	Net Transfers	Expense	Other Charges	Balance June 30, 1948
<b>Miscellaneous: (Continued)</b>						
Consolidated Vultee Aircraft Corp.	.....	.....	\$5,510.00	\$750.00	.....	\$4,760.00
Corporation Flower Fund	.....	\$545.00	38.68	.....	.....	583.68
Corporation K Fund	\$135.14	.....	.....	65.97	.....	69.17
Dean's Fund Special	600.00	900.00	.....	600.00	.....	900.00
D. I. C. — A. M. P. Royalty Account	.....	.....	7,538.93	.....	.....	7,538.93
Douglas Aircraft Scholarship	.....	2,000.00	.....	800.00	\$440.00	760.00
Richard C. du Pont Mem. Spec.	8,790.42	.....	.....	8,401.86	.....	388.56
Electrical Dist. Special 2209	.....	.....	3,259.92	.....	.....	3,259.92
Educational Survey Special No. 2251	4,331.26	.....	.....	4,048.54	.....	282.72
Faculty Flower Fund	.....	.....	132.25	132.25	.....	.....
Fly Ash Eliminator	.....	.....	2,476.59	.....	.....	2,476.59
Foreign Students Project	.....	17,130.15	.....	8,104.25	.....	9,025.90
Fund Raising Special No. 2267	848.00	.....	3,714.38	848.00	.....	3,714.38
Gottesman Foundation Fellowship	.....	2,500.00	.....	.....	.....	2,500.00
Graduate Student Fund	161.52	.....	.....	24.70	.....	136.82
Grounds Special 2305	.....	.....	16,122.49	16,122.49	.....	.....
Gymnasium Special	915.53	.....	.....	.....	915.53	.....
Haynes Student Aid Fund	.....	2,000.00	.....	600.00	.....	1,400.00
High Altitude Lab.	.....	.....	600.00	.....	.....	600.00
Kasch Fellowships	180.00	.....	.....	.....	.....	180.00
William S. Knudsen Fellowship	.....	2,500.00	.....	1,800.00	475.00	225.00
Llora Culver Krueger Fund	2,155.36	.....	.....	.....	400.00	1,755.36
Lecture Fund	165.45	.....	.....	165.45	.....	.....
Arthur D. Little Inc. Royalties	.....	5,067.56	5,067.56	.....	.....	.....
M.I.T. Detroit Alumni Club Scholarship	.....	750.00	.....	.....	.....	750.00
Melvin Trust Scholarships	.....	9,800.00	9,800.00	.....	9,275.00	10,325.00
Modernization of Lighting	.....	.....	3,479.47	.....	.....	3,479.47
National Research Corp. Real Est. Tax	1,017.00	.....	.....	.....	1,017.00	.....
New Student Program	.....	.....	46,504.20	.....	.....	46,504.20
Parking Special 2306	.....	.....	21,237.69	15,300.00	.....	5,937.69
Patent Committee	77.51	.....	.....	.55	76.96	.....
Photographic Service	1,073.92	.....	.....	.....	1,156.55	2,230.47
Poughkeepsie Funds	.....	955.00	.....	.....	.....	955.00
President's Fund	16.04	5,160.60	.....	4,380.30	.....	796.34
President's Portrait Fund	230.40	.....	.....	.....	.....	230.40
President's Special Fund "L"	1,231.43	50.00	.....	503.57	.....	777.86
Radiation Album Special No. 2124	8,385.98	.....	.....	7,473.87	912.11	.....
Space Changes 2296	.....	.....	30,000.00	29,666.96	.....	333.04
Standard Oil Co. N. J.	.....	50,000.00	.....	.....	.....	50,000.00
Teagle Foundation, Inc. Scholarships	.....	5,450.00	350.00	.....	5,800.00	.....
Tech. War Record Spec. 2116	7,300.89	.....	.....	168.20	.....	7,132.69
Tennis Courts Spec. 2266	12,022.30	.....	.....	12,022.30	.....	.....
Travel Special No. 2283	2,500.00	.....	.....	2,500.00	.....	.....
Undergraduate Schp. Award Special	1,000.00	.....	.....	.....	1,000.00	.....
Unesco Fellowship	.....	.....	1,050.00	.....	.....	1,050.00
Visiting Comm. Reports, Special	352.76	.....	.....	352.76	.....	.....
Henry E. Weihmiller Fund	702.40	.....	.....	.....	.....	702.40
Granger Whitney Fund	13.50	200.00	.....	.....	.....	213.50
Walker New Student Lounge	30,993.32	.....	.....	30,993.32	.....	.....
Water Line Building 2	.....	.....	4,500.00	.....	.....	4,500.00
Westgate Survey	.....	.....	2,500.00	.....	.....	2,500.00
Women's Lounge Special No. 2274	5,797.67	.....	582.42	5,215.25	.....	.....
	\$99,551.81	\$121,920.75	\$229,673.64	\$207,415.66	\$19,155.05	\$224,575.49
Total	\$1,175,611.96	\$1,125,240.82	\$941,868.78	\$1,484,586.37	\$423,054.88	\$1,335,080.31

*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
Educational Buildings, Cambridge:			
Main Group.....	\$5,655,949.64		
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.....	530,699.10		
Sloan Automotive Laboratories.....	479,267.50		
Mechanic Arts Building.....	83,658.89		
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		
Hydraulic Laboratory (Building 21).....	11,000.00		
Hydrodynamics Laboratory and Towing Tank (Under Construction).....	44,086.77		
Chemical Engineering Laboratory (Bldg. 38).....	31,000.00		
Building Twenty-Four.....	<u>318,049.27</u>		10,369,195.62
Educational Equipment.....			2,039,953.60
Charles Hayden Memorial Library (Under Construction).....			304,547.16
Undergraduate Dormitories.....	\$1,487,423.79		
Senior House (Under Construction).....	<u>500,000.00<sup>2</sup></u>		1,987,423.79
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.....	84,042.54		
Sailing Pavilion.....	28,849.09		
Briggs Field House and Track.....	<u>121,197.99</u>		1,569,355.30
Summer Camp:			
East Machias, Maine.....			120,558.00
Miscellaneous:			
Power Plant.....	\$389,064.17		
Steam and Electrical Distribution System.....	310,795.32		
Service Building and Garages.....	55,369.74		
Other Plant Assets.....	<u>466,916.61</u>		1,222,145.84
<i>Total, June 30, 1948 (Schedule A).....</i>			<u>\$19,588,960.80</u>

<sup>1</sup> Not including the Graduate House, Westgate Veterans Housing, Women's Dormitory, 120 Bay State Road, Boston and M. I. T. Student House, 111 Bay State Road, Boston (see investments, page 198).

<sup>2</sup> Additional Construction Cost provided for by Investment Funds (see Investments, page 198).

## 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 Guggenheim Fund, for Aeronautical Laboratory .....

675,150.00

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 Laboratory .....

296,863.70

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 Appropriations 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;

Hydraulic Lab., \$44,086.77; Gas Turbine

Lab., \$530,699.10; Bldg. 24, \$318,049.27...

973,836.73

\* Includes Mr. Eastman's original gift of \$3,500,000 together with appropriations from the Building Fund of \$2,500,000 which he established.

## 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	.....	37,400.00
		\$9,997,525.99

## 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.		500,000.00
Alumni Fund	.....	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	.....	14,429.80
		2,039,953.60

## For Charles Hayden Memorial Library:

Charles Hayden Foundation Fund	.....	304,547.16
--------------------------------	-------	------------

## For Dormitories:

Maria A. Evans Fund	.....	\$261,192.55
T. C. duPont	.....	100,000.00
Alumni Dormitory Fund	.....	566,945.66
Alumni Fund 1947 — Senior 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	.....	22,369.92
		1,987,423.79

## For Summer Camp:

Edward Cunningham Fund	.....	\$15,000.00
Charles W. Eaton Fund	.....	15,501.45
Appropriations from Current Income	.....	90,056.55
		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.

## 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.....	24,491.34
Alumni Fund, for Walker Memorial.....	490,000.00
Edmund D. Barbour Fund, for Field House.....	55,000.00
Alumni Fund, for Swimming Pool.....	228,479.15
Stephen Bartlett Fund, for Swimming Pool.....	117,071.64
Class of 1923, Sun Garden.....	10,000.00
Alumni Fund, for Briggs Field House and	
Track.....	156,169.13
Edmund D. Barbour Fund, Sailing Pavilion.....	13,363.89
Anonymous for Boat House.....	30,000.00
Appropriations from Current Income for:	
Boat House.....	6,500.00
Sailing Pavilion.....	15,485.20
Squash Courts.....	29,042.54
Rifle Range.....	1,500.00
	<hr/>
	\$1,533,295.32
Miscellaneous:	
From Sale of Land and Buildings in Boston	
1916.....	\$656,919.45
Other Contributions, Appropriations, etc... .	1,502,547.50
	<hr/>
	2,159,466.95
Total June 30, 1948 (Schedule A).....	<hr/> <hr/> \$19,588,960.80

## SCHEDULE B-1

## STUDENTS' FEES

## TUITION

From Students.....	\$1,795,581.09
Veterans Administration.....	2,070,021.25
Navy V-5 Program.....	3,200.00
Scholarship Awards.....	165,457.00
Student Loan Awards.....	26,520.00
	<hr/>
Locker, Examination and Other Fees.....	\$4,060,779.34
	7,973.12
	<hr/>
Total Schedule B.....	\$4,068,752.46

## SCHEDULE B-2

## GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES

Department	Salaries	Other Expenses	Total
Aeronautical Engineering.....	\$70,220.68	\$153,338.49	\$223,559.17
Architecture.....	361.50	5,108.20	5,469.70
Biology.....	56,698.02	69,103.82	125,801.84
Building Engineering and Construction.....	22,237.32	14,318.89	36,556.21
Business and Engineering Administration.....	6,933.91	3,970.70	10,904.61
Chemical Engineering.....	10,810.73	13,983.15	24,793.88
Chemical Engineering Practice School.....	.....	10,000.00	10,000.00
Chemistry.....	48,461.87	102,517.65	150,979.52
Civil Engineering.....	7,432.26	20,655.08	28,087.34
Economics.....	2,924.90	4,012.05	6,936.95
Electrical Engineering.....	127,648.64	67,481.94	195,130.58
English and History.....	.....	1,054.07	1,054.07
Food Technology.....	61,122.66	37,703.38	98,826.04
Geology.....	13,269.19	11,253.45	24,522.64
Group Dynamics.....	25,116.67	4,264.95	29,381.62
Industrial Relations.....	26,113.52	14,744.26	40,857.78
Mathematics.....	5,779.15	9,251.63	15,030.78
Mechanical Engineering.....	27,159.75	27,824.32	54,984.07
Metallurgy.....	25,632.14	90,446.51	116,078.65
Meteorology.....	10,141.85	1,784.88	11,926.73
Naval Architecture.....	.....	319.54	319.54
Nuclear Science and Engineering.....	.....	19,000.00	19,000.00
Physics.....	26,734.48	57,580.67	84,315.15
Solar Energy Research.....	12,681.35	3,665.45	16,346.80
Library and Museum.....	7,520.61	10,497.78	18,018.39
Medical Department.....	100.00	11,000.00	11,100.00
General Administrative Expenses.....	9,060.00	149,068.99	158,128.99
Plant Operation.....	.....	155,614.37	155,614.37
<i>Total</i> .....	<u>\$604,161.20</u>	<u>\$1,069,564.22</u>	<u>\$1,673,725.42</u>

(Schedule B)

*SCHEDULE B-3*  
RESEARCH CONTRACTS

Total Direct Contract Costs.....	\$11,105,807.29
Total Overhead Allowances.....	<u>2,195,339.79</u>
 Total Contract Revenues.....	 <u>\$13,301,147.08</u>
Less Appropriations:	
To: Reserve for Use of Facilities...	\$302,411.00
Industrial Fund.....	132,095.00
Investment Income.....	143,420.00
Investment Amortization.....	<u>13,702.00</u>
	<u>591,628.00</u>
 <i>Total</i> (Schedule B).....	 <u>\$12,709,519.08</u>
 Contract Costs	
Salaries and Wages.....	\$5,212,788.01
Material and Services.....	5,611,638.07
Travel, Communications, etc.....	188,938.58
Other.....	<u>92,442.63</u>
	<u>\$11,105,807.29</u>
 Other Expenses	
Salaries and Wages.....	\$129,805.31
Space Rental and Operation.....	83,918.79
Servomechanisms Laboratory Overhead Account.....	26,721.31
Depreciation on Equipment.....	22,616.83
Materials and Services.....	21,337.34
Instrumentation Laboratory Overhead Account.....	16,644.56
Auditing and Professional Services.....	6,706.11
Travel.....	5,232.65
Unabsorbed Vacation Costs 1946-47.....	3,999.05
Alterations — Building 32.....	3,497.74
Insurance.....	827.01
Retroactive Wage Increase.....	700.14
Non-Reimbursable Items and Losses.....	23,156.26
Miscellaneous.....	<u>3,408.49</u>
	<u>348,580.59</u>
 <i>Total</i> (Schedule B).....	 <u>\$11,454,387.88</u>

*SCHEDULE B-4*

## RENTALS AND OTHER INCOME

Anonymous for Chemical Engineering.....	\$1,000.00
Land Rentals, etc.....	4,600.00
Lecture Notes.....	202.62
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
Recoveries of Student Fees Prior Years (Net).....	179.64
Central Trust Company Liquidation.....	448.42
 Appropriation Recoveries Prior Years.....	8,816.59
Federal Aid.....	21,780.03
Trustees of H. C. Frick Estate.....	3,058.03
United States Navy Fire Control Research.....	1,150.00
U. S. Government — Veterans Administration.....	<u>15,136.83</u>
 <i>Total (Schedule B).....</i>	<u>\$75,272.16</u>

## SALARIES AND WAGES OF STAFF

247

## SCHEDULE B-5

SALARIES AND WAGES OF STAFF, ACCESSORY TO TEACHING  
AND LABORATORY SERVICE

Department	Staff Salaries	Wages Accessory to Teaching	Wages Laboratory Service	Salaries and Wages Transferred to D.I.C.	Academic Salaries and Wages
Aeronautical Engineering.....	\$236,831.52	\$24,484.68	\$18,623.97	\$58,288.94	\$221,651.23
Architecture.....	70,498.12	6,575.37	1,472.28	.....	78,545.77
Bemis Research.....	7,464.67	569.00	.....	.....	8,033.67
Biology.....	121,329.09	11,292.97	29,702.39	11,500.00	150,824.45
Building Eng. and Construction.....	41,966.71	5,415.80	7,431.02	.....	54,813.53
Business and Eng. Administration.....	120,632.15	15,303.65	.....	.....	135,935.80
Chemical Engineering.....	177,284.23	11,080.40	21,963.14	50,743.36	159,584.41
Chemical Eng. Practice School.....	30,420.01	.....	.....	.....	30,420.01
Chemistry.....	352,733.38	17,999.42	38,800.30	87,521.00	322,012.10
City Planning.....	32,577.66	1,372.00	.....	.....	33,949.66
Civil Engineering.....	152,083.07	6,136.61	15,825.09	24,646.23	149,398.54
Division of Laboratory Supplies.....	.....	.....	44,937.12	.....	44,937.12
Economics.....	146,328.68	9,745.73	.....	4,530.63	151,543.78
Electrical Engineering.....	752,215.71	44,057.77	67,077.06	334,761.51	528,589.03
English and History.....	147,004.55	4,898.67	.....	2,515.91	149,387.31
Food Technology.....	83,725.21	7,455.05	2,743.20	1,046.94	92,876.52
General Eng. and General Science.....	3,896.00	1,794.17	.....	.....	5,690.17
Geology.....	77,574.18	4,867.14	5,459.46	487.69	87,413.09
Graphics.....	49,156.76	2,268.33	.....	.....	51,425.09
Group Dynamics.....	25,841.30	5,141.27	.....	5,865.90	25,116.67
Industrial Relations Section.....	20,280.00	5,833.52	.....	.....	26,113.52
Lantern Operation.....	.....	.....	2,431.81	.....	2,431.81
Mathematics.....	173,674.91	5,723.47	.....	11,137.36	168,261.02
Mechanical Engineering.....	427,210.61	25,927.03	56,733.10	63,565.87	446,304.87
Metallurgy.....	240,582.84	13,944.71	34,073.65	95,878.76	192,722.44
Meteorology.....	92,134.58	8,961.99	4,006.16	35,187.70	69,915.03
Military Science.....	18,579.30	1,970.68	.....	.....	20,549.98
Modern Languages.....	39,835.88	2,221.56	.....	.....	42,057.44
Naval Architecture.....	59,283.34	6,266.10	3,398.77	.....	68,948.21
Physics.....	443,033.23	16,153.89	65,050.72	228,238.64	295,999.20
Solar Energy Research.....	11,865.50	3,766.11	2,155.24	.....	17,786.85
<b>Totals.....</b>	<b>\$4,156,043.19</b>	<b>\$271,227.09</b>	<b>\$421,884.48</b>	<b>\$1,015,916.44</b>	<b>\$3,833,238.32</b>

(Schedule B)

*SCHEDULE B-6*  
DEPARTMENTAL EXPENSES

Aeronautical Engineering.....				\$155,806.49
General	\$3,723.65			
Staff Scholarships	2,468.00	Current Funds	\$149,614.84	
Architecture.....				9,228.44
General	2,053.82	Current Funds	4,983.20	
Lecture Fund	800.00	Major Funds	1,283.78	
Special 2239	107.64			
Bemis Fund Research.....				1,514.66
General	1,514.66			
Biology.....				74,348.82
General	3,400.00	Biol. Eng. Equip.	4,000.00	
Staff Scholarships	345.00	Current Funds	65,103.82	
Shop Account	1,500.00			
Building Engineering and Construction.....				18,165.42
General	3,846.53	Current Funds	14,318.89	
Business and Engineering Administration.....				12,061.42
General	7,970.72	Current Funds	3,970.70	
		Staff Scholarships	120.00	
Chemical Engineering.....				48,753.75
General	17,388.52	Practice School	12,985.08	
Staff Scholarships	4,397.00	Current Funds	12,722.36	
Badger Fund	1,260.79			
Chemistry.....				84,672.64
General	35,000.01	Staff Scholarships	8,030.00	
Current Funds	41,642.63			
City Planning.....				739.93
General	739.93			
Civil Engineering.....				49,993.02
General	5,000.00	Structural Laboratory	2,900.00	
Staff Scholarships	1,623.00	Summer Camp	15,584.76	
Soil Mechanics Laboratory	600.00			
Current Funds	24,285.26			
Economics and Social Sciences.....				12,329.54
General	3,267.53	Staff Scholarships	175.00	
Current Funds	8,757.01	Indus. Econ. Grad. Fell. (Net)	130.00	
Electrical Engineering.....				106,352.21
General	24,485.71	Staff Scholarships	9,880.00	
Current Funds	65,677.70	Teaching Assistants	308.80	
		Ind. Electronics Fell.	6,000.00	
English and History.....				3,464.16
General	3,460.09	Current Funds	4.07	
Food Technology.....				37,903.61
General	2,600.23	Current Funds	35,303.38	
General Science and Engineering.....				93.54
General	93.54			
Geology.....				13,755.82
General	2,502.37			
		Current Funds		
General	11,253.45			
Graphics.....				2,498.33
General	2,498.33			

## SCHEDULE B-6 — (Continued)

Group Dynamics.....				\$4,264.95
General	\$4,264.95			
Industrial Relations Section.....				14,744.26
General	13,242.13	Library Current Funds	\$1,427.13 75.00	
Mathematics.....				14,397.64
General	3,563.01	Staff Scholarships	1,583.00	
Current Funds	9,251.63			
Mechanical Engineering.....				51,608.07
General	22,334.29	Staff Scholarships	3,417.00	
Testing Laboratory	655.69	Current Funds	25,201.09	
Mechanical Metallurgy.....				2,844.83
General	2,844.83			
Metallurgy.....				98,483.82
General	9,993.86	Special 2202 Major Fds.	586.00	
Staff Scholarships	809.00	Current Funds	75,670.39	
Sheffield Foundation	6.65	Mineral Dressing Res.	1,042.75	
		Fdry. Educ. Foundation	10,375.17	
Meteorology.....				6,605.98
General	4,037.10	Staff Scholarships	784.00	
Current Funds	1,784.88			
Military Science.....				2,634.50
General	2,634.50			
Modern Languages.....				1,670.27
General	1,670.27			
Naval Architecture.....				2,519.27
General	2,199.73	Current Funds	319.54	
Nuclear Science and Engineering.....				79,764.52
General	79,764.52			
Oak Ridge Practice School.....				1,374.10
General	1,374.10			
Physics.....				91,971.01
General	16,417.91	Staff Scholarships	4,915.50	
Current Funds	60,746.63	Research	9,890.97	
Solar Energy Res.....				10,434.94
Major Funds	6,769.49	Current Funds	3,665.45	
<i>Total (Schedule B).....</i>				<u>\$1,014,999.96</u>

## REPORT OF THE TREASURER

*SCHEDULE B-7*  
LIBRARY AND MUSEUM EXPENSES

Library.....			\$175,462.71
Salaries of Officers.....	\$52,945.96		
Wages, Office and Clerical.....	67,911.52		
Salaries in Current Funds.....	7,520.61		
Expenses — General.....	33,753.81		
Expenses — Office of Director.....	457.54		
Expenses in Current Funds.....	10,470.78		
Expenses in Major Funds.....	2,402.49		
 Museums.....			 15,040.78
Salaries.....	\$12,144.16		
Expenses.....	2,896.62		
 <i>Total</i> (Schedule B).....			 \$190,503.94

*SCHEDULE B-8*  
CLERICAL AND OFFICE EXPENSE — ADMINISTRATION

	Salaries	Expense	Total
President.....	\$14,650.07	\$15,060.38	\$29,710.45
Dean of Engineering.....	2,394.00	1,114.30	3,508.30
Dean of Science.....	1,853.31	534.78	2,388.09
Dean of Humanities.....	1,698.21	560.43	2,258.64
Dean of Students.....	6,518.08	2,439.89	8,957.97
Dean of Graduate School.....	2,601.96	641.86	3,243.82
Registrar.....	58,549.73	22,107.82	80,657.55
Director of Admissions.....	36,068.07	14,933.72	51,001.79
Treasurer and Bursar.....	79,452.24	17,520.68	96,972.92
Superintendent.....	21,213.75	2,686.77	23,900.52
News Service.....	3,975.00	3,574.63	7,549.63
Undergraduate Scholarship and Loan Fund Board.....	6,597.65	2,890.49	9,488.14
New Student Publicity.....		2,322.23	2,322.23
Placement Bureau.....	18,128.66	3,703.64	21,832.30
Register of Former Students.....		8,268.74	8,268.74
Personnel Office.....	11,552.49	1,900.43	13,452.92
Housing Bureau.....	4,078.87	132.97	4,211.84
 <i>Total</i> .....	 \$269,332.09	 \$100,393.76	 \$369,725.85

(Schedule B)

*SCHEDULE B-9*  
GENERAL ADMINISTRATIVE EXPENSE

<i>Bulletins</i> . . . . .			\$31,400.01
President's Report	\$7,463.59	General Catalogue	\$20,114.17
Directory	3,822.25		
<i>Other Publicity</i> . . . . .			2,060.00
Tech Review to Schools		\$1,500.00	
Tech Review to Tech Clubs		560.00	
<i>General Expense</i> . . . . .			476,364.25
Allowances	\$11,237.80	Employees' Pensions	
Pensions	33,388.03	and Insurance	\$96,168.67
Insurance	35,072.00 <sup>1</sup>	Commencement	15,899.44
Taxes, Cambridge	3,594.94	Travel	22,114.51
Auditing	8,200.00	Telephone Service	82,357.40
Staff Pensions	150,237.51	Dues, Fees, etc.	12,255.40
		Services (net)	5,748.55
<i>Special Expense</i> . . . . .			271,837.34
Visiting Committee		Morss Nautical Fund	\$585.00
Reports	\$ 449.98	President's Enter-	
New Equipment	8,811.26	tainment Fund	3,758.49
Lowell Institute		Surplus Property	
Special	5,000.00	Committee	8,607.07
Historic Memorials		Radiation Album	
Committee	372.49	Special	7,473.87
Society of Arts	1,955.70	Course Exhibit	
Fund Raising		Special	1,987.54
Special	2,133.62	Public Address	
Graduate House		System	1,317.04
Dining Service		Open House	2,025.59
Deficit	25,931.01	Alumni Register	34,900.84 <sup>2</sup>
Westgate West Special		New Student	
Construction	9,542.54	Program	3,495.80
Walker Memorial		Tech Press	6,321.52
Renovations	16,628.92	Hobby Shop	5,769.58
Pritchett Lounge,		Foreign Students	
Walker	33,228.95	Project	8,104.25
Richard C. duPont		Graduate Awards	5,200.00
Memorial Room	8,401.86	Undergraduate	
Walker Memorial		Awards	384.00
Organ	3,710.93	Prize Fund Awards	427.00
High Altitude		Walker Dining	
Laboratory	3,500.00	Service Reserve	7,287.24
Combined College		Special Awards	975.00
Program	4,738.75	Teachers Fund	6,675.00
Lecture Fund	2,000.00	Miscellaneous Major	
Edna Dow Cheney		Funds	5,565.25
Room	2,386.48	Miscellaneous Current	
Arthur D. Little	2,532.63	Funds	29,652.18
Lectures			
<i>Total (Schedule B)</i> . . . . .			<u>\$781,661.60</u>

<sup>1</sup>Includes Workmen's Compensation, General Liability and all coverages except Fire Insurance (see Schedule B-10). <sup>2</sup>Gross expense, receipts of \$21,628.00 recorded in Schedule B-2 in total of \$149,068.99 for General Administrative Expenses.

## SCHEDULE B-10

## DEPARTMENT OF BUILDINGS AND POWER

Building Service.....				\$341,002.11
Janitors	\$125,593.21	Heat'g and Vent'g		\$27,967.81
Night Cleaners	86,920.78	Shop Foreman (net)		4,508.47
Watchmen	44,278.78	Mail and Elevators		14,645.48
Window Cl'g	13,678.21	Shipping, Stock Room, Matron, Messenger		23,409.37
Power Plant and Electric Power.....				284,546.84
Fuel Oil.....			\$122,418.17	
Coal.....			74,519.58	
Cambridge Electric Light Co., Power.....			113,182.05	
Salaries.....			42,904.09	
Repairs.....			14,301.24	
Water, Supplies, etc.....			12,431.65	
Total Operating Cost.....			\$379,756.78	
Less: Credits — Electric Power.....	\$23,710.75			
Steam.....	71,499.19			95,209.94 <sup>1</sup>
Repairs, Alterations and Maintenance.....				299,827.23
Buildings	\$130,709.33	Water and Gas	\$22,120.01	
Grounds, Roads, etc.	50,697.11	Furniture	7,465.35	
Mains and Conduits	29,577.98	Elevators	6,355.99	
		Misc. (net)	52,901.46	
Fire Insurance.....				16,217.04
Total.....				\$941,593.22
Special Alterations.....				393,382.29
Chemistry Laboratories.....			\$60,875.02	
Additional Painting.....			50,000.00	
Electrical Distribution.....			135,452.38	
Modernization of Processing Laboratory.....			15,710.99	
Gas Turbine Laboratory.....			17,147.10	
Other.....			114,196.80	
Total (Schedule B).....				\$1,334,975.51

<sup>1</sup> Including Dormitories, Graduate House, Walker Memorial and Bexley Hall.

*SCHEDULE B-II*  
MEDICAL DEPARTMENT

Salaries, Staff.....		\$57,434.65
Expense of Clinic.....		45,717.48
Salaries      \$19,029.27	X-Ray Operation	
Supplies, etc.    7,060.97	and Equipment      \$12,629.43	
	Physical Examinations    6,997.81	
Expense of Infirmary.....		44,043.66
Salaries      31,282.07	Food (net)      2,575.02	
Equipment and		
Supplies      6,622.76	Laundry      3,563.81	
Expense of Dental, Eye, Nose and Throat Clinics (Net) .....		490.79
Maintenance and Repairs.....		5,739.81
<i>Total</i> (Schedule B).....		<u><u>\$153,426.39</u></u>

*SCHEDULE B-II*  
UNDERGRADUATE BUDGET BOARD

Athletic Coaches' Salaries.....	\$42,550.00
Director's Office Expense (including non-staff salaries).....	2,548.49
Undergraduate Dues.....	38,262.00
Cambridge Armory, Rental of.....	2,510.76
Walker Memorial (excluding Dining Service) (net)      34,737.18	
Institute Committee Salaries.....	313.46
Athletic Fields, Maintenance.....	27,194.11
Sailing Pavilion and Activities (net).....	10,428.01
Boat House and Launches, Maintenance.....	12,629.56
Musical Clubs, Equipment and Supplies.....	5,252.00
Swimming Pool (Including Wages).....	28,856.61
Equipment for Freshman Athletics.....	973.63
Publications Advertising .....	327.55
<i>Total</i> (Schedule B).....	<u><u>\$206,583.36</u></u>

*SCHEDULE B-13*  
AUXILIARY ACTIVITIES

	SUMMARY	<i>Income</i>	<i>Expense</i>
B-13 A.	Graduate House.....	\$164,162.47	\$164,162.47
B-13 B.	Undergraduate Dormitories.....	229,107.07	196,579.15
B-13 C.	Walker Memorial Dining Service...	397,193.47	397,193.47
B-13 D.	Graduate House Dining Service....	237,063.44	237,063.44
B-13 E.	Barracks Dormitory.....	85,229.70	85,229.70
B-13 F.	Women's Dormitory.....	11,195.40	11,195.40
B-13 G.	Westgate.....	59,900.83	59,900.83
B-13 H.	Westgate West.....	74,604.31	74,604.31
<i>Total</i> (Schedule B).....		<u><u>\$1,258,456.69</u></u>	<u><u>\$1,225,928.77</u></u>

*SCHEDULE B-13 A*  
GRADUATE HOUSE OPERATION

## Income:

Rentals (Net).....	\$160,414.00
Miscellaneous.....	3,748.47

*Total* (Schedule B-13)..... \$164,162.47

## Expense:

Salaries.....	\$91,035.95
Real Estate Tax.....	6,137.95
Light, Heat, Power and Water.....	27,081.51
Repairs.....	15,264.50
Supplies (Net).....	4,164.16
Laundry.....	5,409.16
Administration.....	2,053.45
Equipment.....	1,917.73
Depreciation.....	5,953.48
House Tax Allowance.....	2,250.00
Insurance.....	2,894.58

Balance — Income (Schedule A-1)..... 00.00

*Total* (Schedule B-13)..... \$164,162.47

*SCHEDULE B-13 B*  
UNDERGRADUATE DORMITORY OPERATION

## Income:

Rentals (Net).....	\$225,969.00
Miscellaneous.....	3,138.07

*Total* (Schedule B-13)..... \$229,107.07

## Expense:

Salaries.....	\$105,977.79
Light, Heat, Power, Water.....	32,135.57
Repairs.....	18,220.21
Supplies (Net).....	7,276.04
Equipment.....	2,477.20
Laundry.....	5,066.38
Administration.....	4,199.38
Senior House Alterations.....	17,726.58
House Tax Allowance.....	3,500.00

*Total* (Schedule B-13)..... \$196,579.15  
Balance..... 32,527.92

*Total*..... \$229,107.07

## REPORT OF THE TREASURER

*SCHEDULE B-13 C*  
 WALKER MEMORIAL DINING SERVICE

## Income:

Cash.....	\$395,138.30
From Reserve Fund to Offset Deficit.....	2,055.17
<i>Total</i> (Schedule B-13).....	<u><u>\$397,193.47</u></u>

## Expense:

Food.....	\$242,324.51
Salaries.....	111,666.87
Light, Heat, Power, Water.....	10,834.75
Laundry.....	4,145.25
Equipment.....	6,430.47
Repairs.....	4,979.97
Administration.....	5,362.83
Occupancy.....	12,000.00
<i>Total Expense</i> .....	\$396,844.65
Add Decrease in Inventory at June 30, 1948.....	348.82
<i>Total</i> (Schedule B-13).....	<u><u>\$397,193.47</u></u>

*SCHEDULE B-13 D*  
 GRADUATE HOUSE DINING SERVICE

## Income:

Cash.....	<u><u>\$237,063.44</u></u>
<i>Total</i> (Schedule B-13).....	<u><u>\$237,063.44</u></u>

## Expense:

Food.....	\$153,569.79
Salaries.....	90,878.06
Light, Heat, Power, Water.....	3,891.42
Laundry.....	2,717.25
Equipment and Supplies.....	2,155.95
Repairs.....	3,198.92
Administration.....	3,731.45
<i>Total Expense</i> .....	\$260,142.84
Add: Decrease in Inventory at June 30, 1948.....	2,851.61
	<u><u>\$262,994.45</u></u>

## Deficit — Charged To:

General Administrative Expense(Schedule B-9)	25,931.01
<i>Total</i> (Schedule B-13).....	<u><u>\$237,063.44</u></u>

## SCHEDULE B-13 E

## BARRACKS DORMITORY OPERATION

## Income:

Rentals (Net).....	\$82,266.00
Miscellaneous.....	2,963.70
<i>Total</i> (Schedule B-13).....	<u>\$85,229.70</u>

## Expense:

Salaries.....	\$46,676.43
Light, Heat, Water.....	10,000.00
Repairs.....	2,841.16
Supplies (Net).....	4,696.47
Laundry.....	2,595.62
Equipment.....	1,010.81
Administration.....	1,387.72
Depreciation.....	15,121.49
House Tax Allowance.....	900.00
<i>Total</i> (Schedule B-13).....	<u>\$85,229.70</u>

## SCHEDULE B-13 F

## WOMEN'S DORMITORY OPERATION

## Income:

Rentals.....	<u>\$11,195.40</u>
--------------	--------------------

<i>Total</i> (Schedule B-13).....	<u>\$11,195.40</u>
-----------------------------------	--------------------

## Expense:

Salaries.....	\$2,669.39
Food.....	3,463.51
Real Estate Taxes.....	581.25
Light, Heat, Power, Water.....	1,224.58
Repairs.....	1,176.21
Supplies.....	445.10
Equipment.....	180.90
Laundry.....	235.70
Telephone and Insurance.....	249.60
Depreciation.....	500.00
House Tax Allowance.....	77.50
<i>Total</i> .....	\$10,803.74
Balance — Income (Schedule A-1).....	391.66
<i>Total</i> (Schedule B-13).....	<u>\$11,195.40</u>

## REPORT OF THE TREASURER

*SCHEDULE B-13 G*  
 WESTGATE — VETERANS' HOUSING

Income:	
Rentals .....	<u>\$59,900.83</u>
<i>Total</i> (Schedule B-13) .....	<u><u>\$59,900.83</u></u>
Expense:	
Real Estate Tax .....	\$12,425.00
Agency Commission .....	2,994.21
Electricity .....	5,443.11
Water .....	743.70
Insurance .....	784.76
Repairs .....	11,598.96
Administration .....	129.68
Depreciation .....	<u>20,778.70</u>
<i>Total</i> .....	<u>\$54,898.12</u>
Balance — Income (Schedule A-1) .....	<u>5,002.71</u>
<i>Total</i> (Schedule B-13) .....	<u><u>\$59,900.83</u></u>

*SCHEDULE B-13 H*  
 WESTGATE WEST — VETERANS' HOUSING  
 UNDER FEDERAL PUBLIC HOUSING AUTHORITY

Income:	
Rentals .....	<u>\$74,604.31</u>
<i>Total</i> (Schedule B-13) .....	<u><u>\$74,604.31</u></u>
Expense:	
Real Estate Tax .....	\$12,783.98
Repairs .....	10,881.97
Electricity .....	9,988.64
Water .....	917.70
Agency Commission .....	3,697.44
Administration .....	97.30
Liability Insurance .....	42.50
F.P.H.A. Land Rent .....	2,550.00
F.P.H.A. Reserve Allowance .....	4,536.64
F.P.H.A. Management Allowance .....	<u>1,478.21</u>
<i>Total</i> .....	<u>\$46,974.38</u>
Balance to United States Government .....	<u>27,629.93</u>
<i>Total</i> (Schedule B-13) .....	<u><u>\$74,604.31</u></u>

### A BRIEF DESCRIPTION OF THE ENDOWMENT AND OTHER 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. 38-59, Schedules A-3 to A-11.

- 801 ALBERT FUND, 1930-48. Balance \$4,510. 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 FUND (Alpha Zeta Chapter), 1935-1948. Balance \$5,512. Deposited for investment purposes only.
- 623 ANONYMOUS FUND (H), 1942-43, \$10,000. For general purposes of the Institute.
- 625 ANONYMOUS FUND (J), 1944-47, \$3,400. Gift for unrestricted purposes.
- 627 ANONYMOUS FUND (M), 1941, \$1,500. For general purposes of the Institute.
- 981 ANONYMOUS FUND (Q), 1945-48. Balance \$7,125. Subject to special annuity provisions.
- 629 ANONYMOUS FUND (R), 1946, \$57,150. Principal and income for general purposes of the Institute.
- 701 ANONYMOUS FUND (S), 1946, \$500,000. For research. Present balance, \$536,811.
- 983 ANONYMOUS FUND (X), 1944-45. Balance \$20,458. Subject to special annuity provisions.
- 984 ANONYMOUS (Y), 1948, \$100. For general purposes or a possible Faculty Fund.
- 897 ANONYMOUS FUND, 1924, \$1,052.50. Gift of member of Class of 1924 to accumulate until twenty-fifth reunion of Class in 1949. Balance \$3,024.02.
- 351 LOUIE G. APPLEBEE FUND, 1941-42, \$400. Bequest for assisting deserving students.
- 703 APPLIED MATHEMATICS FUND, 1943. Balance \$22,617. Appropriated from surplus to provide support for postwar program.
- 101 GEORGE ROBERT ARMSTRONG FUND, 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 FUND, 1943-1944. Balance \$28,779.80 used for new construction, 1947.

928 ASSOCIATION OF CLASS SECRETARIES FUND, 1940-45. Balance \$3,000. Held for investment purposes only.

802 ATHLETICS FIELDS SPECIAL FUND, 1948, \$1,000. Gift for improvements.

353 ELISHA ATKINS SCHOLARSHIP FUND, 1894, \$5,000. Bequest of Mary E. Atkins. For undergraduate scholarship.

201 WILLIAM PARSONS ATKINSON FUND, 1918, \$13,082. Bequest of Charles F. Atkinson as a memorial to father — for English Department of the Institute.

301 EDWARD AUSTIN FUND, 1899, \$360,000. Bequest. Interest paid to needy, meritorious students and teachers to assist in payment of studies.

985 AVOCAS FUND, 1946, \$76,200. In trust, subject to life annuities.

551 BABSON FUND, 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.

E. B. BADGER AND SONS CO. FUND, 1944, \$10,000. Gift. Used for new construction 1947.

357 THOMAS WENDELL BAILEY FUND, 1914, \$2,172. Bequest. Income used for rendering assistance to needy students in Department of Architecture.

359 CHARLES TIDD BAKER FUND, 1922, \$20,000. Bequest. One-half of net income for assistance of poor and worthy students and one-half to principal. Present balance \$37,400.49.

633 EDMUND DANA BARBOUR FUND, 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 WALTER S. BARKER FUND, 1927, \$10,000. Bequest. Income only available for purposes of the Library.

SIDNEY BARTLETT FUND, 1889, \$10,000. Bequest. Appropriated for new dormitories, 1924.

635 STEPHEN L. BARTLETT FUND, 1939-46, \$375,208.53. Bequest. Principal and income unrestricted — \$323,000 appropriated for educational plant, including swimming pool and current purposes. Present balance \$52,371.

203 ALBERT FARWELL BEMIS FUND, 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 \$308,768.

709 ALBERT FARWELL BEMIS FUND — 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. Present balance \$11,300.

ALBERT FARWELL BEMIS FUND, 1923, \$100,000. Gift. Used for new dormitory unit, 1923.

263 SAMUEL BERKE FUND, 1943-46, \$20,000. Gifts. Income for general purposes of the Institute Library.

803 BESS BIGELOW FUND, 1936-38, \$25,000. Anonymous donation for special purposes as suggested by donor, but subject to approval of President. Present balance \$37,810.

361 BILLINGS STUDENT FUND, 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 GEORGE BLACKBURN MEMORIAL FUND, 1931-48, \$962,030.22. Bequest of Harriette A. Nevins. Income for general purposes.

STANTON BLAKE FUND, 1889, \$5,000. Bequest. Used for educational plant, 1926.

363 HUSE TEMPLETON BLANCHARD FUND, 1947, \$6,551. Bequest. For undergraduate scholarships.

553 ROBERT A. BOIT FUND, 1921, \$5,000. Bequest. Income to stimulate students' interest in best use of English language through annual prizes of scholarships.

205 FRANK WALTER BOLES MEMORIAL FUND, 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 LEVI BOLES FUND, 1915, \$10,000. Bequest of Frank W. Boles in memory of father. Income for assistance of needy and deserving students.

303 WILLIAM SUMNER BOLLES FUND 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 FUND, 1945-48, \$25,546. Contributions for equipment of Map Room in new library building.

367 JONATHAN BOURNE FUND, 1915, \$10,000. Bequest of Hannah B. Abbe. Income to aid deserving students.

369 ALBERT G. BOYDEN FUND, 1931-48. Balance \$571,692.25. Bequest. Estate of Elizabeth R. Stevens. Income for scholarships. Preference to students from Fall River and Swansea, Mass.

105 CLARA H. BRIGGS FUND, 1941, \$12,514.55. Bequest. Income for general purposes.

953 MAJOR BRIGGS FUND, 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. Present balance \$36,029.

371 HARRIET L. BROWN FUND, 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 MALCOLM COTTON BROWN FUND, 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.

MATTHEW C. BRUSH FUND, 1946, \$31,395.74. Bequest. Used for construction of Campus Room at Graduate House.

582 BURSAR'S FUND, 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. Present balance \$36,226.38.

207 SAMUEL CABOT FUND, 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.

MARY A. CARLETON FUND, 1946, \$14,456.48. Bequest for general purposes of the Institute. Appropriated for buildings, 1947.

792 CARNEGIE S. A. L. CENTER FUND, 1948, \$25,000. Gift toward the support of a Center for Scientific Aids to Learning.

107 JAMES A. CARNEY FUND, 1944-45, \$17,170.01. Bequest. Income for general purposes.

HOWARD A. CARSON FUND, 1932, \$1,000. Bequest. Used for new equipment.

373 MABEL BLAKE CASE FUND, 1920, \$25,000. Bequest of Caroline S. Freeman. Income to aid deserving students (preferably women) who are in need of assistance.

375 NINO TESHER CATLIN FUND, 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 \$2,265.

713 CENTER OF ANALYSIS FUND, 1945. Balance \$21,646. Transferred from current operating fund as a reserve — for investment purposes only.

209 WILLIAM E. CHAMBERLAIN FUND, 1917-19, \$7,309. Bequest. Income used for Department of Architecture.

307 FRANCIS W. CHANDLER FUND, 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.

WILLIAM L. CHASE FUND, 1925, \$11,590.09. Bequest. \$7,500 appropriated for Homberg Infirmary, 1927. Balance used for educational plant, 1928.

715 CHEMICAL ENGINEERING — BADGER FUND, 1945, \$20,000. Gift for use of Department.

717 CHEMICAL ENGINEERING PRACTICE FUND, 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. Present balance \$270,524.

575 EDNAH Dow CHENEEY FUND, 1905-06, \$13,965. Bequest. Income for maintenance and care of Margaret Cheney Room for women students.

109 CHARLES CHOATE FUND, 1906-21, \$35,858.15. Bequest. Income for general purposes.

793 FRANK HARVEY CILLEY FUND, 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. Present balance, \$85,392.

377 LUCIUS CLAPPE FUND, 1905, \$4,900. Bequest. Income to worthy students who may not be able to complete their studies without help.

804 A. V. CLARKE SCHOLARSHIP FUND, 1948, \$1,462.50. Gift. Principal and interest for student aid.

795 CLASS OF 1874 FUND, 1934, \$287.55. For purposes of the Library.

881 CLASS OF 1887 FUND, 1941-46. Balance, \$4,343. Held for use of Class and for final distribution as provided in Declaration of Trust.

883 CLASS OF 1889 FUND, 1947. Balance \$174. Held for special purposes.

379 CLASS OF 1895 MEMORIAL FUND, 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 FUND, 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.

583 CLASS OF 1898 FUND. Balance \$12,920. By subscription of certain members of class from 1927-31. Income only for scholarship loans, as authorized by committee of Class.

555 CLASS OF 1904 FUND, 1925, \$447. Contributions received by Professor Gardner for Architectural Department prizes.

383 CLASS OF 1909 SCHOLARSHIP FUND, 1934-48. Balance \$4,423. Accumulated through contributions and from proceeds of life insurance policies. Principal to be invested, income available for scholarship aid with preference to direct descendants of members of Class of 1909.

885 CLASS OF 1914 FUND. Balance \$1,017. Held for investment purposes only.

805 CLASS OF 1917 FUND. Present balance \$1,208.

806 CLASS OF 1918 (ORGAN) FUND. Balance \$149. Subscriptions by Class members toward purchase of an organ for Walker Memorial.

889 **CLASS OF 1919, SPECIAL FUND, 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 FUND, 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 FUND, 1946-7,** Balance \$4,697. Contributed for Class Twenty-Fifth Year Memorial Fund.

385 **CLASS OF 1922 SCHOLARSHIP FUND, 1942-48.** Balance \$20,501. For scholarships.

387 **CLASS OF 1922 SPECIAL SCHOLARSHIP FUND, 1944-46.** Balance \$4,800. For special scholarships.

389 **CLASS OF 1938 SCHOLARSHIP FUND, 1938-48.** Balance \$962. Gift of Class of 1938. Income for scholarships.

895-927 inc. **CLASS ENDOWMENT FUNDS (See pages 222 to 225).**

*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 Renuions. 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.

281 **SAMUEL C. COBB FUND, 1916, \$36,551.** Bequest. Income for salaries of President and professors.

393 **FRED L. AND FLORENCE L. COBURN FUND, 1932, \$5,000.** Bequest. Income to aid needy and worthy students, preference being given to those residing in Somerville, Mass.

397 **COFFIN MEMORIAL FUND, \$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 FUND, 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 FUND, 1917, \$12,384.97.** Bequest. Used for new dormitories, 1924.

641 **HELEN COLLAMORE FUND, 1947, \$49,500.** Bequest. For unrestricted use.

**SAMUEL P. COLT FUND, 1920-22, \$20,000.** Bequest. Used for new dormitories, 1924.

399 **WILLIAM A. CONANT FUND, 1943-48, \$153,410.** 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 ARTHUR J. CONNER FUND, 1941-48. Balance \$211,911. The total of gifts and the residue of two trusts for construction of a dormitory.

401 ALBERT CONRO FUND, 1943, \$25,000. Bequest for scholarship.

403 GEORGE R. COOKE FUND, 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 COÖPERATIVE FOUNDATION FUND, 1945, \$1,577.44. Cash surrender value of first insurance policy taken under Plan. Use of fund not yet determined.

719 COSMIC TERRESTRIAL RESEARCH FUND, 1938-48, \$86,100. Gifts (anonymous) for special research. Present balance \$31,552.

CRANE AUTOMOTIVE FUND, 1928, \$5,000. Gift of Henry M. Crane. Used for purchase of equipment for Aeronautical Laboratory, 1928-40.

405 LUCRETIA CROCKER FUND, 1916, \$50,551. Bequest of Matilda H. Crocker. Income for establishment of scholarships for women in memory of sister.

211 CROSBY HONORARY FUND, 1916, \$1,633. Contributions in honor of William Otis Crosby (Professor Emeritus). Income for upbuilding of the Geology Department, especially its collections.

EDWARD CUNNINGHAM FUND, 1917, \$15,000. Gift. For new building and equipment at Civil Engineering Summer Camp, Maine.

311 DALTON GRADUATE CHEMICAL FUND, 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.

WILLIAM S. B. DANA FUND, 1946, \$500. Bequest for general purposes. Used for construction, 1947.

407 ISAAC W. DANFORTH FUND, 1903, \$5,000. Bequest of James H. Danforth. Income for scholarship purposes as a memorial to brother.

N. LORING DANFORTH FUND, 1937, \$5,000. Bequest. Principal and income for general purposes. Appropriated for educational plant, 1940.

585 DEAN'S FUND, 1924, \$3,350. Contributions. To be loaned by Dean to needy students. Present balance \$12,008.

587 CARL P. DENNETT FUND, 1926, \$500. Gift. To be loaned to students, preferably Freshmen, at discretion of President. Present balance \$1,967.

807 DAVIS R. DEWEY MEMORIAL FUND, 1943, \$500. To provide a suitable memorial for the late Professor Dewey.

409 ANN WHITE DICKINSON FUND, 1898, \$40,000. Bequest. Income used to establish free scholarships. Such persons enjoying benefit shall be worthy young men of American origin.

411 DORMITORY FUND, 1903, \$2,857. Contributions. Income for scholarship purposes.

GEORGE B. DORR FUND, 1890, \$49,573.47. Bequest. Appropriated for educational plant, 1918.

213 SUSAN E. DORR FUND, 1914, \$95,955. Bequest. Income for use and benefit of Rogers Physical Laboratory.

808 DRAMA CLUB THEATRE FUND, 1938, \$400. Deposited by Drama Club of M.I.T. toward future purchase of theatrical equipment.

111 EBEN S. DRAPER FUND, 1915, \$100,000. Bequest. Specially invested. Income used for general purposes of the Institute. Present balance \$107,485.41.

CHARLES C. DREW FUND, 1920, \$305,171.52. Bequest. Appropriation to educational plant, 1921-24.

413 THOMAS MESSINGER DROWN FUND, 1928, \$50,000. Bequest of Mary Frances Drown. Income to establish scholarships for deserving undergraduate students.

CARBON P. DUBBS FUND, 1943, \$5,000. Gift. For general purposes. Used for new construction, 1947.

113 COLEMAN DU PONT FUND, 1931-38, \$221,325. Bequest. Income for support and maintenance of the Institute.

PIERRE DU PONT FUND, 1938, \$25,000. Gift. Used for new equipment.

313 RICHARD CHICHESTER DU PONT MEMORIAL FUND, 1946, \$108,772. Contributions by members of his family to establish Memorial Fellowship in Aerodynamics or Meteorology.

115 EASTMAN CONTRACT FUND, 1924, \$9,498,869. Gift of George Eastman. Income for general purposes of the Institute.

603 GEORGE EASTMAN BUILDING FUND, 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. Present balance \$130,373.

215 GEORGE EASTMAN FUND, 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 CHARLES W. EATON FUND, 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 FUND, 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 MARTHA ANN EDWARDS FUND, 1890, \$30,000. Bequest. Income for general purposes.

722 ELECTRONICS, INDUSTRIAL FELLOWSHIPS IN, 1946-47, \$35,000. Contributions for Fellowships.

721 ELECTRONICS, RESEARCH LABORATORY OF, 1943. Balance \$56,952. Appropriations from surplus for postwar research.

797 ARTHUR ELSON FUND, 1944, \$500. For the purpose of special book purchases for the Library.

415 FRANCES AND WILLIAM EMERSON FUND, 1930, \$100,000. Gift. Income for aid of regular and special students in Department of Architecture.

557 WILLIAM EMERSON PRIZE FUND, 1939, \$2,145. Contributed by friends as a fund for prizes to architectural students.

F. W. EMERY FUND, 1916, \$120,000. Bequest. Used for buildings and equipment.

123 WILLIAM ENDICOTT FUND, 1916, \$25,000. Bequest. Income for general purposes.

995 ENDOWMENT RESERVE FUND, 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. (Page 175, this report.) Present balance \$2,396,649.93.

ARTHUR F. ESTABROOK FUND, 1923-38, \$100,800. Bequest. Used for purchase of land and equipment.

IDA F. ESTABROOK FUND, 1926-37, \$22,157.51. Bequest. Used for educational plant.

417 FARNSWORTH FUND, 1889, \$5,000. Bequest of Mary E. Atkins. Income for scholarships.

HENRIETTA G. FITZ FUND, 1930, \$10,000. Bequest. For general purposes. Appropriated for educational plant, 1940.

217 HAROLD H. FLETCHER FUND, 1942, \$10,000. Bequest under will of Herbert H. Fletcher. To endow a bed in the Institute's Infirmary.

419 CHARLES LEWIS FLINT FUND, 1889, \$5,000. Bequest. Income for support of worthy student, preference given graduate of English High School, Boston.

207 CHARLES LEWIS FLINT FUND, 1889, \$5,000. Bequest. Income for purchase of books and scientific publications for Library.

723 FOOD TECHNOLOGY FUND, 1945-46, \$210,000. Contribution for research. Present balance \$145,998.

283 SARAH H. FORBES FUND, 1901, \$500. Gift of Malcolm Forbes as memorial to mother. Income for salaries.

421 SARAH S. FORBES FUND, 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.

125 FRANCIS APPLETON FOSTER FUND, 1922, \$1,000,000. Bequest. Income for purposes of Institute.

127 JOHN W. FOSTER FUND, 1938, \$299,650. Bequest. Income for purposes of the Institute.

605 MATILDA A. FRASER FUND, 1942, \$859.89. Bequest. Towards construction of a women's dormitory.

129 ALEXIS H. FRENCH FUND, 1930, \$5,000. Bequest. Income for general purposes of Institute.

CAROLINE L. W. FRENCH FUND, 1916, \$100,843.34. Bequest. Used for new equipment, 1928.

131 JONATHAN FRENCH FUND, 1915-16, \$25,212.48. Bequest of Caroline L. W. French. For purposes of the Institute.

133 HENRY CLAY FRICK FUND, 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 PHILIP JACOB FRIEDLANDER FUND, 1945, \$1,000. Gift. Income to be used to aid qualified students in need of assistance.

WALTER L. FRISBIE FUND, 1923, \$7,614.98. Bequest. Used for educational plant, 1928.

649 ERASTUS C. GAFFIELD FUND, 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 \$88,000 appropriated for miscellaneous purposes.

285 GEORGE A. GARDNER FUND, 1898, \$20,000. Gift. Income for salaries of instructors.

607 GAS TURBINE LABORATORY FUND, 1946, \$500,000. Contributions from five industrial corporations for construction and operation of new laboratory.

135 GENERAL ENDOWMENT FUND, 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 NATHAN R. GEORGE FUND, 1943, \$29,197.37. Bequest. Income to be loaned to undergraduates under certain administrative conditions. Balance \$34,414.

425 NORMAN H. GEORGE FUND, 1919-25, \$89,453. Bequest. Income for assistance of worthy and needy students.

427 ARTHUR B. GILMORE FUND, \$10,000, 1941. Bequest. Net income to assist needy students, members of Beta Theta Pi — not more than two students in any one year.

CHARLES W. GOODALE FUND, 1929, \$50,000. Bequest. Used for new dormitory, 1930.

429 BARNETT D. GORDON FUND, 1942-44, \$10,000. The income to be used as scholarships for deserving students.

137 ELIOT GRANGER FUND, 1936, \$21,568.43. Bequest under will of Mary Granger in memory of deceased son. Income for the general purposes of the Institute.

725 JOHN A. GRIMMONS FUND, 1930-48, Balance \$5,266. 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.

727 GROUP DYNAMICS RESEARCH FUND, 1945-47. Balance \$8,175. Gift. For conduct of research in this field.

431 LUCIA G. HALL SCHOLARSHIP FUND, 1945-46. Balance \$54,413. Bequest of Louise K. Gunn. The income only used for aid of worthy students.

433 HALL-MERCER SCHOLARSHIP FUND, 1940-48. Balance \$76,299. Bequest under will of Alexander G. Mercer. The income to be used for tuition and other necessary expenses of students.

GEORGE WYMAN HAMILTON FUND, 1935, \$54,414.15. Appropriated for new equipment, 1937-39.

729 HARVEY NONFERROUS FORGING FUND, 1946, \$10,000. For research.

435 JAMES H. HASTE FUND, 1930-45. Balance \$241,074. Bequest. Income for aid of deserving students of insufficient means.

139 CHARLES HAYDEN FUND, 1937, \$1,000,000. Bequest of Charles Hayden. Income for general educational purposes of the Institute.

CHARLES HAYDEN FUND, 1925, \$42,700.76. Gift. Used for educational plant.

CHARLES HAYDEN FUND, 1927, \$100,000. Gift for new dormitories.

609 CHARLES HAYDEN MEMORIAL LIBRARY FUND, 1945-47, \$2,200,000. Gift of Charles Hayden Foundation for new library.

437 CHARLES HAYDEN MEMORIAL SCHOLARSHIP FUND, 1940-43, \$100,000. From the Charles Hayden Foundation. For entrance scholarships. Preference given to students from Boston and New York.

439 CHARLES HAYDEN MEMORIAL SCHOLARSHIP FUND, SPECIAL 1947, \$11,078.36. Accumulation of income of Scholarship Fund (No. 437).

731 CHARLES HAYDEN FOUNDATION DENTAL CLINIC FUND, 1940, \$10,000. To assist in establishment of and necessary equipment for a Dental Clinic available to entire student body, faculty and employees.

287 JAMES HAYWARD FUND, 1866, \$18,800. Bequest. Income for salaries.

JAMES W. HENRY FUND, 1935, \$8,226. Bequest. Used for new equipment.

651 WILLIAM T. HENRY FUND, 1943-48. Present balance \$35,210. Income from Trust Fund held outside M. I. T. Fund for general purposes.

987 JOSEPH HEWETT FUND, 1921-24, \$200,000. In Trust subject to special annuity provisions. Present balance \$214,472.

315 CLARENCE J. HICKS MEMORIAL FUND, 1946, \$20,000. For fellowship in Industrial Relations.

141 JOHN MARSHALL HILLS FUND, 1941-42, \$366,430.96. Bequest. Income for general purposes of M. I. T.

218 EDITH MORRILL HOBBS FUND, 1948, \$5,000. Bequest. Income for purchase of books on Architecture.

316 EDITH MORRILL HOBBS FELLOWSHIP FUND, 1948, \$5,000. Bequest. Income for aid to graduate students in Architecture.

FREDERICK S. HODGES FUND, 1928, \$57,316.26. Bequest. Appropriated for new dormitories.

142 WALTER W. HODGES FUND, 1946, \$36,797.20. Bequest. Income only, for general purposes.

ELLIS HOLLINGSWORTH FUND, 1940, \$10,000. Bequest for unrestricted use. Used for new construction, 1947.

441 GEORGE HOLLINGSWORTH FUND, 1916, \$5,000. Bequest of Rose Hollingsworth. Income used for scholarship.

809 OSCAR H. HOROVITZ FUND, 1947, \$1,000. Gift for special purposes.

653 ERNEST R. HOSBACH MEMORIAL FUND, 1948, \$1,000. Gift of Frederick W. Hosbach in memory of his son. For general purposes of Institute.

559 ROGER DEFRIEZ HUNNEMAN PRIZE FUND, 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.

ABBY W. HUNT FUND, 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 SAMUEL P. HUNT FUND, 1946, \$7,496. Gift. For undergraduate scholarships.

445 T. STERRY HUNT FUND, 1894, \$3,000. Bequest. Income to a student in Chemistry.

447 WILLIAM F. HUNTINGTON FUND, 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 FUND, 1946. Balance \$22,987. Gifts toward construction of new building.

733 INDUSTRIAL ECONOMICS FUND, 1940-48. Balance \$36,892. Contributions in support of Graduate Program in Economics.

737 INDUSTRIAL FUND, 1924-46. 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 Coöperation and Research. Used for purchase of new equipment and support of special research. (Page 175 this report.)

739 INDUSTRIAL RELATIONS SECTION FUND, 1938-48. Balance \$182,722. Contributions in support of the Industrial Relations Section of the Department of Economics.

741 INSTRUMENTATION FUND, 1943-45. Balance \$271,093. For research in the field of instrument design.

INSURANCE ENGINEERING FUND, 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.

CHARLES C. JACKSON FUND, 1912, \$25,000. Gift. Used for purchase of new site.

143 JAMES FUND, 1898-99, \$163,654. Bequest of Julia B. H. James. Income for development of M. I. T.

449 DAVID L. JEWELL FUND, 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 EDWARD A. JONES FUND, 1947, \$41,254. Bequest for scholarships.

317 REBECCA R. JOSLIN FUND, 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 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 WILLIAM R. KALES FUND, 1944, \$75,001.48. Gift of Mrs. Kales and family. To establish and maintain Eye Clinic in Medical Department.

WILLIAM R. KALES FUND, 1925-27, \$11,000. Gift for new dormitories.

659 KELLER FUND, 1948, \$100. Gift of Carl T. Keller. For expenditures under the direction of Doctor Tate.

221 ARTHUR E. KENNELLY FUND, 1940-44, \$67,058. Bequest. Income only to be used for the study of mathematics directed toward physics or physical applications.

CARRIE BELLE KENNEY FUND, 1945, \$1,000. Bequest. Used for new construction, 1947.

743 A. NORTON KENT FUND, 1944-47, \$500. Gift. For research in Physics. Appropriated, 1947.

269 WILLIAM HALL KERR FUND, 1896, \$2,000. Gift of Alice M. Kerr. Income for the annual purchase of books and drawings in machine design.

DAVID P. KIMBALL FUND, 1924, \$10,000. Bequest. Used for educational plant, 1926.

455 AMELIA S. KNEISNER SCHOLARSHIP FUND, 1945-48, \$16,000. Gift of the family. Income to provide scholarship aid to meritorious or needy students — preference to students from Danbury (Connecticut).

811 KURRELMAYER FUND, 1945-46, \$2,033. Contributions toward Memorial Fund.

591 LAMSON-VIRGIN LOAN FUND, 1946-48, \$10,600. Bequest. Income to be used in aiding worthy students, with provision for repayment.

319 WILFRED LEWIS FUND, 1930, \$5,000. Gift of Emily Sargent Lewis. Income for maintenance of graduate student in Mechanical Engineering.

613 LIBRARY BUILDING FUND, 1946, \$1,000. Gift toward new building.

799 LIBRARY GROWTH FUND, 1943-47. Balance \$4,729. For investment purposes.

577 JACOB AND JENNIE LICHTER FUND, 1944-48, \$10,475. Gift. To accumulate income and ultimately add to bequest.

457 WILLIAM LITCHFIELD FUND, 1910, \$5,000. Bequest. Income for scholarship on competitive examination.

223 ARTHUR DEHON LITTLE MEMORIAL FUND, 1937. Balance \$157,460. 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 \$132,695.22 at June 30, 1948.)

813 ARTHUR D. LITTLE MEMORIAL LECTURESHIP FUND, 1944, \$6,100. Gift of Arthur D. Little, Inc., for purpose indicated.

HIRAM H. LOGAN FUND, 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.

JOHN M. LONGYEAR FUND, 1915-16, \$30,000. Gift. Used for land and equipment, 1916.

459 ELISHA T. LORING FUND, 1890, \$5,000. Bequest. Income for assistance of needy and deserving pupils.

461 LOWELL INSTITUTE FUND, 1923, \$2,000. Gift from alumni of Lowell Institute to establish scholarship for its graduates.

225 KATHARINE BIGELOW LOWELL FUND, 1895, \$5,000. Gift of Augustus Lowell in honor of Mrs. Lowell. Income for purchase of books and apparatus for Department of Physics.

ARTHUR T. LYMAN FUND, 1913, \$5,000. Bequest. Used for educational plant, 1926.

JAMES McGREGOR FUND, 1913, \$2,500. Bequest. Used for educational plant, 1926.

814 JOHN R. MACOMBER FUND, 1948, \$3,780. Gift. For general expenses.

463 RUPERT A. MARDEN FUND, 1933, \$2,000. Gift (anonymous). Income to aid worthy student — Protestant and of American origin — preference to student taking Coöperative Course in Electrical Engineering (Course VI-A).

289 WILLIAM P. MASON FUND, 1868, \$18,800. Bequest. Income to support a professorship in the Institute.

M. I. T. ALUMNI FUND, 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 FUND, 1938-42. Total subscription \$400,000. Appropriated for Briggs Field House, for Athletic Field, and for swimming pool.

931 M. I. T. ALUMNI, CLASS OF 1898, 1944-47, Balance \$9,761. Gifts to provide annual contribution to Alumni Fund from earned income.

815 M. I. T. ALUMNI FUND, 1940-48. 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 \$530,228. In 1947, \$500,000 was applied to the new Senior Dormitory construction, and \$10,000 toward new Tennis Courts.

819 M. I. T. ALUMNI FUND, 1948-49. Net subscriptions to date of the ninth year of operation. Balance \$76,652.

929 M. I. T. ALUMNI ASSOCIATION PERMANENT FUND, 1929-46. Balance \$106,536. Deposited with M. I. T. for investment purposes only.

465 M. I. T. CLUB OF CHICAGO FUND, 1944-48, \$6,355. Gift. For scholarships.

821 M. I. T. TEACHERS' INSURANCE FUND, 1928-48. Refund of premiums paid on Group Insurance under M. I. T. Pension and Insurance Plan held at interest and accumulated. Appropriated for special pension purposes only. Balance \$151,061.

960 M. I. T. WOMEN'S DORMITORY FUND, 1948, \$1,075.25. Contributions for additional equipment and replacements.

467 MARGARET A. MATHEWS FUND, 1947, \$111,682. Bequest. For scholarship. For women students who expect to become teachers.

749 JOHN LAWRENCE MAURAN FUND, 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. Balance \$3,455.

227 GEORGE HENRY MAY FUND, 1914, \$4,250. Gift, Income for benefit of Chemical Department.

469 GEORGE HENRY MAY FUND, 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 THOMAS McCAMMON FUND, 1930, \$15,000. Bequest in honor of father, James Elder McCammon. Income available for general purposes.

561 JAMES MEANS FUND, 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 FUND. Appropriation by M. I. T. to assist needy students in payment of medical and hospital bills. Present balance \$5,377.

CHARLES E. MERRILL FUND, 1943, \$2,300. Used for new construction, 1947.

615 METALS PROCESSING LABORATORY FUND, 1947-48, \$68,204. Contribution. For construction and equipment.

METALLURGY, SPECIAL FUND, 1938, \$10,000. Subscription (anonymous) used for special equipment for Department of Metallurgy.

665 ALICE BUTTS METCALF FUND, 1945, \$100,000. Bequest for unrestricted use. \$50,000 used for new construction, 1947.

579 EDWARD F. AND MARY R. MILLER FUND, 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.

HIRAM F. MILLS FUND, 1923, \$10,175. Bequest. Appropriated for educational plant, 1937.

471 ROBERT W. MILNE FUND, 1943, \$75,856. Bequest. Income for assistance of worthy and needy students.

751 SUSAN MINNS FUND, 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 JAMES H. MIRRLEES FUND, 1886, \$2,500. Gift of James Buchanan Mirrlees. Income to such student in third or fourth year Mechanical Engineering most deserving pecuniary assistance.

823 JOHN D. MITSCH MEMORIAL FUND, 1946. Balance \$2,739. Contributions toward memorial and children of the late Professor Mitsch.

753 FORRIS JEWETT MOORE FUND, 1927-31, \$32,000. Gift of Mrs. F. Jewett Moore as a memorial to husband. Income or principal (under special conditions) expendable 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. Present balance \$30,834.

321 MOORE FUND, 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 FRED W. MORRILL FUND, 1941, \$2,000. Bequest. Income for financial assistance to students.

149 KATE M. MORSE FUND, 1925, \$25,000. Bequest. Income for general purposes of M. I. T.

151 EVERETT MORSS FUND, 1934, \$25,000. Bequest. Income for general purposes of M. I. T.

EVERETT MORSS, 1916, 1921-25, \$35,000. Gifts. For Walker Memorial murals by E. H. Blashfield.

825 HENRY A. MORSS NAUTICAL FUND, 1937, \$3,500. Gift for maintenance of sailing activities and sailing pavilion.

667 JOHN WELLS MORSS FUND, 1940, \$50,000. Bequest. Principal and income for general purposes.

ALBERT H. MUNSELL FUND, 1920, \$7,908.28. Bequest. Used for educational plant, 1928.

MARGARET A. MUNSELL FUND, 1920, \$1,105.32. Bequest. Used for educational plant, 1928.

NATHANIEL C. NASH FUND, 1881, \$10,000. Bequest. Appropriated for new dormitories, 1924.

685 NEW ERA FUND, 1947-48. Present balance, \$29,025. Contributions for future development.

477 NICHOLS FUND, 1895, \$5,000. Bequest of Betsy F. W. Nichols. Income for scholarship to student in Chemistry.

479 CHARLES C. NICHOLS FUND, 1904, \$5,000. Bequest. Income for scholarship.

WILLIAM E. NICKERSON FUND, 1928, \$50,000. Gift. Principal and income used to finance chair in Humanics, 1928-40.

755 NUCLEAR SCIENCE AND ENGINEERING FUND, 1947. Present balance \$47,300. For research.

MOSES W. OLIVER FUND, 1921, \$12,870.49. Used for educational plant, 1938.

CHRISTEL ORVIS FUND, 1942, \$539.42. Bequest. Used for new construction, 1947.

271 GEORGE A. OSBORNE FUND, 1928, \$10,000. Bequest. Income for benefit of mathematical library.

481 JOHN FELT OSGOOD FUND, 1909, \$5,000. Bequest of Elizabeth P. Osgood in memory of husband. Income for scholarship in Electricity.

757 F. WARD PAINE FUND, 1944, \$10,000. Bequest. For special research in Geology.

827 CHARLES FRANCIS PARK MEMORIAL FUND, 1947, \$5,500. For investment purposes.

758 THEODORE B. PARKER MEMORIAL FUND, 1945-46, \$3,000. For special graduate scholarships.

483 GEORGE L. PARMELEE FUND, 1921, \$17,641. Bequest. Income for tuition of either special or regular worthy students.

EMERETTE O. PATCH FUND, 1935-38, \$8,240.84. Bequest. \$5,964 used for special expenditures, 1938-40. Balance for new construction, 1947.

FRANK E. PEABODY FUND, 1920, \$51,467.35. Bequest. Used for educational plant, 1921 and 1926.

484 FRANK STETSON PECKER SCHOLARSHIP FUND, 1948, \$59,731.18. Bequest.

FRANCES M. PERKINS FUND, 1912, \$122,569.67. Bequest. Used for educational plant.

H. B. PERKINS FUND, 1940, \$250. Bequest. Used for new equipment, 1940.

153 RICHARD PERKINS FUND, 1887, \$50,000. Bequest. Income for general purposes.

485 RICHARD PERKINS FUND, 1887, \$50,000. Bequest. Income for scholarships.

325 WILLARD B. PERKINS FUND, 1898, \$6,000. Bequest. Income to be expended every fourth year for traveling scholarships in architecture.

231 EDWARD D. PETERS FUND, 1924, \$5,000. Bequest of Elizabeth W. Peters. Income for the Department of Mineralogy.

E. S. PHILBRICK FUND, 1922, \$36,213.92. Bequest. Used for educational plant, 1926.

861 PHOTO SERVICE RESERVE FUND, 1945. Present balance, \$17,411. For equipment and maintenance of Photo Service.

PRESTON PLAYER FUND, 1933, \$20,000. Bequest. Used for educational plant, 1938.

233 PRATT NAVAL ARCHITECTURAL FUND, 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.

829 PRESIDENT'S FUND, SPECIAL, 1941-44, \$10,500. Gifts. Principal and/or income to be used by President as desired.

CHARLES O. PRESCOTT FUND, 1935, \$30,640.78. Principal and income used for educational plant, 1938.

234 RAYMOND B. PRICE MEMORIAL FUND, 1948, \$5,000. Gift. Income for research in chemistry or related sciences.

487 FLORENCE E. PRINCE FUND, 1943, \$7,689.28. Bequest. Income for aid to worthy students.

759 RADIOACTIVITY CENTER FUND, 1945. Balance, \$31,423. Appropriation for postwar research.

155 J. W. & B. L. RANDALL FUND, 1897, \$83,452. Bequest of Belinda L. Randall as a permanent fund or in erecting a building with those names.

489 THOMAS ADELBERT READ FUND, 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 WILLIS WARD REEVES FUND, 1946-47, \$2,500. For undergraduate scholarships.

863 RESERVE FOR USE OF FACILITIES FUND, 1945-47. Balance \$145,999. Appropriated for renovation or improvement of physical plant and facilities. (See page 175 of this Report.)

493 CHARLES A. RICHARDS FUND, 1939, \$31,719.32. Bequest. Income only to be used for assistance of poor Protestant students in the Institute.

235 ELLEN H. RICHARDS FUND, 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 FUND, 1929. Balance of subscriptions from friends for portrait of Professor Robert Hallowell Richards available for the Department of Metallurgy. Present balance \$945.

237 CHARLOTTE B. RICHARDSON FUND, 1891, \$30,000. Bequest. Income to support of Industrial Chemical School.

495 JOHN ROACH SCHOLARSHIP FUND, 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.

RUSSELL ROBB FUND, 1928, \$28,750. Bequest. Appropriated for new dormitories, 1930.

ROCKEFELLER FOUNDATION RESEARCH FUND, 1931-36, \$170,000. Contributed and expended for Research in Science Departments over period of five years.

291 HENRY B. ROGERS FUND, 1873, \$25,000. Gift. Income for salaries of one or more professors or instructors.

327 HENRY BROMFIELD ROGERS FUND, 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 MINNIE HEMPEL ROGERS FUND, 1945, \$1,195.04. Bequest for student loans.

ROBERT E. ROGERS FUND, 1886, \$7,600. Bequest in memory of his brother, William B. Rogers. Used for new equipment, 1940.

496 WILLIAM BARTON ROGERS FUND. 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 WILLIAM BARTON ROGERS MEMORIAL FUND, 1883-84-85, \$250,225. Contributions from 91 persons. Income for support of Institute.

241 WILLIAM BARTON AND EMMA SAVAGE ROGERS FUND, 1937, \$102,064.18. Bequest of Dr. Francis H. Williams. 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 \$186,595.

243 FRANCIS E. ROPER FUND, 1936, \$2,000. Bequest. Income for use in Department of Mechanical Engineering.

273 ARTHUR ROTCH ARCHITECTURAL FUND, 1895, \$5,000. Bequest. Income for Library or collection of Department of Architecture.

245 ARTHUR ROTCH FUND, 1895, \$25,000. Bequest. Income for general purposes of Department of Architecture.

565 ARTHUR ROTCH FUND, 1895, \$5,000. Bequest. Income for annual prize to student in regular course in Architecture graduating highest in class.

567 ARTHUR ROTCH SPECIAL FUND, 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 RICHARD LEE RUSSEL FUND, 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 WILLIAM PATRICK RYAN MEMORIAL FUND, 1935, \$3,557. Contributed by friends of Professor Ryan. Income for scholarship in Chemical Engineering.

831 WILLIAM PATRICK RYAN SPECIAL FUND, 1933. Balance \$449. Appropriation. Educational fund for three children of late Prof. W. P. Ryan.

569 HENRY WEBB SALISBURY FUND, 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 FUND, 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 \$68,236.87.

331 HENRY SALTONSTALL FUND, 1901, \$10,000. Bequest. Income to aid one or more needy students.

333 JAMES SAVAGE FUND, 1873, \$10,000. Bequest. Income for scholarships in institution "where my son-in-law, William B. Rogers, is President."

161 SAMUEL E. SAWYER FUND, 1895, \$4,764. Bequest. Income to be used in such a manner as will best promote interests of M. I. T.

499 JOHN P. SCHENKL FUND, 1922, \$43,821. Bequest of Johanna Pauline Schenkl in memory of father. Income for scholarships in Department of Mechanical Engineering.

THEODORE EDWARD SCHWARZ MEMORIAL FUND, 1937-38, \$4,391.86. Gift. Use for equipment of a room for map collection.

833 SEDGWICK MEMORIAL LECTURE FUND, 1930-48. Balance \$17,059. 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 W. T. SEDGWICK FUND, 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. Present balance \$55,757.

500 PAUL D. SEGHERS, JR., SCHOLARSHIP FUND, 1948, \$4,800. Bequest. Income for annual scholarship.

617 SENIOR HOUSE FUND, 1947, \$500,000. Gift of Alumni Association from accumulated Alumni Fund, for new dormitory unit.

765 SERVOMECHANISMS LABORATORY, 1943. Appropriation from Industrial Fund for postwar research. Present balance \$35,638.

767 SERVOMECHANISMS RESEARCH FUND. Present balance \$50,403. Proceeds from royalties for research.

RICHARD B. SEWALL FUND, 1919, \$30,000. Bequest. Used for educational plant, 1924.

501 FRANK ARNOLD SHERMAN FUND, 1947, \$10,000. Bequest. For scholarships with preference to Westerly, R. I., students.

503 THOMAS SHERWIN FUND, 1871, \$5,000. Gift of Committee on Sherwin Memorial Fund for free scholarship to graduate of English High School.

293 ALFRED P. SLOAN PROFESSORSHIP FUND, 1945-46, \$300,000. For endowment of Professorship in Industrial Management.

769 SLOAN AUTOMOTIVE LABORATORY FUND, 1929-47, \$215,000. Gift. Expended for automotive laboratory.

619 SLOAN FOUNDATION, 1946-47, \$71,667.00. Expended for automotive laboratory.

GEORGE A. SLOAN FUND, 1945, \$500. Gift. Used for new construction. 1947.

ELLEN VOSE SMITH FUND, 1930, \$25,000. Bequest. Used for new equipment.

505 G. H. MILLER SMITH FUND, 1946, \$10,000. For undergraduate scholarships.

507 HORACE T. SMITH FUND, 1930, \$33,019. Bequest. Income for scholarships. Preference to graduates of East Bridgewater (Mass.) and Bridgeport (Conn.) High Schools.

955 LILLIE C. SMITH FUND, 1937, \$4,800. Bequest to M. I. T. Women's Association for purposes of the Association. Present balance \$6,616.

957 WALTER B. SNOW FUND, 1938-47. Balance \$10,054. Reserve funds of Technology Christian Association. Deposited for investment purposes.

251 SOLAR ENERGY FUND, 1938, \$647,700. 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 FUND, 1931, \$600. Gift. Income for scholarship aid to a boy of New England ancestry.

771 SPECIAL RESEARCH (PADEFORD) FUND. Balance \$2730. For research.

511 ANNA SPOONER FUND, 1939-41, \$10,896. Bequest. Income to be used in assisting meritorious students.

163 ANDREW HASTINGS SPRING FUND, 1921, \$50,000. Bequest of Charlotte A. Spring in memory of nephew as a permanent fund. Income for general purposes.

CHARLES A. STONE, 1912-24, \$15,000. Gift for land. 1928, \$25,023.59. Gift for dormitories.

GALEN L. STONE, 1912, \$10,000. Gift for land. 1916, \$10,000. Gift for Mining Building.

165 GEORGE G. STONE FUND, 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 SAMUEL W. STRATTON PRIZE FUND, 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 FUND, 1945, \$25,000. Gift. To be used for fundamental studies relating to application of ultrasonics to biological problems.

595 SUMMER SURVEYING CAMP LOAN FUND, 1927, \$500. Gift of Lammot du Pont as a revolving loan fund to help students in Civil Engineering attend summer surveying camp. Present balance \$2,894.

775 HENRY N. SWEET FUND, 1936, \$8,036.50. Bequest. For industrial research. Present balance \$10,555.

167 SETH K. SWEETSER FUND, 1915, \$25,061. Bequest as a permanent fund. Income for general purposes.

335 SUSAN H. SWETT FUND, 1888, \$10,000. Bequest. Income to support a graduate scholarship.

777 SWIFT AMINO ACID FUND, 1947. Balance \$8,752. For research.

779 SWIFT PROTEIN RESEARCH FUND, 1944, \$20,000. Gift. For research.

337 GERARD SWOPE GRADUATE FELLOWSHIPS FUND, 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 HERMAN W. TAMKIN, 1948, \$13,500. Bequest. For general purposes.

835 TAU BETA PI MEMORIAL SCHOLARSHIP FUND, 1948, \$2,461. Contributions. For special scholarship purposes.

837 TEACHERS' FUND, 1899-1900. Gifts of \$50,000 each from Augustus Lowell and A. Lawrence Lowell to establish fund for use in case of retirement, disability, or death of members of instructing staff. Present balance \$121,514.

597 TECHNOLOGY LOAN FUND, 1930-41. Present balance \$1,946,274. Contributed by eighteen alumni to provide loans for students.

959 TECHNOLOGY MATRONS' TEAS FUND, 1916-22-31, \$8,500. Gifts of Mrs. F. Jewett Moore. Income for social activities of Technology Matrons.

839 TECHNOLOGY PRESS FUND, 1946. Balance \$98,841. Royalties on books published.

STURGIS H. THORNDIKE FUND, 1928, \$15,000. Bequest. Appropriated for new dormitories, 1930.

NATHANIEL THAYER, 1906, \$25,000. Gift. Used for educational plant.

295 NATHANIEL THAYER FUND, 1868, \$25,000. Gift. Income for professorship of Physics.

961 W. B. S. THOMAS FUND, 1935-37, \$2,000. 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 ELIHU THOMSON FUND, 1933-37, \$23,680. Contributed toward fund for Professorship in Electrical Engineering.

ELIHU THOMSON, 1912, \$25,000; 1924, \$5,000. Gift. Used for purchase of land.

339 FRANK HALL THORP FUND, 1932, \$10,000. Anonymous gift. Income for fellowship in Industrial Chemistry.

340 TILLOTSON FELLOWSHIP FUND, 1948, \$1,900. Gift. For Graduate Fellowship in Electrical Engineering.

598 WILLIAM H. TIMBIE LOAN FUND, 1948, \$4,860.50. Contributions to assist needy students in the Cooperative Course in Electrical Engineering.

513 SAMUEL E. TINKHAM FUND, 1924, \$2,338. Gift of Boston Society of Civil Engineers. Income to assist worthy student in Civil Engineering.

275 JOHN HUME TOD FUND, 1913, \$2,500. Gift of Mrs. F. Jewett Moore. Income for purchase of books of a humanistic character for General Library.

515 F. B. TOUGH FUND, 1924, \$465. Gift to extend financial assistance to worthy students in mining or oil production.

675 TOWLE FUND, 1944-46, \$10,500. Gift. For general purposes.

841 TOWLE LECTURE FUND, 1947, \$1,000. Gift. For special lectures.

781 NELLIE FLORENCE TREAT FUND, 1944, \$609. Bequest. For use in the field of Food Technology.

677 CHARLES A. TRIPP FUND, 1943, \$100,000. Bequest. For dormitory construction — or such other use of all or part as may seem advisable.

255 EDMUND K. TURNER FUND, 1915-41, \$206,814. Bequest. Income, three-quarters for Department of Civil Engineering and one-quarter to be added annually to principal. Present balance \$288,436.26.

LUCIUS TUTTLE FUND, 1916, \$50,000. Bequest. Used for educational plant, 1918.

783 TWENTIETH CENTURY-FOX FILM RESEARCH CORPORATION FUND, 1947, \$2,500. For research.

581 ALICE BROWN TYLER FUND, 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 FUND, 1935. Balance \$1,837. 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 FUND, ATHLETICS. Present balance \$22,522. Transferred from Undergraduate Dues (current operating account) to secure investment income.

969 UNDERGRADUATE DUES RESERVE FUND, CONTINGENT. Present balance, \$16,406. Transferred from Undergraduate Dues (current operating account) to secure investment income.

965 UNDERGRADUATE PUBLICATIONS TRUST FUND, 1935. Balance \$5,762. Deposited by Alumni Advisory Council on Publications for investment purposes only.

785 WILLIAM LYMAN UNDERWOOD FUND, 1932, \$16,252. Bequest. For benefit of Biology Department or otherwise for general purposes.

786 UNION CARBIDE & CARBON CORPORATION FUND, 1948, \$20,000. Gift for research in the fields of gas turbine research, nuclear science and engineering, and heat transfer and fluidized powder research.

517 SUSAN UPHAM FUND, 1892, \$1,000. Gift. Income to assist students deserving financial aid.

341 THOMAS UPHAM FUND, 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 **SAMSON R. URBINO FUND**, 1927, \$1,000. Bequest. Income for students who need assistance, Germans preferred.

277 **THEODORE N. VAIL FUND**, 1925-42, \$67,506. Bequest. For benefit of Vail Library.

343 **LUIS FRANCISCO VERGES FUND**, 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 FUND**, 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 **ANN WHITE VOSE FUND**, 1896, \$60,718. Bequest. Income for free scholarships for young men of American origin.

**HORACE W. WADLEIGH FUND**, 1916-20, \$22,143.14. Bequest. Appropriated for new buildings, 1924.

525 **ARTHUR M. WAITT FUND**, 1925, \$9,761. Bequest. Income for deserving students in second, third, and fourth year classes in Mechanical Engineering.

679 **GRANT WALKER FUND**, 1943-47, \$75,500. Bequest. For general purposes.

527 **GRANT WALKER FUND**, 1944, \$55,000. Bequest. Income for scholarships.

169 **WILLIAM J. WALKER FUND**, 1915-17, \$23,613. Bequest. Income for general purposes.

865 **WALKER MEMORIAL RESERVE FUND**. Present balance \$13,618. For purposes of repair and renovation of the building.

867 **WALKER MEMORIAL DINING SERVICE RESERVE FUND**. Present balance \$17,820. For repair and replacement of Dining Service Equipment.

257 **WILLIAM R. WARE FUND**, 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 **CHARLES D. WATERBURY FUND**, 1941. Present balance \$17,241. Bequest. For erection of a building as a memorial to above-named at such time as M. I. T. shall decide.

171 **HORACE HERBERT WATSON FUND**, 1930-48, \$36,057.19. Bequest of Elizabeth Watson Cutter as a permanent fund. Income for general purposes.

529 **JAMES WATT SCHOLARSHIP FUND**, 1942, \$13,259.72. Bequest under will of Jennie A. Douglas. For scholarships in Mechanical Engineering.

**EDWIN S. WEBSTER FUND**, 1912-24, \$15,000. Gift. Used toward purchase of land.

**FRANK G. WEBSTER FUND**, 1931, \$25,000. Bequest. Used for new construction, 1947.

531 LOUIS WEISBEIN FUND, 1915, \$4,000. Bequest. Income for scholarship for student in Architectural Department, preference to be given to a Jewish boy.

173 ALBION B. K. WELCH FUND, 1871, \$5,000. Bequest as a permanent fund. Income for general purposes.

CHARLES G. WELD FUND, 1907, \$15,000. Gift. Used for educational plant, 1924.

175 EVERETT WESTCOTT FUND, 1935-38, \$171,394. Bequest as a permanent fund. Income for general purposes.

177 MARION WESTCOTT FUND, 1938-48, \$244,152. Bequest for endowment. Income for general purposes.

533 FRANCES ERVING WESTON FUND, 1912-31, \$5,000. Bequest. Income to aid a native-born American Protestant girl of Massachusetts.

535 SAMUEL MARTIN WESTON FUND, 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.

ALEXANDER S. WHEELER FUND, 1907-16, \$30,000. Contributed by friends. Used for new dormitories, 1924.

GEORGE R. WHITE FUND, 1912, \$10,000. Gift. Used toward purchase of new site.

537 AMASA J. WHITING FUND, 1927, \$4,515. Bequest of Mary W. C. Whiting. Income as scholarship to deserving students; preference to students from the Town of Hingham, Massachusetts.

EDWARD WHITNEY FUND, 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 JONATHAN WHITNEY FUND, 1912. Present balance \$518,168. 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 HARRY C. WIESS FUND, 1947, \$11,500. Gift. For unrestricted purposes.

179 GEORGE WIGGLESWORTH FUND, 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 \$26,766.45.

GEORGE WIGGLESWORTH, 1917-24, \$65,000. Gift. Used for additional land purchase, 1924.

684 BELLE A. WILLSTON FUND, 1948, \$17,118.68. Bequest for general purposes.

539 ELIZABETH BABCOCK WILLMANN FUND, 1935, \$5,065. Bequest. Income to be used toward tuition of young women students taking Chemistry courses.

989 GEORGE S. WITMER FUND, 1938-47. Balance \$76,278. In Trust, subject to special annuity provisions.

KENNETH F. WOOD FUND, 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 **EDWIN A. WYETH FUND, 1913-35, \$254,703.** 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 **MORRILL WYMAN FUND, 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.)

DEPARTMENT OF AERONAUTICAL ENGINEERING

HUNSAKER, JEROME C. and BRANDON G. RIGHTMIRE. *Engineering Applications of Fluid Mechanics*. New York: McGraw-Hill, 1947.

SEAMANS, ROBERT C., JR. Automatic Control of Aircraft. *The Technology Review* 50, p. 102, December, 1947.

WEEMS, WILLIAM R. *Eight Articles on Gyroscopic Subjects for the National Encyclopedia*. New York: P. F. Collier & Son Corp., 1947.

WEEMS, WILLIAM R. *An Introduction to the Study of Gyroscopic Instruments*. M. I. T. Dept. of Aero. Eng'g. Instrumentation section, 1948.

WEEMS, WILLIAM R. Teaching Engineering Gyroscopics. *J. Eng. Educ.* 38, pp. 313-319, December, 1947.

DEPARTMENT OF ARCHITECTURE

ANDERSON, LAWRENCE B. and HERBERT L. BECKWITH. New England School Thoughtfully Planned; Proposed Elementary Community School for Lincoln, Mass. *Arch. Record* 103, pp. 142-144, March, 1948.

KENNEDY, ROBERT W. The Small House in New England. *Mag. Art* 41, pp. 123-128, April, 1948.

KENNEDY, ROBERT W. House for Mr. John Hay, Brewster, Mass. *Progressive Arch.* 29, p. 72, June, 1948.

WURSTER, WILLIAM W. Architectural Education. *Am. Inst. Architects J.* 9, pp. 34-36, January, 1948.

WURSTER, WILLIAM W. When Is a Small House Large? *House & Garden* 92, pp. 72-75, August, 1947.

WURSTER, WILLIAM W. Elevated Building Provides Parking, Wurster, Bernardi & Emmons, Architects. *Arch. Record* 102, p. 133, October, 1947.

WURSTER, WILLIAM W. Niles, Calif., Offices for a Branch Plant of the Schuckl Canning Company; views, plans and diagrams, Wurster, Bernardi & Emmons, Architects. *Progressive Arch.* 28, pp. 51-54, December, 1947.

WURSTER, WILLIAM W. Jefferson National Expansion Memorial Competition. *Arch. Record* 103, pp. 92-103, April, 1948.

DEPARTMENT OF BIOLOGY

BENNETT, H. STANLEY. Cytochemical Evidence for Sulphydryl in Nerve Axoplasm, Retinal Rods, and Capillary Endothelium. *Anatom. Record* 100, p. 640, (Abstract No. 7), April, 1948.

BENNETT, H. STANLEY. The Disposition of Sulfhydryl in Resting Striated Muscle. *Anatom. Record* 100, p. 732, (Abstract No. 209), April, 1948.

BLAKE, CHARLES H. On the Term "Albino". *Nautilus* 61, pp. 32-33, July, 1947.

BLAKE, CHARLES H. Wing-flapping Rates of Birds. *Auk* 64, pp. 619-620, October, 1947.

BLAKE, CHARLES H. Swallow Notes. *Mass. Audubon Soc. Bull.* 31, p. 239, October, 1947.

BLAKE, CHARLES H. Elemental Nomenclature. *Nature* 160, p. 648, November, 1947.

BLAKE, CHARLES H. The Flight of Swallows. *Auk* 65, pp. 54-62, January, 1948.

BLAKE, CHARLES H. Snow-shoveling Birds. *Mass. Audubon Soc. Bull.* 32, p. 63, March, 1948.

BLAKE, CHARLES H. and JAMES L. PETERS. *Microsittace* not Different, Generically from *Enicognathus*. *Auk* 65, pp. 288-289, April, 1948.

BLAKE, CHARLES H. Temporary Loss of Flight. *Bird-Banding* 19, pp. 70-71, April, 1948.

DE ROBERTIS, EDUARDO D. P. and F. O. SCHMITT. An Electron Microscope Analysis of Certain Nerve Axon Constituents. *J. Cell & Comp. Physiol.* 31, pp. 1-24, February, 1948.

DE ROBERTIS, EDUARDO D. P. Proteolytic Activity in the Physiology, Pathology and Therapeutics of the Thyroid Gland. (Van Meter Prize Essay of the American Association for the Study of Goiter 1947). *Western J. Surgery* 56, pp. 253-269, May, 1948.

GOULD, BERNARD S. and A. WASSERMAN. Studies in the Biochemistry of *Neurospora*. (Abstract) *J. Bact.* 54, pp. 29-30, July, 1947.

HALL, CECIL E. Dark-Field Electron Microscopy. I. Studies of Crystalline Substances in Dark-Field. *J. Appl. Physics* 19, p. 198, February, 1948. II. Studies of Colloidal Carbon. *J. Appl. Physics* 19, p. 271, March, 1948.

LION, KURT S. Technology and Medicine. (In Smithsonian Institution. *Annual report* . . . for the year ended June 30, 1946. pp. 401-10. Washington: U. S. Gov't Printing Office, 1947.)

LION, KURT S. and OTHERS. Round Table Discussion on Biophysics. *Arch. Phys. Med.* 29, pp. 230-237, April, 1948.

LOGEMANN, HUGO, JR. Wide-Band F-M Receiver. (Chapter 17 in *Micro-wave Receivers*, edited by S. N. Van Voorhis. M. I. T. Radiation Laboratory Series, 23, pp. 440-454). New York: McGraw-Hill, 1948.

LOGEMANN, HUGO, JR. Simple RC Equalizer Circuits. (Laboratory & Shop Notes) *Review Sci. Instr.* 19, p. 196, March, 1948.

LOOFBOUROW, JOHN R. and ROBERT L. SINSHEIMER. Christiansen Filters for the Ultraviolet. *Nature* 160, pp. 674-675, November, 1947.

LOOFBOUROW, JOHN R. Operational Analysis in Relation to Administration of Government-sponsored Research. *Science* 106, pp. 113-117, August 8, 1947.

SCHMITT, FRANCIS O. and A. R. T. DENUES. Physical Properties of Protoplasm. *Annual Rev. Physiol.* 10, pp. 1-16, 1948.

SCOTT, JESSE F. Electron Micrograph Studies on Sodium Desoxyribose Nucleate. *Biochimica et Biophysica Acta* 2, p. 1, 1948.

SCOTT, JESSE F., R. L. SINSHEIMER and J. R. LOOFBOUROW. Low-Temperature Spectroscopy of Biological Compounds. *Science* 107, p. 302, March 19, 1948.

SIZER, IRWIN W. The Action of Tyrosinase on Certain Proteins and Products of Their Autolysis. *J. Biol. Chem.* 169, pp. 303-311, July, 1947.

SIZER, IRWIN W. and ANDREW C. PEACOCK. The Ultraviolet Absorption of Serum Albumin and of Its Constituent Amino Acids as a Function of pH. *J. Biol. Chem.* 171, pp. 767-777, December, 1947.

**DEPARTMENT OF BUILDING ENGINEERING  
AND CONSTRUCTION**

DIETZ, ALBERT G. H. and W. H. CAMPBELL, JR. Bonded Wire Strain Gage Techniques for Polymethyl Methacrylate Plastics. *Soc. Experimental Stress Analysis Proc.* 5, No. 1, pp. 59-62, 1947.

DIETZ, ALBERT G. H. Progress in Wood Construction. *Forest Products Research Soc. Proc.* 1, 1947. (Also in *Wood Preserving News* 25, pp. 110-114, 119-121, December, 1947.)

DIETZ, ALBERT G. H. High-Grade and Low-Grade Lumber in Glued Laminated Members. (In Northeastern Wood Utilization Council Bull. 22, *Recent Progress in Laminated Wood*. pp. 37-44. April, 1948.)

DIETZ, ALBERT G. H. Stress-Time Relations in Plastics. *SPE News*, May, 1948.

GAILUS, W. J., G. S. BURR, J. O. SILVEY, S. YURENKA and ALBERT G. H. DIETZ. Universal Plastics Testing Machine. *A. S. T. M. Proc.* 47, pp. 1030-1043, 1947. (Also in *A. S. T. M. Bull.* No. 149, pp. 51-57, December, 1947.)

PEABODY, DEAN, JR. Continuous Frame Analysis of Flat Slabs. *Boston Soc. Civil Engrs. J.* 35, p. 1, January, 1948.

STALEY, H. R. and SIDNEY H. GREENFIELD. Surface Areas of High-Calcium Quicklimes and Hydrates. *A. S. T. M. Proc.* 47, pp. 953-964, 1947.

VOSS, WALTER C. Engineering Laminates — Fundamentals Underlying the Problems of Their Inhomogeneity. (Twenty-first Edgar Marburg Lecture). *A. S. T. M. Proc.* 47, p. 449, 1947.

VOSS, WALTER C., DEAN PEABODY, JR., HOWARD R. STALEY and ALBERT G. H. DIETZ. Thin-shelled Domes Loaded Eccentrically. *Am. Soc. Civil Engrs. Proc.* 73, p. 1173, October, 1947.

VOSS, WALTER C. Monomers, Polymers and Co-Polymers. *Modern Plastics* 2, pp. 89, 202+, November, 1947.

VOSS, WALTER C. Fireproof Construction. New York: D. Van Nostrand Co., Inc., 1948.

**DEPARTMENT OF BUSINESS  
AND ENGINEERING ADMINISTRATION**

HILL, THOMAS M. Accounting Progress — The Next Step. *Nat. Assoc. Cost Accountants Bull.* 29, pp. 1119-1134, May 15, 1948.

SCHELL, ERWIN H. Formal Education in Scientific Management. *International Management Congress, 8th Stockholm, 1947. Papers.* 1, p. 69, 1947.

SCHELL, ERWIN H. Toward New Horizons — Management Reconstructs Its Thinking. *Dun's Review* 56, pp. 11-13 +, May, 1948.

**DEPARTMENT OF CHEMICAL ENGINEERING**

GILLILAND, EDWIN R. Heat Transfer. (Chapter 10 in *The Science and Engineering of Nuclear Power*, edited by Clark Goodman. Vol. 1, pp. 323-352. Cambridge, Mass.: Addison-Wesley Press, 1947.)

HAUSER, ERNST A. and LE BEAU, D. S. Elasticity Explained. *Sci. American* 177, pp. 204-206, November, 1947.

HAUSER, ERNST A. and LE BEAU, D. S. Why Matter is Elastic. *Tech Eng. News* 29, p. 65, December, 1947.

HAUSER, ERNST A. and OTHERS. Letter to the Editor re Penicillin. *Science* 106, p. 616, December 19, 1947.

HAUSER, ERNST A. and KOLB, FREDERICK J. Applications of the Spectrographic Method for Studying the Resin-bodying of Drying Oils. *Federation of Paint & Varnish Production Clubs. Official Digest* 276, pp. 84-95, January, 1948.

HAUSER, ERNST A. and D. S. LE BEAU. The Effect of Temperature and Molecular-Weight Distribution on the Morphology of Natural and Synthetic High Polymers. *J. Phys. and Colloid Chem.* 52, pp. 27-39, January, 1948.

HAUSER, ERNST A. The Importance of Colloid Chemistry in Food Technology. *Food Technology* 2, pp. 144-157, April, 1948.

McADAMS, WILLIAM HENRY. Economic Balance. (Chapter 7 in *Chemical Engineering Economics*, by Chaplin Tyler. Ed. 3, pp. 123-141. New York: McGraw-Hill, 1948.)

MEISSNER, HERMAN P. and E. W. MERRILL. Some Factors Affecting Adhesive Bond Formation. *A. S. T. M. Bull.* 151, pp. 80-83, March, 1948.

MEISSNER, HERMAN P. and S. H. GREENFELD. Composition and Boiling Points of Binary Azeotropes. *Ind. Eng. Chem.* 40, pp. 438-442, March, 1948.

MEISSNER, HERMAN P. Chemical Reaction Equilibria — Estimating Standard Entropy Changes. *Ind. Eng. Chem.* 40, p. 904, May, 1948.

VIVIAN, J. EDWARD and ROY P. WHITNEY. Absorption of Chlorine in Water. *Chem. Eng. Progress* 43, pp. 691-702, December, 1947.

VIVIAN, J. EDWARD and OTHERS. The Solubility of Sulfur Dioxide in Calcium Bisulfite Solutions. *Paper Trade J.* 126, no. 20, p. 46 (TAPPI Sec. p. 242), May 13, 1948.

WEBER, HAROLD C. Design of Laboratories for Chemical Engineering Instruction. *J. Chem. Educ.* 24, pp. 341-346, July, 1947.

## DEPARTMENT OF CHEMISTRY

AMDUR, I. Low Temperature Transport Properties of Gases. I. Helium. *J. Chem. Phys.* 15, p. 482, July, 1947. II. Neon, Argon, Krypton, and Xenon. *J. Chem. Phys.* 16, p. 190, March, 1948.

AMDUR, I. Determination of the Molecular Law of Force from Self-Diffusion Coefficients. *Phys. Rev.* 72, p. 642, October, 1947.

ASHDOWN, AVERY A. Reid Hunt, 1870-1948. *The Nucleus* 25, p. 245, May, 1948.

COPE, ARTHUR C. and OTHERS. Activation Energies and Entropies of Activation in the Rearrangement of Allyl Groups in Three Carbon Systems. *Am. Chem. Soc. J.* 69, p. 1893, August, 1947.

COPE, ARTHUR C. Chemical Education in American Institutions — Massachusetts Institute of Technology. *J. Chem. Educ.* 25, p. 187, April, 1948.

COPE, ARTHUR C. and CHARLES G. OVERBERGER. Cyclic Polyolefins. I. Synthesis of Cyclooctatetraene from Pseudopelletierine. *Am. Chem. Soc. J.* 70, p. 1433, April, 1948.

CORYELL, CHARLES D. Chemistry of the Fission Process. (Chapter 7 in *The Science and Engineering of Nuclear Power*, edited by Clark Goodman, Vol. 1, pp. 231-250, Cambridge, Mass.: Addison-Wesley Press, 1947.)

CORYELL, CHARLES D. Some Problems for Study in Nuclear Chemistry. *Nucleonics* 1, no. 2, pp. 2-9, October, 1947.

CORYELL, CHARLES D. Fundamental Principles of the Detection and Measurement of Radioactivity. (In *Symposium on the Use of Isotopes in Biology and Medicine*, pp. 105-140. Univ. of Wisconsin Press, 1948.)

EDWARDS, RAYMOND R. and T. H. DAVIES. Chemical Effects of Nuclear Transformations. *Nucleonics* 2, no. 6, pp. 44-56, June, 1948.

EDWARDS, RAYMOND R. and OTHERS. Recoil-Activated and Thermal Exchange Reactions between S<sup>35</sup> and CS<sub>2</sub>. *Am. Chem. Soc. J.* 70, p. 1670, April, 1948.

EVANS, HOWARD T., JR. The Crystal Structures of Ammonium and Potassium Molybdotellurates. *Am. Chem. Soc. J.* 70, p. 1291, March, 1948.

GEE, ALLEN and J. H. HILDEBRAND. Relative Association of Hydrogen and Deuterium Fluorides in the Liquid State. *Am. Chem. Soc. J.* 70, p. 427, January, 1948.

GLENDENIN, LAWRENCE E. Determination of the Energy of Beta Particles and Photons by Absorption. *Nucleonics* 2, no. 1, pp. 12-32, January, 1948.

HUNTRESS, ERNEST H. The Philosophy of Classification of Chemical Literature. *Ind. Eng. Chem.* 40, pp. 473-476, March, 1948.

HUNTRESS, ERNEST H. Review of *Organic Analytical Reagents*, by F. J. Welcher. vol. 1-4. New York: Van Nostrand, 1947. *Am. Chem. Soc. J.* 70, pp. 2301-2302, June, 1948. (Also reviewed in *U. S. Quarterly Book List* 4, pp. 223-224, June, 1948.)

IRVINE, JOHN W., JR. Heavy Elements and Nuclear Fuels. (Chapter 11 in *The Science and Engineering of Nuclear Power*, edited by Clark Goodman. Vol. 1, pp. 353-377, Cambridge, Mass.: Addison-Wesley Press, 1947.)

IRVINE, JOHN W., JR. and OTHERS. A Study of Metal Transfer between Sliding Surfaces. *N. A. C. A. Tech. Note* 1355, September, 1947.

IRVINE, JOHN W., JR. Production of Radioactive Isotopes by the Cyclation and Other Methods. *U. S. Naval Medical Bull.*, Supplement, 48, pp. 52-59, March-April, 1948.

KEYES, FREDERICK G. and C. E. HUCKABA. The Accuracy of Estimation of Hydrogen Peroxide by Potassium Permanganate Titration. *Am. Chem. Soc. J.* 70, pp. 1640-1644, April, 1948.

LOFTFIELD, ROBERT B. Preparation of C<sup>14</sup> labeled Hydrogen Cyanide, Alanine, and Glycine. *Nucleonics* 1, no. 3, p. 54, November, 1947.

LOFTFIELD, ROBERT B. and OTHERS. Incorporation of C<sup>14</sup> from Carboxyl labeled dl-Alanine into the Proteins of Liver Slices. *Science* 106, pp. 544-545, December 5, 1947.

LORD, RICHARD C. Infrared Spectra and the Structure of Molecules. *Research Reviews*, Office of Naval Research, p. 3, April, 1948.

LORD, RICHARD C. and OTHERS. Infrared and Raman Spectra of Heavy Cyclooctatetraene. *J. Chem. Phys.* 16, p. 548, May, 1948.

MARINSKY, J. A., L. E. GLENDEEN and C. D. CORYELL. The Chemical Identification of Radioisotopes of Neodymium and Element 61. *Am. Chem. Soc. J.* 69, pp. 2781-2785, November, 1947.

MARVIN, GEORGE G. The Analytical Laboratory. *J. Chem. Educ.* 24, p. 329, July, 1947.

MILAS, NICHOLAS A. and THERESE M. HARRINGTON. A New Synthesis of 1-(2', 6', 6'-Trimethylcyclohexen-1'-yl)-3-Methylhexa-1, 3, 5-trien-7-one (C<sub>18</sub> ketone). *Am. Chem. Soc. J.* 69, p. 2247, September, 1947.

MILAS, NICHOLAS A. The Synthesis of Vitamin A and Related Products. *Vitamins and Hormones* 5, pp. 1-38, October, 1947.

MILAS, NICHOLAS A., FRANK X. GROSSI, SIEGFRIED E. PENNER and SAMUEL KAHN. The Synthesis of 1-[Cyclohexen-1'-yl]-3-methyl-1,3,5-octatrien-7-one (C<sub>16</sub> ketone). *Am. Chem. Soc. J.* 70, p. 1292, March, 1948.

MILAS, NICHOLAS A. and OTHERS. Synthesis of Products Related to Vitamin A. IV. The Application of the Darzens Reaction to  $\beta$ -Ionone. *Am. Chem. Soc. J.* 70, pp. 1584-1591, April, 1948. V. The Synthesis of [1-(2', 6', 6'-Trimethylcyclohexen-1'-yl)-3,7-dimethyldeca-1,3,5,7-tetraenyl]-10-ethyl Ether. *Am. Chem. Soc. J.* 70, pp. 1591-1596, April, 1948. VI. The Synthesis of Biologically Active Vitamin A Ethers. *Am. Chem. Soc. J.* 70, pp. 1597-1607, April, 1948. VIII. The Synthesis of 1-(Cyclohexen-1'-yl)-3-methyl-3-epoxybutyne-1 and Related Products. *Am. Chem. Soc. J.* 70, pp. 1829-1834, May, 1948.

MORTON, AVERY A. and MURIEL E. T. HOLDEN. Polymerization. VII. The Structure of the Alfin Catalyst. *Am. Chem. Soc. J.* 69, p. 1675, July, 1947.

MORTON, AVERY A. Levulinic Acid as a Source of Heterocyclic Compounds. *Sugar Research Found. Sci. Report Series*, no. 8, August, 1947.

SCATCHARD, GEORGE. Review of *Thermodynamics for Chemists*, by Samuel Glasstone. New York: Van Nostrand, 1947. *Am. Chem. Soc. J.* 70, p. 886, February, 1948.

SCATCHARD, GEORGE and OTHERS. Chemical, Clinical, and Immunological Studies on the Products of Human Plasma Fractionation. XXXVI. Inactivation of the Virus of Homologous Serum Hepatitis in Solutions of Normal Human Serum Albumin by Means of Heat. *J. Clin. Investigation* 27, p. 239, March, 1948.

SCATTERGOOD, ALLEN and MORRIS ZIEF. The Structure of 2,4,3,5-Dimethylene-D-gluconic acid. *Am. Chem. Soc. J.* 69, p. 2132, September, 1947.

SCHEINBERG, I. HERBERT, THOMAS D. KINNEY and C. A. JANEWAY. Homologous Serum Jaundice; a Problem in the Operation of Blood Banks. *Am. Med. Assoc. J.* 134, p. 841, July, 1947.

SCHUMB, WALTER C., A. S. EISENSTEIN and E. F. SEWELL. Observations on the Stability of the Barium-Hydrogen and Zirconium-Hydrogen Systems. *Amer. Chem. Soc. J.* 69, pp. 2029-2033, August, 1947.

SCHUMB, WALTER C. and CLARENCE K. MOREHOUSE. Anhydrous Lower Bromides of Hafnium. *Am. Chem. Soc. J.* 69, pp. 2696-2697, November, 1947.

SCHUMB, WALTER C. and H. F. PRIEST. Colored Complexes of Tungsten Hexafluoride with Organic Compounds. *Am. Chem. Soc. J.* 70, p. 2291, June, 1948.

SHEEHAN, JOHN C. and PATRICK T. IZZO. A Novel Synthesis of a  $\beta$ -lactam. *Am. Chem. Soc. J.* 70, p. 1985, May, 1948.

STEVENS, CALVIN L. and S. M. McELVAIN. Ester and Orthoester Formation in the Alcoholysis of Iminoester Hydrochlorides. *Am. Chem. Soc. J.* 69, p. 2663, November, 1947.

STEVENS, CALVIN L. and S. M. McELVAIN. A Study of New Approaches to  $\alpha$ -Halogenated Orthoesters. *Am. Chem. Soc. J.* 69, p. 2667, November, 1947.

STEVENS, CALVIN L. Chloro- and Bromoisobutyronitriles. *Am. Chem. Soc. J.* 70, p. 165, January, 1948.

STEVENS, CALVIN L. and OTHERS. Mercaptan Derivatives as Modifiers in the Copolymerization of Butadiene and Styrene. *J. Polymer Science* 3, pp. 50-57, February, 1948.

SWAIN, C. GARDNER. The Mechanism of Addition of Grignard Reagents to Nitriles. *Am. Chem. Soc. J.* 69, pp. 2306-2309, October, 1947.

SWAIN, C. GARDNER and OTHERS. Kinetics and Mechanism of the Reactions of Tertiary  $\beta$ -Chloroethylamines in Solution. I. Methyl-bis- $\beta$ -chloroethylamine. *Am. Chem. Soc. J.* 69, p. 2971, December, 1947. II. Ethyl-bis- $\beta$ -chloroethylamine. *Am. Chem. Soc. J.* 69, p. 2977, December, 1947.

SWAIN, C. GARDNER. Kinetic Evidence for a Termolecular Mechanism in Displacement Reactions of Triphenylmethyl Halides in Benzene Solution. *Am. Chem. Soc. J.* 70, pp. 1119-1128, March, 1948.

*DEPARTMENT OF CITY AND REGIONAL PLANNING*

ADAMS, FREDERICK J. Land and Community Planning. (In Collier's Year-book, New York: P. F. Collier & Son Corp., 1947.)

ADAMS, FREDERICK J., ANATOLE A. SOLOW and ANN COPPERMAN. Planning the Neighborhood. Chicago: Public Administration Service, 1948.

KELLY, BURNHAM. The Massachusetts State Law on Building Codes. *Prefabrication* 9, pp. 20-22, January-February, 1948.

KELLY, BURNHAM. A New Massachusetts Approach to the Building Code Problem. *Tomorrow's Town* 5, No. 8, p. 2, November, 1947.

KELLY, BURNHAM and JOHN E. BURCHARD and OTHERS. Terminal Ballistics; the History of Division 2, NDRC. (Part two in *Rockets, Guns and Targets*; edited by J. E. Burchard. pp. 237-337. Boston: Little, Brown and Company, 1948.)

#### DEPARTMENT OF CIVIL AND SANITARY ENGINEERING

BABCOCK, JOHN B., 3D. Engineering Construction Courses in an Under-graduate Civil Engineering Curriculum. *Civil Eng. Bull.* (Am. Soc. Eng. Educ.) 13, No. 2, pp. 2-4, March, 1948.

BONE, ALEXANDER J. Planning the Airport Site. *Boston Soc. Civil Engrs. J.* 34, p. 215, July, 1947.

HORWOOD, MURRAY P. Food Sanitation. *Modern Hospital* 69, pp. 102-106, July, 1947.

HORWOOD, MURRAY P. and OTHERS. Is There a Cure for Tuberculosis? *Mass. Health J.* 28, pp. 2-6, September, 1947.

LAMBE, THOMAS WILLIAM. Discussion of Investigation of Drainage Rates Affecting Stability of Earth Dams by F. H. Kellogg. *Am. Soc. Civil Engrs. Proc.* 74, p. 769, May, 1948.

MIRABELLI, EUGENE. Review of *The Chemistry of Portland Cement*, by R. H. Bogue. New York: Reinhold, 1947. *J. Appl. Phys.* 19, p. 113, January, 1948.

TAYLOR, DONALD W. *Fundamentals of Soil Mechanics*. New York: John Wiley & Sons, Inc., 1948.

WILBUR, JOHN B. and CHARLES H. NORRIS. Elementary Structural Analysis. New York: McGraw-Hill Book Co., Inc., 1948.

#### DEPARTMENT OF ECONOMICS AND SOCIAL SCIENCE

BAKER, THOMAS E. Bankruptcy of "Internationalist" Thinking. *Mech. Eng.* 70, p. 336, April, 1948.

BISHOP, ROBERT L. Alternative Expansionist Fiscal Policies. (In *Income, Employment and Public Policy; Essays in Honor of Alvin H. Hansen*, by L. A. Metzler and Others. New York: W. W. Norton and Company, 1948.)

BROWN, E. CARY. Pay-as-you-go Corporate Taxes? *Am. Econ. Rev.* 37, pp. 641-645, September, 1947.

BROWN, E. CARY. Business-Income Taxation and Investment Incentives. (In *Income, Employment and Public Policy; Essays in Honor of Alvin H. Hansen*, by L. A. Metzler and Others. New York: W. W. Norton and Company, 1948.)

FESTINGER, LEON. The Role of Group Belongingness in a Voting Situation. *Human Relations* 1, pp. 154-180, November, 1947.

FREEMAN, HAROLD A. and OTHERS, Editors. *Sampling Inspection*, by the Statistical Research Group, Columbia University. New York: McGraw-Hill, 1948.

JENKINS, DAVID H. Studies in Group Dynamics and Their Implications for Social Studies Teachers. *New England Social Studies Bull.* 5, no. 3, March, 1948.

JENKINS, DAVID H. Feedback and Group Self-Evaluation. *J. Social Issues* 4, no. 2, pp. 50-60, Spring, 1948.

KNICKERBOCKER, IRVING. Review of *Democracy and Industry*, by Constance Reaveley and John Winnington. London: Chatto & Windus, 1947. *Management Rev.* 36, pp. 556-557, October, 1947.

LEAVITT, HAROLD J. and STANLEY B. WILLIAMS. Group Opinion as a Predictor of Military Leadership. *J. Consulting Psych.* 11, pp. 283-291, November-December, 1947.

McGREGOR, DOUGLAS. Review of *Arbitration of Labor Disputes*, by Samuel R. Zack. Great Neck, N. Y.: Doniger & Raughley, 1947. *Management Rev.* 37, pp. 51-52, January, 1948.

MYERS, CHARLES A. Union-Management Cooperation. *Mech. Eng.* 70, pp. 230-231, March, 1948.

PADELFORD, NORMAN J., Editor. *International Relations; a Selection of Current Readings; prepared by the International Relations Division, Department of Economics and Social Science*, M. I. T. January, 1948; June, 1948. Cambridge: The Technology Press, M. I. T., 1948. (M. I. T. Publications in International Affairs.)

PADELFORD, NORMAN J. Solutions to the Turkish Straits Problem. *Middle East* J. April, 1948.

PADELFORD, NORMAN J. The Use of the Veto. *International Organization* 2, pp. 227-246, June, 1948.

PIGORS, PAUL and CHARLES A. MYERS. *Personnel Administration: A Point of View and a Method*. New York: McGraw-Hill, 1947.

RADKE, MARIAN J. and MRS. H. G. TRAGER. Early Childhood Aids Its Views. *Educ. Leadership* 5, pp. 16-24, October, 1947.

RADKE, MARIAN J. and E. CASO. Lecture and Discussion-Decision as Methods of Changing Food Habits. *Am. Dietetic Assoc. J.* 24, pp. 23-31, January, 1948.

SAMUELSON, PAUL A. Comparative Statics and the Logic of Economic Maximizing. *Rev. Econ. Studies* 14, pp. 41-43, 1946-1947.

SAMUELSON, PAUL A. and ALVIN H. HANSEN. Economic Analysis of Guaranteed Wages. (Appendix F from *Guaranteed Wages: Report to the President of the Advisory Board of the Office of War Mobilization and Reconversion*. Washington, D. C.: Government Printing Office, 1947.) (Reprinted as Bureau of Labor Statistics, Bull. 907.)

SAMUELSON, PAUL A. *Foundations of Economic Analysis*. Cambridge, Mass.: Harvard University Press, 1947.

SAMUELSON, PAUL A. *Economics: An Introductory Analysis*. New York: McGraw-Hill, 1948.

SAMUELSON, PAUL A., E. C. BROWN, R. L. BISHOP and OTHERS. The Simple Mathematics of Income Determination. (In *Income, Employment and Public Policy; Essays in Honor of Alvin H. Hansen*, by L. A. Metzler and Others. New York: W. W. Norton and Company, 1948.)

SAMUELSON, PAUL A. Exact Distribution of Continuous Variables in Sequential Analysis. *Econometrica* 16, pp. 191-198, April, 1948.

SAMUELSON, PAUL A. International Trade and the Equalisation of Factor Prices. *Economic J.* 58, pp. 163-184, June, 1948.

YOUNG, LOUIS C. The Growth of Industrial Statistics. *Mech. Eng.* 69, p. 843, October, 1947.

#### DEPARTMENT OF ELECTRICAL ENGINEERING

ARGUIMBAU, LAWRENCE B. *Vacuum Tube Circuits*. New York: John Wiley & Sons, Inc., 1948.

BALSBAAUGH, JAYSON C. Power Factor of Electrical Insulating Oils. Significance of and Methods of Testing Stability. *A. S. T. M. Bull.* no. 149, pp. 75-83, December, 1947.

BERANEK, LEO L. Acoustical Properties of Homogeneous, Isotropic Rigid Tiles and Flexible Blankets. *Acoustical Soc. Am. J.* 19, pp. 556-568, July, 1947.

BERANEK, LEO L. Thermodynamic and Viscous Absorption in Fibrous Acoustical Materials. *Acoustical Soc. Am. J.* 19, p. 728, July, 1947.

BERANEK, LEO L. Design of Speech Communication Systems. *I. R. E. Proc.* 35, pp. 880-890, September, 1947.

BERANEK, LEO L. Attenuation of Sound by Light-Weight Multiple Structures. (Abstract) *Acoustical Soc. Am. J.* 20, p. 222, March, 1948.

BRECKENRIDGE, ROBERT G., JAMES M. BROWNLOW and G. N. HOWATT. Fabrication of Thin Ceramic Sheets for Capacitors. *Am. Ceramic Soc. J.* 30, pp. 237-242, August, 1947.

BROWN, GORDON S. and DONALD P. CAMPBELL. *Principles of Servomechanisms*. New York: John Wiley & Sons, Inc., 1948.

CALLEN, HERBERT B. The Application of Onsager's Reciprocal Relations to Thermoelectric, Thermomagnetic and Galvanomagnetic Effects. *Phys. Rev.* 73, pp. 1349-1358, June 1, 1948.

CHEATHAM, THOMAS P. A Crystal Limiter for Use in an FM Receiver in the Presence of Impulse Interference. *M. I. T. Research Laboratory of Electronics, Technical Report* No. 36, 1947.

CHU, LAN J. Physical Limitations of Omnidirectional Antennas. *M. I. T. Research Laboratory of Electronics, Technical Report* No. 64, 1948.

DAVID, EDWARD E., JR. Locking Phenomena in Microwave Oscillators. *M. I. T. Research Laboratory of Electronics, Technical Report* No. 63, 1948.

DWIGHT, HERBERT B. Effective Resistance of Isolated Nonmagnetic Rectangular Conductors. *A. I. E. E. Trans.* 66, pp. 549-552, July, 1947.

DWIGHT, HERBERT B. Table of Roots for Natural Frequencies in Coaxial Type Cavities. *J. Math. and Phys.* 27, pp. 84-89, April, 1948.

EDGERTON, HAROLD E. The Past, Present and Future of High-Speed Photography. *P S A Jour.* 13, pp. 437-440, July, 1947.

EDGERTON, HAROLD E. Humming Birds in Action. *Nat. Geog. Mag.* 92, pp. 220-224, pp. I-VIII colored plates, August, 1947.

EDGERTON, HAROLD E. Circus Action in Color. *Nat. Geog. Mag.* 93, pp. 305-324, March, 1948.

EDGERTON, HAROLD E. Light Meter for Electric Flash Lamps. *Electronics* 21, pp. 78-81, June, 1948.

EVANS, HOWARD T. and ROBINSON D. BURBANK. The Crystal Structure of Hexagonal Barium Titanate. (Letter to the editor) *J. Chem. Phys.* 16, p. 634, June, 1948.

FANO, ROBERT M. A Note on the Solution of Certain Approximation Problems in Network Synthesis. *M. I. T. Research Laboratory of Electronics, Technical Report* No. 62, 1948.

FANO, ROBERT M. Theoretical Limitations on the Broadband Matching of Arbitrary Impedances. *M. I. T. Research Laboratory of Electronics, Technical Report* No. 41, 1948.

FANO, ROBERT M. and ANDREW W. LAWSON, JR. Microwave Filters Using Quarter-Wave Couplings. *Proc. Inst. Radio Engrs.* 35, pp. 1318-1323, November, 1947.

FAY, RICHARD D., R. L. BROWN, and OVIDE V. FORTIER. Measurement of Acoustic Impedances of Surfaces in Water. *Acoustical Soc. Am. J.* 19, pp. 850-856, September, 1947.

FAY, RICHARD D. and JAMES E. WHITE. Acoustic Impedance from Motional Impedance Diagrams. *Acoustical Soc. Am. J.* 20, pp. 98-107, March, 1948.

GALLOWAY, WILLIAM C. Distortion in the Frequency-modulated Output of a Frequency-stabilized Oscillator. *M. I. T. Research Laboratory of Electronics Technical Report* No. 57, 1948.

GETTING, IVAN A. Artificial Cosmic Radiation. *Technology Review* 50, pp. 435-440, 452, June, 1948.

GOLDMAN, STANFORD. *Frequency Analysis Modulation and Noise*. New York: McGraw-Hill, 1948.

GOLDMAN, STANFORD. Some Fundamental Considerations Concerning Noise Reduction and Range in Radar and Communication. *I. R. E. Proc.* 36, pp. 584-594, May, 1948. (Also *M. I. T. Research Laboratory of Electronics, Technical Report* No. 32, 1947.)

HAZEN, HAROLD L. The Philosophy and Curricular Content of a Graduate Program in Electrical Engineering. *J. Eng. Educ.* 38, pp. 129-140, October, 1947.

KRETZMER, ERNEST R. Distortion in Pulse-Duration Modulation. *I. R. E. Proc.* 35, pp. 1230-1235, November, 1947.

M. I. T. ELECTRICAL ENGINEERING DEPARTMENT. CENTER OF ANALYSIS, STAFF OF COMPUTING SECTION. *Technical Report* No. 3. Tables of Supersonic Flow around Yawing Cones, by the Staff of the Computing Section, under the direction of Zdenek Kopal. Cambridge, Mass.: M. I. T., 1947.

MOON, PARRY and DOMINA E. SPENCER. *Lighting Design*. Cambridge, Mass.: Addison-Wesley Press, 1948.

MOON, PARRY. A Table of Planck's Function 2000 to 3500° K. Cambridge, Mass.: M. I. T., 1947.

MOON, PARRY and DOMINA E. SPENCER. Analytic Representation of Experimental Spectroradiometric Curves. *Franklin Inst. J.* 244, pp. 441-464, December, 1947.

MOON, PARRY and DOMINA E. SPENCER. Utilizing the MKS System. *Am. J. Phys.* 16, pp. 25-38, January, 1948.

MOON, PARRY and DOMINA E. SPENCER. Modern Terminology for Physics. *Am. J. Phys.* 16, pp. 100-104, February, 1948.

MOON, PARRY. A Table of Planckian Radiation. *Opt. Soc. Am. J.* 38, pp. 291-294, March, 1948.

MOON, PARRY. The Color of Unstained Wood. *Opt. Soc. Am. J.* 38, pp. 405-408, April, 1948.

MORENO, THEODORE. *Microwave Transmission Design Data*. New York: McGraw-Hill, 1948.

STEMPNITZKY, ISAAY. M. I. T. Hobby Shop. *Tech. Review* 50, pp. 441-443, 460, June, 1948.

THURSTON, JAMES N., B. CHANCE and P. L. RICHMAN. Some Designs and Applications for Packaged Amplifiers Using Subminiature Tubes. *Rev. Sci. Inst.* 18, pp. 610-616, September, 1947.

TRUMP, JOHN G. Roentgen Rays against Cancer. *Tech. Rev.* 50, pp. 91-95, 122+, December, 1947.

TRUMP, JOHN G. Physical Basis for the High Skin Tolerance of Super Voltage Roentgen Rays. *Radiology* 50, pp. 649-656, May, 1948.

VON HIPPEL, ARTHUR R. Structure and Conductivity in the VI<sub>b</sub> Group of the Periodic System. *J. Chem. Phys.* 16, pp. 372-380, April, 1948.

VON HIPPEL, ARTHUR R. and BERND T. MATTHIAS. Structure, Electrical and Optical Properties of Barium Titanate. *Phys. Rev.* 73, p. 268, February 1, 1948.

VON HIPPEL, ARTHUR R. and BERND T. MATTHIAS. Domain Structure and Dielectric Response of Barium Titanate Single Crystals. *Phys. Rev.* 73, pp. 1378-1384, June 1, 1948.

#### DEPARTMENT OF ENGLISH AND HISTORY

BALLANTINE, DUNCAN S. *U. S. Naval Logistics in the Second World War*. Princeton University Press, 1947.

BARTLETT, HOWARD R. Invention. (In *World Book Encyclopedia* 9, pp. 3834-3845. Chicago: The Quarrie Corp., 1947.)

DEUTSCH, KARL W. The Crisis of Peace and Power in the Atom Age. (A Chapter in *Conflicts of Power in Modern Culture*, seventh symposium: Conference on Science, Philosophy, and Religion . . ., edited by L. Bryson and Others, pp. 608-657. New York: Harper, 1947.)

DEUTSCH, KARL W. The Value of Freedom, Part I. *Am. Scholar* 17, pp. 150-160, Spring, 1948; Part II, 17, pp. 323-335, Summer, 1948.

GREENE, WILLIAM C. The Eighteenth Century. (A chapter in *Good Reading*, Edition 9, edited by the Committee on College Reading of the National Council of Teachers, pp. 14-17. Chicago: National Council of Teachers of English, 1947.) (Also in Penguin Books, 1947.)

MAHONEY, THOMAS H. D. Is UN Dying on Its Feet? *Catholic Action* 29, p. 6, September, 1947.  
Also 35 book reviews in *America*; *Boston Herald*; *China Monthly*; *Commonweal*.

RAE, JOHN B. and THOMAS H. D. MAHONEY. *The United States in Modern History, 1870-1939*. M. I. T., 1947. *Supplement*. M. I. T., 1948.

#### DEPARTMENT OF FOOD TECHNOLOGY

CAMPBELL, WILLIAM L. Significance of War-Time Advances in Food Technology. In *Meals for Millions* — Final Report of New York State Joint Legislative Committee on Nutrition. pp. 50-53, 1947. (Legislative Document No. 61.)

CAMPBELL, WILLIAM L. Cost Determination and Allocation in Food Manufacturing Operations. *Food Tech.* 1, p. 466, July, 1947.

CAMPBELL, WILLIAM L. Value of Industrial Research Institutes to Food Technology. *Food Tech.* 1, pp. 497-502, October, 1947.

GUILD, LOUISE P., ERNEST E. LOCKHART, and ROBERT S. HARRIS. Stability of Solutions of Pure Ascorbic Acid and of Dehydroascorbic Acid. *Science* 107, pp. 226-227, February 27, 1948.

HARRIS, ROBERT S. and KENNETH V. THIMANN, *Editors*. Vitamins and Hormones. Volume 5. New York: Academic Press, Inc., 1947.

HARRIS, ROBERT S. Nutritional and Clinical Significance of Antivitamins. *Tufts Medical J.* 15, pp. 3-7, 21, January, 1948.

HARRIS, ROBERT S., MARCO A. TAPIA and F. deP. MIRANDA. Calidad en Proteínas de Alimentos Seleccionados. *Ciencia (Mexico)* 7, pp. 203-206, 1946.

HARRIS, ROBERT S. Food Composition and Nutrition Programs. *Nutrition Reviews* 6, pp. 33-35, February, 1948.

HARRIS, ROBERT S. Fundación de Nutrición de Centro América. *Boletín de la Oficina Sanitaria Panamericana* 27, pp. 97-101, Febrero, 1948.

HARRIS, ROBERT S. and OTHERS. Effect of Phytate and Other Food Ingredients on the Absorption of Radioactive Iron (Abstract). *Federation Proc.* 7, pp. 298-299, March, 1948.

MILLER, MABEL C. Reductone Interference in Estimation of Vitamin C. *Food Research* 12, pp. 343-359, September-October, 1947.

MUNSELL, HAZEL E., ROBERT S. HARRIS and LOUIS O. WILLIAMS. Composition of Central American Foods. I. Honduras (Abstract). *Federation Proc.* 7, p. 295. March, 1948.

MUNSELL, HAZEL E., LOUISE P. GUILD, CYNTHIA B. TROESCHER, GERTRUDE NIGHTINGALE and ROBERT S. HARRIS. Retention of Thiamine, Riboflavin, and Niacin in Cooked, Enriched Farina. *Am. Dietetic Assoc. J.* 24, pp. 314-316, April, 1948.

PROCTOR, BERNARD E. Remarks as Chairman of Jury for 1947 Food Industries Award. (Institute of Food Technologists) *Food Technology* 1 No. 3, pp. 19-22, July, 1947.

PROCTOR, BERNARD E. Technological Tolerance. *Food Technology* 1, pp. 304-305, July, 1947.

PROCTOR, BERNARD E. and ARTHUR W. PHILLIPS, JR. Frozen Precooked Foods. *Amer. J. Public Health* 38, pp. 44-49, January, 1948.

PROCTOR, BERNARD E. and SAMUEL A. GOLDBLITH. Radar Energy for Rapid Food Cooking and Blanching, and Its Effect on Vitamin Content. *Food Technology* 2, pp. 95-104, April, 1948.

PROCTOR, BERNARD E. and J. T. R. NICKERSON. Improving Frozen Foods through Microbiological Control. *Food Industries* 20, pp. 682-683, 820-822, May, 1948.

PROCTOR, BERNARD E. and JOHN T. R. NICKERSON. Sanitation — Key to Frozen Food Quality. *Refrigerating Eng.* 55, pp. 456-459, May, 1948.

#### DEPARTMENT OF GEOLOGY

BREGER, IRVING A. Transformation of Organic Substances by Alpha Particles and Deuterons. *J. Phys. and Colloid Chem.* 52, pp. 551-563, March, 1948.

BUERGER, MARTIN J. The Cell and Symmetry of Pyrrhotite. *Am. Mineralogist* 32, pp. 411-414, July-August, 1947.

BUERGER, MARTIN J. The Crystal Structure of Cubanite. *Am. Mineralogist* 32, pp. 415-425, July-August, 1947.

BUERGER, MARTIN J. The Relative Importance of the Several Faces of a Crystal. *Am. Mineralogist* 32, pp. 593-606, November-December, 1947.

BUERGER, MARTIN J. Review of *Los Rayos X y la Estructura Fina de los Cristales: Fundamentos Teóricos y Métodos Prácticos* by Julio Garrido and Joaquin Orland. Madrid, Editorial Dosset, 1946. *J. Appl. Phys.* 19, pp. 112-113, January, 1948.

BUERGER, MARTIN J. Review of *X-Rays in Practice*, by Wayne T. Sproull. New York: McGraw-Hill, 1946. *J. Appl. Phys.* 19, pp. 218-219, February, 1948.

BUERGER, MARTIN J. The Role of Temperature in Mineralogy. *Am. Mineralogist* 33, pp. 101-121, March-April, 1948.

BUERGER, MARTIN J. Phase Determination with the Aid of Implication Theory (Letter to the Editor). *Phys. Rev.* 73, pp. 927-928, April 15, 1948.

BUERGER, MARTIN J. Some Relations between the  $F$ 's and  $F^2$ 's of X-Ray Diffraction. *Nat. Acad. Sci. Proc.* 34, pp. 277-285, June, 1948.

HURLEY, PATRICK M. and HENRY H. NOGAMI. The Absorption Factor in Counting Alpha Rays from Thick Mineral Sources. *Am. Geophys. Union Trans.* 29, pp. 335-340, June, 1948.

SHROCK, ROBERT R. Corrigenda for Index Fossils of North America. *J. Paleontology* 21, pp. 494-497, September, 1947.

SHROCK, ROBERT R. Fossils in Laterite and Bauxite (Abstract). *Geol. Soc. Am. Bull.* 58, pp. 1227-1228, December, 1947.

SHROCK, ROBERT R. Loiponic Deposits (Abstract). *Geol. Soc. Am. Bull.* 58, p. 1228, December, 1947.

SHROCK, ROBERT R. A Classification of Sedimentary Rocks. *J. Geol.* 56, pp. 118-129, March, 1948.

THOMPSON, JAMES B. The Role of Aluminum in the Rock-Forming Silicates (Abstract). *Geol. Soc. Am. Bull.* 58, p. 1232, December, 1947.

#### SECTION OF GRAPHICS

EVANS, HOWARD T., JR. Relations among Crystallographic Elements. *Am. Mineralogist* 33, pp. 60-63, January-February, 1948.

EVANS, HOWARD T., JR. The Unit Cell and Space Group of Pirssonite. *Am. Mineralogist* 33, pp. 261-262, March-April, 1948.

EVANS, HOWARD T., JR. and ROBINSON D. BURBANK. The Crystal Structure of Hexagonal Barium Titanate (letter to the Editor). *J. Chem. Phys.* 16, p. 634, June, 1948.

#### DEPARTMENT OF MATHEMATICS

BOAS, RALPH P., JR. Inequalities for the Coefficients of Trigonometric Polynomials. Part I. *Koninklijke Nederlandsche Akademie van Wetenschappen Proc.* 50, pp. 492-495, May, 1947; Part II, 50, pp. 759-762, September, 1947.

BOAS, RALPH P., JR. More Inequalities for Fourier Transforms. *Duke Math. J.* 15, pp. 105-109, March, 1948.

BOAS, RALPH P., JR., R. C. BUCK and P. ERDÖS. The Set on Which an Entire Function Is Small. *Am. J. Math.* 70, pp. 400-402, April, 1948.

BOAS, RALPH P., JR. and HARRY POLLARD. The Multiplicative Completion of Sets of Functions. *Amer. Math. Soc. Bull.* 54, pp. 518-522, June, 1948.

BOAS, RALPH P., JR. and K. CHANDRASEKHARAN. Derivatives of Infinite Order. *Amer. Math. Soc. Bull.* 54, pp. 523-526, June, 1948.

CROUT, PRESCOTT D. A Method of Virtual Displacements for Electrical Systems with Applications to Pulse Transformers. *I. R. E. Proc.* 35, pp. 1236-1247, November, 1947.

DOUGLASS, RAYMOND D. and SAMUEL D. ZELDIN. *Calculus and Its Applications.* New York: Prentice-Hall, 1947.

FRANKLIN, PHILIP. *Electronic Methods of Computation*, by John Von Neumann. Summary of Communication Presented before the Academy February 11, 1948. *Am. Academy Arts and Sciences Proc.* 1, No. 3, pp. 2-4, March, 1948.

HUREWICZ, WITOLD. Filters and Servo Systems with Pulsed Data. (Chapter 5 in *Theory of Servomechanisms*, edited by H. M. James and Others. M. I. T. Radiation Lab. Series 25, pp. 231-261. New York: McGraw-Hill, 1947.)

HUREWICZ, WITOLD, J. DUGUNDJI and C. H. DOWKER. Continuous Connectivity Groups in Terms of Limit Groups. *Annals Math.* 49, pp. 391-406, April, 1948.

LEVINSON, NORMAN. A Heuristic Exposition of Wiener's Mathematical Theory of Prediction and Filtering. *J. Math. and Phys.* 26, pp. 110-119, July, 1947.

LEVINSON, NORMAN. Perturbations of Discontinuous Solutions of Non-linear Systems of Differential Equations. *Nat. Acad. Sci. Proc.* 33, pp. 214-218, July, 1947.

LEVINSON, NORMAN. A Simple Second Order Differential Equation with Singular Motions. *Nat. Acad. Sci. Proc.* 34, pp. 13-15, January, 1948.

LEVINSON, NORMAN. The Asymptotic Nature of Solutions of Linear Systems of Differential Equations. *Duke Math. J.* 15, No. 1, March, 1948.

LIN, C. C. Velocity and Temperature Distributions in Turbulent Jets. *National Tsing Hua University Science Reports, Series A. Math. Physical and Eng'g Sciences* 4, pp. 419-450, October, 1947.

LIN, C. C. and G. F. CARRIER. On the Nature of the Boundary Layer near the Leading Edge of a Flat Plate. *Quarterly Appl. Math.* 6, pp. 63-68, April, 1948.

REDHEFFER, RAYMOND M. The Measurement of Dielectric Constants. (Chapter 10 in *Technique of Microwave Measurements*, edited by C. G. Montgomery. M. I. T. Radiation Lab. Series, 11, pp. 561-676. New York: McGraw-Hill, 1947.)

REDHEFFER, RAYMOND M. A Machine for Playing the Game Nim. *Am. Math. Monthly* 55, pp. 343-349, July, 1948.

REISSNER, ERIC. Note on the Membrane Theory of Shells of Revolution. *J. Math. and Phys.* 26, pp. 290-293, January, 1948.

SALEM, RAPHAEL. Sur une Extension du Théorème de Convexité de M. Marcel Riesz. *Colloquium Mathematicum* 1, no. 1, pp. 6-8, 1947.

SALEM, RAPHAEL and A. ZYGMUND. On a Theorem of Banach. *Nat. Acad. Sci. Proc.* 33, pp. 293-297, October, 1947.

SALEM, RAPHAEL and A. ZYGMUND. On Lacunary Trigonometric Series Part I. *Nat. Acad. Sci. Proc.* 33, pp. 333-338, November, 1947; Part II, 34, pp. 54-62, February, 1948.

SALEM, RAPHAEL, M. KAC and A. ZYGMUND. A Gap Theorem. *Am. Math. Soc. Trans.* 63, pp. 235-243, March, 1948.

SELFridge, OLIVER G. Some Notes on the Theory of Flutter. *Instituto de Cardiología de México Archivos* 18, pp. 177-187, April, 1948.

WADSWORTH, GEORGE P., JOSEPH G. BRYAN and CHESTER H. GORDON. Short Range and Extended Forecasting by Statistical Methods. *U. S. Army Air Forces Weather Service Tech. Report* No. 105-37, February, 1948.

WALLMAN, HENRY. Intermediate-Frequency Amplifiers. (Chapter 6 in *Microwave Receivers*; edited by S. N. Van Voorhis. M. I. T. Radiation Lab. Series, 23, pp. 155-187. New York: McGraw-Hill, 1948.)

WALLMAN, HENRY. Stagger-tuned Amplifier Design. *Electronics* 21, No. 5, pp. 100-105, May, 1948.

WALLMAN, HENRY, ALAN MACNEE and CHRISTOPHER GADSDEN. A Low-Noise Amplifier. *I. R. E. Proc.* 36, pp. 700-708, June, 1948.

WIENER, NORBERT and SZOLEM MANDELBROJT. Sur les Fonctions Indefiniment Dérivables sur une Demi-Droite. *Acad. Sci. Paris Comptes Rendus* 225, pp. 978-980, November 24, 1947.

WIENER, NORBERT and SZOLEM MANDELBROJT. Quasi-analyticité Générale et Théorèmes du Type Phragmén-Lindelöf. *Acad. Sci. Paris Comptes Rendus* 226, pp. 47-49, January 5, 1948.

#### DEPARTMENT OF MECHANICAL ENGINEERING

BARRY, FRANK W. and GILBERT M. EDELMAN. An Improved Schlieren Apparatus. *J. Aero. Sci.* 15, pp. 364-365. June, 1948.

BURWELL, JOHN T., JR. The Calculated Performance of Dynamically Loaded Sleeve Bearings. *J. Appl. Mechanics* 14, pp. A-231-A-245, September, 1947.

BURWELL, JOHN T., JR. Hydrodynamic Lubrication of Sleeve Bearings Subject to Varying Loads. *Lubrication Eng.* 4, pp. 67-71, April, 1948.

COLLINS, SAMUEL C. Review of *Air Conditioning and Elements of Refrigeration*, by Samuel P. Brown. New York: McGraw-Hill, 1947. *J. Appl. Mech.* 15, p. 91, March, 1948.

COLLINS, SAMUEL C. Proposed Turbo-Expander Design for Air Liquefaction. *Refrigerating Eng.* 55, pp. 351-354, April, 1948.

COLLINS, SAMUEL C. Low Temperature and Some of Its Effects upon the Behavior of Matter. *Science* 107, pp. 327-333, April, 1948.

EDELMAN, GILBERT M. and ASCHER H. SHAPIRO. Tables for Numerical Solution of Problems in the Mechanics and Thermodynamics of Steady One-dimensional Gas Flow. *J. Appl. Mech.* 14, pp. A-344-A-351, December, 1947.

FINCH, ROGERS B., A. J. MCQUADE and R. W. LITTLE. Test Methods for Evaluation: B-4 Launching Tests (pp. 123-126); Applications to Military Equipage; A. Tentage Fabrics: 2. Relative Suitability of Treatments: a. Laboratory Evaluations (pp. 360-369) (Sections in *Flame Proofing of Textile Fabrics*, edited by R. W. Little. New York: Reinhold, 1947.)

FINCH, ROGERS B. Compressional Behavior of Textile Materials. I. Measurement at a Constant Rate of Deformation. *Textile Res. J.* 18, pp. 165-177, March, 1948. II. Measurement of Compressional Stress Relaxation at Constant Deformation. *Textile Res. J.* 18, pp. 237-243, April, 1948.

HAWTHORNE, WILLIAM R. and W. J. KING. American Aircraft Propulsion Machinery. *Instn. Mech. Engrs. (Lond.) Proc.* 157, pp. 197-202 (War Emergency Issue No. 29), 1947.

HERSEY, MAYO D. Teoria de la Lubricación; traducido por Rodolfo Martinez de Vedia. Buenos Aires: El Ateneo, 1947.

KEENAN, JOSEPH H. and JOSEPH KAYE. A Survey of the Calculated Efficiencies of Jet Power Plants. *J. Aero. Sci.* 14, pp. 437-450, August, 1947.

KEENAN, JOSEPH H. and ASCHER H. SHAPIRO. History and Exposition of the Laws of Thermodynamics. *Mech. Eng.* 69, pp. 915-921, November, 1947.

LEARY, WILLIAM A., E. S. TAYLOR, C. F. TAYLOR and J. U. JOVELLANOS. A Rapid Compression Machine Suitable for Studying Short Ignition Delays. *N. A. C. A. Tech. Note* No. 1332, February, 1948.

LEARY, WILLIAM A., E. S. TAYLOR, C. F. TAYLOR and J. U. JOVELLANOS. The Effect of Fuel Composition, Compression Pressure and Fuel-Air Ratio on the Compression Ignition Characteristics of Several Fuels. *N. A. C. A. Tech. Note* 1470, March, 1948.

MACGREGOR, CHARLES W. and L. F. COFFIN, JR. Approximate Solutions for Symmetrically Loaded Thick-walled Cylinders. *J. Appl. Mech.* 14, pp. A-301-A-311, December 7, 1947.

MACGREGOR, CHARLES W. and J. C. FISHER. Tempering Effects and the Mechanical Equation of State. *Am. Soc. Metals Trans.* 40, pp. 302-314, 1948.

MACGREGOR, CHARLES W. and N. GROSSMAN. The Effect of Combined Stresses on the Transition Temperatures for Brittle Fracture. *Welding J. Welding Res. Suppl.* 27, pp. 7s-16s, January, 1948.

MACGREGOR, CHARLES W. and N. GROSSMAN. A Comparison of the Brittle Transition Temperatures as Determined by the Charpy Impact and the M. I. T. Slow Bend Tests. *Welding J. Welding Res. Suppl.* 27, pp. 16s-19s, January, 1948.

MACGREGOR, CHARLES W., L. F. COFFIN, JR. and J. C. FISHER. Partially Plastic Thick-walled Tubes. *Franklin Inst. J.* 245, pp. 135-158, February, 1948.

MACGREGOR, CHARLES W., L. F. COFFIN, JR. and J. C. FISHER. The Plastic Flow of Thick-walled Tubes with Large Strains. *J. Appl. Phys.* 19, pp. 291-297, March, 1948.

MACGREGOR, CHARLES W. Review of *Plasticity in Engineering*, by F. K. Th. Van Iterson. London: Blackie, 1947. *J. Appl. Mech.* 15, pp. 94-95, March, 1948.

MACGREGOR, CHARLES W. and N. GROSSMAN. Some New Aspects of the Fatigue of Metals Brought Out by Brittle Transition Temperature Tests. *Welding J. Welding Res. Suppl.* 27, pp. 132s-144s, March, 1948.

MACGREGOR, CHARLES W. and N. GROSSMAN. Supplementary Statement on a Comparison of the Brittle Transition Temperatures as Determined by the Charpy Impact and the M. I. T. Slow Bend Tests. *Welding J. Welding Res. Suppl.* 27, pp. 159s-160s, March, 1948.

MACGREGOR, CHARLES W. and N. GROSSMAN. The Brittle Transition Temperatures of Various Low-Carbon Steels Welded by the Same Method. *Welding J. Welding Res. Suppl.* 27, pp. 2678-2718, May, 1948.

MACGREGOR, CHARLES W. and W. D. TIERNEY. Developments in High Speed Rotating Disk Research at M. I. T. *Welding J. Welding Res. Suppl.* 27, pp. 3038-3098, June, 1948.

RIGHTMIRE, BRANDON G. and B. W. SAKMANN. Investigation of Fretting Corrosion under Several Conditions of Oxidation. *N. A. C. A. Tech. Note* No. 1492, June, 1948.

ROHSENOW, WARREN M. and J. P. HUNSAKER. Determination of the Thermal Correction for a Single Shielded Thermocouple. *A. S. M. E. Trans.* 69, pp. 699-704, August, 1947.

SCHWARZ, EDWARD R. Synthetics. *Am. Wool and Cotton Reporter* 61, No. 42, p. 15, October 9, 1947.

SCHWARZ, EDWARD R. Textile Research Results. *Am. Dyestuff Reporter* 37, pp. p4-p6, January 12, 1948.

SCHWARZ, EDWARD R. Importance of the Time Factor in the Study of Textile Properties (Abstract). *Am. Wool and Cotton Reporter* 62, No. 14, pp. 15-16, April 1, 1948.

SCHWARZ, EDWARD R. New Trends in Textile Science (Radio Broadcast). *Textile Topics* 7, p. 4, June, 1948.

SHAPIRO, ASCHER H. and W. R. HAWTHORNE. The Mechanics and Thermodynamics of Steady, One-dimensional Gas Flow. *J. Appl. Mech.* 14, pp. A-317-A-336, December, 1947.

SHAPIRO, ASCHER H., W. A. REED and OTHERS. High-Output Combustion of Ethyl Alcohol and Air. *A. S. M. E. Trans.* 70, pp. 161-169, April, 1948.

SHAPIRO, ASCHER H. and GILBERT M. EDELMAN. Tables for Numerical Solution of Problems in Compressible Gas Flow with Energy Effects. *J. Appl. Mech.* 15, pp. 169-175, June, 1948.

SHAW, MILTON C. The Mechanism of Cutting Fluid Action. *J. Appl. Phys.* (Letter to the Editor) 18, p. 683, July, 1947.

SHAW, MILTON C. The Application of the Metal Cutting Process in the Chemical Industry (Guest Editorial). *Engrs. Digest* (N. Y.) 5, p. 160, May-June, 1948.

SHAW, MILTON C., C. D. STRANG, JR. and O. W. HART. Measurement of Piston-Ring Radial-Pressure Distribution. *S. A. E. Quarterly Trans.* 2, pp. 169-189, January, 1948.

SHAW, MILTON C. Mechanical Activation — A Newly Developed Chemical Process. *J. Appl. Mech.* 15, pp. 37-44, March, 1948.

SHAW, MILTON C. and C. D. STRANG, JR. The Hydrosphere — A New Hydrodynamic Bearing. *J. Appl. Mech.* 15, pp. 137-145, June, 1948.

SLOANE, ALVIN. *Fundamentals of Engineering Mechanics*. New York: Prentice-Hall, 1947.

TAYLOR, C. FAYETTE, JAMES V. D. EPPES, and JAMES C. LIVENGOOD. The Effect of Changing the Ratio of Exhaust-Valve Flow Capacity to Inlet-Valve Flow Capacity on Volumetric Efficiency and Output of a Single-Cylinder Engine. *N. A. C. A. Tech. Note* No. 1365, October, 1947.

*MEDICAL DEPARTMENT*

CRAWFORD, G. MARSHALL and C. GUY LANE. Treatment and Prevention of Certain Common Skin Diseases. *Medical Clinics of North America*, pp. 1135-1147, September, 1947.

CRAWFORD, G. MARSHALL. Syphilis. *N. E. J. Med.* 238, pp. 87-93; 121-128; 152-159, January, 1948.

CRAWFORD, G. MARSHALL. Injection Therapy for Angiomas. *Am. Med. Assoc. J.* 137, pp. 519-527, June, 1948.

FARNSWORTH, DANA LYDA. The Student Health Service in the Massachusetts Institute of Technology. *Lancet* 68, p. 87, March, 1948.

RICHARDS, LYMAN G. Otolaryngology in Transition. *Laryngoscope* 58, pp. 455-465, June, 1948.

*DEPARTMENT OF METALLURGY*

AVERBACH, BENJAMIN L., S. G. FLETCHER and M. COHEN. The Dimensional Stability of Steel. Part II — Further Experiments on Subatmospheric Transformations. *Am. Soc. Metals Trans.* 40, pp. 703-727, 1948. III — Decomposition of Martensite and Austenite at Room Temperature. *Am. Soc. for Metals Trans.* 40, pp. 728-757, 1948.

AVERBACH, BENJAMIN L. and M. COHEN. X-Ray Determination of Retained Austenite by Integrated Intensities. *Metals Tech.* 15, No. 2, February, 1948 (Am. Inst. Mining and Met. Engrs. Tech. Pub. No. 2342).

BARTHOLOMEW, EDWARD L., JR., M. S. BURTON, and F. R. EVANS. Flame Hardening of Armor Plate. *Metal Progress* 52, pp. 979-983, December, 1947.

BEVER, MICHAEL B. and R. J. ROCCA. Some Quantitative Aspects of the Use of Oxygen in the Iron Blast Furnace. *A. I. M. M. E. Blast Furnace, Coke Oven and Raw Materials Committee of the Iron and Steel Division Proc.* 6, pp. 67-82, 1947.

BEVER, MICHAEL B. Gases in Cast Metals. *Iron Age* 161, No. 17, pp. 91-94, April 22, 1948.

BEVER, MICHAEL B. Review of *Grundlagen der Eisengewinnung*, by Robert Durrer. Berne: Francke, 1947. *Mining and Metallurgy* 29, pp. 292-293, May, 1948.

COHEN, MORRIS and R. T. HOWARD, JR. Quantitative Metallography by Point-Counting and Lineal Analysis. *Metals Tech.* 14, No. 5, August, 1947 (Am. Inst. Mining and Met. Engrs. Tech. Pub. No. 2215).

COHEN, MORRIS and R. T. HOWARD, JR. Austenite Transformation above and within the Martensite Range. *Metals Tech.* 14, No. 6, September, 1947 (Am. Inst. Mining and Met. Engrs. Tech. Pub. No. 2283).

COHEN, MORRIS. Discussion of *The Isothermal Transformation of a Eutectoid Aluminum Bronze*, by D. J. Mack. *Metals Tech.* 15, No. 4, September, 1947 (Am. Inst. Mining and Met. Engrs. Tech. Pub. No. 2398, June, 1948).

GRANT, NICHOLAS J. Limitations on Precision Cast Parts. *Iron Age* 160, No. 6, pp. 62-66, August 7, 1947.

GRANT, NICHOLAS J. The Cobalt-Chromium J Alloy at 1350 to 1800°F. *Am. Soc. Metals Trans.* 40, pp. 585-616, 1948.

GRANT, NICHOLAS J., A. F. FREDERICKSON and M. E. TAYLOR. A Summary of Heat Resistant Alloys from 1200° to 1800°F, Parts I-III. *Iron Age* 161, No. 12, pp. 73-78, March 18, 1948; No. 15, pp. 75-81, April 8, 1948; No. 16, pp. 88-93, April 15, 1948.

HAYWARD, CARLE R. How Long Will Our Metals Last? *Technology Review* 50, pp. 96-101, December, 1947.

HAYWARD, CARLE R. Non-ferrous Metallurgists Report New Progress. *Eng. and Min. J.* 149, pp. 114-117, February, 1948.

KAUFMANN, ALBERT R. and E. GORDON. Vacuum Melting and Casting of Beryllium. *Metal Progress* 52, pp. 387-390, September, 1947.

NORTON, FREDERICK H. Pure Beryllium Oxide as a Refractory. *Am. Ceramic Soc. J.* 30, pp. 242-245, August, 1947.

NORTON, JOHN T. and D. ROSENTHAL. Recent Contributions to the X-Ray Method in the Field of Stress Analysis. *Soc. Exper. Stress Analysis Proc.* 5, No. 1, pp. 71-77, 1947.

SCHUHMANN, REINHARDT, JR. The Unit Processes of Chemical Metallurgy. *Metals Tech.* 15, No. 4, June, 1948. (Am. Inst. Mining and Met. Engrs. Tech. Pub. No. 2363).

SHALER, AMOS J. and J. WULFF. Rate of Sintering of Copper Powder (Letter to the Editor). *Phys. Rev.* 72, pp. 79-80, July 1, 1947.

SHALER, AMOS J., J. PRIETO ISAZA and J. WULFF. Tantalum Powder by Magnesium Reduction. *Metals Tech.* 14, No. 6, September, 1947. (Am. Inst. Mining and Met. Engrs. Tech. Pub. No. 2277.)

SHALER, AMOS J. and J. WULFF. On the Rate of Sintering of Metal Powder. (Letter to the Editor.) *Phys. Rev.* 73, p. 926, April 15, 1948.

SHALER, AMOS J. and J. WULFF. Mechanism of Sintering. *Ind. Eng. Chem.* 40, pp. 838-842, May, 1948.

SPEDDEN, H. RUSH and WILLIAM S. HANNAN, JR. Attachment of Mineral Particles to Air Bubbles in Flotation. *Mining Tech.* 12, No. 2, March, 1948. (Am. Inst. Mining and Met. Engrs. Tech. Pub. No. 2354.)

TELKES, MARIA. The Efficiency of Thermoelectric Generators I. *J. Appl. Phys.* 18, pp. 1116-1127, December, 1947.

UHLIG, HERBERT H. Passivity in Chromium-Iron Alloys; Adsorbed Iron Films on Chromium. *Metals Tech.* 14, No. 6, September, 1947. (Am. Inst. Mining and Met. Engrs. Tech. Pub. No. 2243).

UHLIG, HERBERT H. Mécanisme des Inhibiteurs de Corrosion. *Métaux et Corrosion* 22, pp. 204-210, November-December, 1947.

UHLIG, HERBERT H., Editor. *Corrosion Handbook*. New York: John Wiley & Sons, Inc. 1948.

UHLIG, HERBERT H. and R. B. MEARS. Passivity. (Section 1, Chapter 4 of *Corrosion Handbook*, edited by H. H. Uhlig, pp. 20-33, New York: John Wiley & Sons, Inc., 1948.)

UHLIG, HERBERT H. Iron and Steel. Section 2, Chapter 12 of *Corrosion Handbook*, edited by H. H. Uhlig, pp. 125-143, New York: John Wiley & Sons, Inc., 1948.

UHLIG, HERBERT H. Pitting in Stainless Steels and Other Passive Metals. Section 2, Chapter 13 of *Corrosion Handbook*, pp. 165-173, New York: John Wiley & Sons, Inc., 1948.

UHLIG, HERBERT H. and JOHN J. NAUGHTON. Determination of Small Amounts of Carbon in Steel. *Anal. Chem.* 20, pp. 477-480, May, 1948.

WILLIAMS, ROBERT S. and V. O. HOMERBERG. *Principles of Metallography*. Fifth Edition. New York: McGraw-Hill, 1948.

#### DEPARTMENT OF METEOROLOGY

AUSTIN, JAMES M. A Note on Cumulus Growth in a Nonsaturated Environment. *J. Meteorology* 5, pp. 103-107, June, 1948.

HOUGHTON, HENRY G. Some Personal Opinions of the Present Status of the Science and Practice of Meteorology. *Am. Meteor. Soc. Bull.* 29, pp. 101-105, March, 1948.

STARR, VICTOR P. Momentum and Energy Integrals for Gravity Waves of Finite Height. *J. Marine Res.* 6, pp. 175-193, December 15, 1947.

STARR, VICTOR P. An Essay on the General Circulation of the Earth's Atmosphere. *J. Meteor.* 5, pp. 39-43, April, 1948.

STARR, VICTOR P. Estimates of Water Transport Produced by Wave Action. *J. Marine Res.* 7, pp. 1-9, April 15, 1948.

#### DEPARTMENT OF MODERN LANGUAGES

CONDYANNIS, GEORGE E. Language or Technicalities. *Mod. Lang. J.* 31, pp. 443-454, November, 1947.

CONDYANNIS, GEORGE E. Adapting our College Courses to Conversation. *German Quarterly* 21, pp. 1-8, January, 1948.

CONDYANNIS, GEORGE E. Russian for Scientists (publ. as Note). *Mod. Lang. J.* 32, p. 392, May, 1948.

ZNAMENSKY, GEORGE A. One-Semester Course in Scientific Russian for Graduate Students. *Am. Assoc. of Teachers of Slavic and East European Languages Bull.* 5, pp. 10-12, September 15, 1947.

#### DEPARTMENT OF NAVAL ARCHITECTURE AND MARINE ENGINEERING

CHAPMAN, LAWRENCE B. The Course in Marine Transportation at M. I. T. *Am. Merchant Marine Conf. Proc. for 1948* 13, pp. 268-269, 1947.

LEWIS, FRANK M. Propeller Tunnel Notes. *Soc. of Naval Architects and Marine Engrs. Trans.* 55, pp. 284-304, 1947.

MANNING, GEORGE C. A Refresher on the Fundamentals of Ship Plans. *Nautical Gazette* 141, No. 11, pp. 30-31, 43-46, November, 1947.

#### DEPARTMENT OF PHYSICS

ALPERT, NELSON L. Studies of the Solid State by Means of Nuclear Magnetism (Letter to the Editor). *Phys. Rev.* 72, pp. 637-638, October 1, 1947.

BEARD, CHARLES I. and B. P. DAILEY. Microwave Spectrum and Structure of Isothiocyanic Acid (Letter to the Editor). *J. Chem. Phys.* 15, p. 762, October, 1947.

BEARD, CHARLES I. and B. P. DAILEY. Microwave Spectrum of Methyl Isothiocyanate. *Am. Chem. Soc., Abstracts of Papers*, 112th Meeting, p. 11-0, September, 1947.

BITTER, FRANCIS, N. L. ALPERT, D. E. NAGLE, and H. POSS. A Measurement of the Deuteron Proton Magnetic-Moment Ratio (Letter to the Editor). *Phys. Rev.* 72, p. 1271, December 15, 1947.

BOLT, RICHARD H. and GIACOMINI, A. Report on the National Electro-acoustic Institute "O. M. Corbino" (I. M. E. A. C.), Rome, Italy. *Acoustical Soc. Am. J.* 20, pp. 328-343, May, 1948.

BROWN, SANBORN C. and WARREN W. MILLER. Carbon Dioxide Filled Geiger-Müller Counters. *Rev. of Sci. Instr.* 18, pp. 496-500, July, 1947.

BROWN, SANBORN C. and KENNETH SCOTT. Count Rumford, International Informer. *N. E. Quarterly* 21, pp. 34-49, March, 1948.

BROWN, SANBORN C., MANFRED A. BIONDI, MELVIN A. HERLIN, EDGAR EVERHART and DONALD E. KERR. Methods of Measuring the Properties of Ionized Gases at Microwave Frequencies. *M. I. T. Research Lab. of Electronics. Tech. Report* No. 66, 1948.

BROWN, SANBORN C. A Laboratory Experiment on Alpha-Particle Scattering. *Am. J. Phys.* 16, pp. 304-307, May, 1948.

BROWN, SANBORN C. Detection of Ionizing Radiation by Ultra High Frequency Gas Discharge Counters (Abstract). *Phys. Rev.* 73, p. 1240, May 15, 1948.

BROWN, SANBORN C. Theory and Operation of Geiger-Müller Counters. I. The Discharge Mechanisms. *Nucleonics* 2, pp. 10-22, June, 1948.

BUECHNER, WILLIAM WEBER and L. R. MCINTOSH. Hygrometer for High-Pressure Gases. *Rev. Sci. Inst.* 18, p. 586, August, 1947.

BUECHNER, WILLIAM WEBER, R. J. VAN DE GRAAFF, A. SPERDUTO, E. A. BURRILL and L. R. MCINTOSH. Electrostatic Accelerator for Electrons. *Rev. Sci. Inst.* 18, pp. 754-765, October, 1947.

BUECHNER, WILLIAM WEBER and E. A. BURRILL. Sensitometry of Radiographic Films Exposed to Two-Million-Volt X-Rays. *A. S. T. M. Bull.* 148, pp. 52-57, October, 1947.

DEUTSCH, MARTIN. The Fission Process. (Chapter 2 in *The Science and Engineering of Nuclear Power*, edited by Clark Goodman. Vol. 1, pp. 75-86, Cambridge, Mass.: Addison-Wesley Press, 1947.)

DUNTLEY, SEIBERT Q. The Measurement of Meteorological Range (Abstract). *Optical Soc. Am. J.* 37, pp. 994-995, December, 1947.

DUNTLEY, SEIBERT Q. The Reduction of Apparent Contrast by the Atmosphere. *Optical Soc. Am. J.* 38, pp. 179-191, February, 1948.

DUNTLEY, SEIBERT Q. The Visibility of Distant Objects. *Optical Soc. Am. J.* 38, pp. 237-249, March, 1948.

EVANS, ROBLEY D. Fundamentals of Nuclear Physics. (Chapter 1 in *The Science and Engineering of Nuclear Power*, edited by Clark Goodman. Vol. 1, pp. 1-74, Cambridge, Mass.: Addison-Wesley Press, 1947).

EVANS, ROBLEY D. and K. LANGE. Absorption of Radon through the Skin and Its Exhalation through the Lungs. *Radiology* 48, pp. 514-516, May, 1947.

EVANS, ROBLEY D., J. W. IRVINE and OTHERS. The Measurement of Post-Transfusion Survival of Preserved Stored Human Erythrocytes by Means of Two Isotopes of Radioactive Iron. *J. Clinical Investigation* 26, pp. 704-714, July, 1947.

EVANS, ROBLEY D. and OTHERS. The Post-Transfusion Survival of Preserved Human Erythrocytes Stored as Whole Blood or in Re-Suspension, after Removal of Plasma, by Means of Two Isotopes of Radioactive Iron. *J. Clinical Investigation* 26, pp. 715-738, July, 1947.

EVANS, ROBLEY D. and OTHERS. The Rate of Post-Transfusion Loss of Non-Viable Stored Human Erythrocytes and the Re-Utilization of Hemoglobin-Derived Radioactive Iron. *J. Clinical Investigation* 26, pp. 739-746, July, 1947.

EVANS, ROBLEY D. and OTHERS. The Effect of Varying Temperatures on the Post-Transfusion Survival of Whole Blood during Depot Storage and after Transportation by Land and Air. *J. Clinical Investigation* 26, pp. 747-755, July, 1947.

EVANS, ROBLEY D. Radioactivity Units and Standards. *Nucleonics* 1, No. 2, p. 32, October, 1947.

EVANS, ROBLEY D. Tissue Dosage in Radio-Isotope Therapy. *Am. J. Roentgenology & Radium Therapy* 58, pp. 754-756, December, 1947.

EVANS, ROBLEY D. and RICHARD O. EVANS. Studies of Self-Absorption in Gamma-Ray Sources. *Rev. Modern Phys.* 20, pp. 305-326, January, 1948.

FELD, BERNARD T. The Application and Experimental Basis of Pile Theory. (Chapter 6 in *The Science and Engineering of Nuclear Power*, edited by Clark Goodman. Vol. 1, pp. 187-230, Cambridge, Mass.: Addison-Wesley Press, 1947.)

FELD, BERNARD T. The Photogenic Mesons. *M. I. T. Laboratory for Nuclear Science and Engineering. Tech. Report* No. 8, 1948.

FELD, BERNARD T., H. H. GOLDSMITH and H. W. IBSER. Neutron Cross Sections of the Elements. *Rev. Modern Phys.* 19, pp. 259-297, October, 1947.

FELD, BERNARD T. and F. DE HOFFMAN. Delayed Neutrons from  $\text{Pu}^{239}$ . *Phys. Rev.* 72, pp. 567-569, October 1, 1947.

FELD, BERNARD T. On the Nuclear Electric Quadrupole Interaction in Molecular Spectra. (Letter to the Editor). *Phys. Rev.* 72, pp. 1116-1117, December 1, 1947.

FELD, BERNARD T., L. DAVIS, C. W. ZABEL and J. R. ZACHARIAS. The Hyperfine Structure and Nuclear Moments of Chlorine. (Letter to the Editor). *Phys. Rev.* 73, pp. 525-527, March 1, 1948.

FELD, BERNARD T., F. DE HOFFMAN and P. R. STEIN. Delayed Neutrons from  $\text{U}^{235}$  after Short Irradiation. (Letter to the Editor). *Phys. Rev.* 73, p. 636, March 15, 1948.

FELD, BERNARD T. and OTHERS. Inelastic Scattering of Fast Neutrons by Fe, Pb, and Bi. *Phys. Rev.* 73, pp. 1307-1310, June 1, 1948.

FESHBACH, HERMAN and M. LAX. On the Radiation Problem at High Frequencies. *Acoustical Soc. Am. J.* 19, pp. 682-690, July, 1947.

FESHBACH, HERMAN and I. SCHIFF. Thresholds for Creation of Particles. (Letter to the Editor). *Phys. Rev.* 72, pp. 254, August 1, 1947.

FESHBACH, HERMAN and A. E. HEINS. The Coupling of Two Acoustical Ducts. *J. Math. and Phys.* 26, pp. 143-155, October, 1947.

FESHBACH, HERMAN and M. LAX. Absorption and Scattering for Impedance Boundary Conditions on Spheres and Circular Cylinders. *Acoustical Soc. Am. J.* 20, pp. 108-124, March, 1948.

FRIEDMAN, FRANCIS L. Elementary Pile Theory. (Chapter 5 in *The Science and Engineering of Nuclear Power*, edited by Clark Goodman. Vol. 1, pp. 111-186, Cambridge, Mass.: Addison-Wesley Press, 1947.)

FRIEDMAN, FRANCIS L. and G. BREIT. Calculations on Countercurrent Electromigration. *J. Research (Nat. Bur. Standards R. P. 1836)* 39, pp. 397-409. November, 1947.

GOODMAN, CLARK, *Editor*. *The Science and Engineering of Nuclear Power*. Vol. 1, Cambridge, Mass.: Addison-Wesley Press, 1947.

GOODMAN, CLARK. Construction of Nuclear Reactors. (Chapter 9 in *The Science and Engineering of Nuclear Power*, edited by Clark Goodman. Vol. 1, pp. 273-322, Cambridge, Mass.: Addison-Wesley Press, 1947.)

GOODMAN, CLARK. Petroleum vs. Plutonium. *Petroleum Engr.* 18, p. 224. September, 1947.

GOODMAN, CLARK. Training in Nuclear Technology. *Nucleonics* 1, pp. 44-49, September, 1947.

GOODMAN, CLARK. Nuclear Principles of Nuclear Reactors. *Nucleonics* 1, No. 3, pp. 23-33, November, 1947.

GOODMAN, CLARK. Propagation of a Chain Reaction; Nuclear Principles of Nuclear Reactors — II. *Nucleonics* 1, pp. 22-31, December, 1947.

GOODMAN, CLARK. Nuclear Principles of Nuclear Reactors. *Tech Eng. News* 29, pp. 187-189, March, 1948.

HARDY, ARTHUR C. and F. L. WURZBURG, JR. Color Correction in Color Printing. *Optical Soc. Am. J.* 38, p. 300, April, 1948.

HARDY, ARTHUR C. and EDWARD C. DENCH. An Electronic Method for Solving Simultaneous Equations. *Optical Soc. Am. J.* 28, p. 308, April, 1948.

HARDY, ARTHUR C. and F. L. WURZBURG, JR. A Photoelectric Method for Preparing Printing Plates. *Optical Soc. Am. J.* 38, p. 295, April, 1948.

HARRISON, GEORGE R., *Editor*. Optics — A History of Divisions 16 and 17, *N. D. R. C.*, by G. H. Kirk Stephenson and Edgar L. Jones. (A section in *Applied Physics: Electronics, Optics, Metallurgy*, edited by C. G. Suits, G. R. Harrison and Louis Jordan. Boston: Little, Brown & Company. (Atlantic Monthly Press), 1948.)

HARRISON, GEORGE R. New Advances in Science. *Food Tech.* 2, pp. 45-50, January, 1948.

HERLIN, MELVIN A. and SANBORN C. BROWN. Breakdown of a Gas at Microwave Frequencies. *M. I. T. Research Lab. of Electronics. Tech. Report* No. 60, 1948.

HERLIN, MELVIN A. and A. G. SMITH. Measurements. (Chapter 18 in *Microwave Magnetrons*, edited by G. B. Collins. *M. I. T. Radiation Lab. Series* 6, pp. 698-738. New York: McGraw-Hill, 1948.)

HERLIN, MELVIN A. and SANBORN C. BROWN. Measurements of Breakdown in Low-Pressure Helium at Microwave Frequencies (Abstract). *Phys. Rev.* 73, p. 1245, May 15, 1948.

KERR, DONALD E. Propagation of Very Short Waves. *Electronics* 21, No. 1, p. 124, January, 1948; v. 21, No. 2, pp. 118-123, February, 1948.

KING, GILBERT W. The Asymmetric Rotor, VI. Calculation of the Higher Energy Levels by Means of the Correspondence Principle. *J. Chem. Phys.* 11, pp. 820-830, November, 1947.

LAWRENCE, RICHARD B. Antenna Systems. (Chapter 10 in *Loran; Long Range Navigation*, edited by J. A. Pierce and others. pp. 301-348. New York: McGraw-Hill, 1948.)

MCNALLY, J. RAND, JR. Ratio of g Values of the  $2P_{1/2}$  and the  $2S_1$  States in Ionized Calcium. (Letter to the Editor). *Phys. Rev.* 73, p. 1130, May 1, 1948.

MAXWELL, EMANUEL. Conductivity of Metallic Surfaces at Microwave Frequencies. *J. Appl. Phys.* 18, pp. 629-638, July, 1947.

MAXWELL, EMANUEL, P. M. MARCUS and J. C. SLATER. Surface Impedance of Tin at 2400 Mc/sec. (Abstract). *Am. Phys. Soc. Bull.* 23, p. 40, April 29, 1948.

OZEROFF, WILLIAM J. Control and Operation of a Pile. (Chapter 8 in *The Science and Engineering of Nuclear Power*, edited by Clark Goodman. Vol. 1, pp. 251-272, Cambridge, Mass.: Addison-Wesley Press, 1947.)

PICCIONI, ORESTE. On the Capture of Negative Mesons. (Letter to the Editor). *Phys. Rev.* 73, p. 411, February 15, 1948.

POSS, HOWARD L. The Magnetic Moment of  $Tl^{205}$ . (Letter to the Editor). *Phys. Rev.* 72, p. 637, October 1, 1947.

RARITA, WILLIAM R. Some Deuteron Variational Methods. (Abstract). *Am. Phys. Soc. Bull.* 23, p. 26, April 29, 1948.

RARITA, WILLIAM R. and H. FESHBACH. Tensor Forces and the Binding Energy of the Triton. (Abstract). *Phys. Rev.* 73, p. 1272, May 15, 1948.

ROSSI, BRUNO B., MATTHEW SANDS and ROBERT F. SARD. Measurement of the Slow Meson Intensity at Several Altitudes. *Phys. Rev.* 72, pp. 120-125, July 15, 1947.

ROSSI, BRUNO B., HERBERT BRIDGE and ROBERT WILLIAMS. Burst Production by Penetrating Cosmic-Ray Particles. (Letter to the Editor). *Phys. Rev.* 72, pp. 257-258, August 1, 1947.

ROSSI, BRUNO B., H. BRIDGE and W. E. HAZEN. Further Results on Burst Production by Penetrating Cosmic-Ray Particles. (Letter to the Editor). *Phys. Rev.* 73, pp. 179-180, January 15, 1948.

SANDS, MATTHEW L., W. A. HIGINBOTHAM and JAMES GALLAGHER. The Model 200 Pulse Counter. *Rev. Sci. Inst.* 18, p. 706, October, 1947.

SLATER, JOHN C. The Design of Linear Accelerators. *M. I. T. Research Lab. of Electronics. Tech. Rept.* No. 47, 1947.

SLATER, JOHN C. Electromagnetic Waves in Iris-loaded Waveguides. *M. I. T. Research Lab. of Electronics. Tech. Rept.* No. 48, 1947.

TINLOT, JOHN H. Variation of Penetrating Showers with Altitude. (Letter to the Editor). *Phys. Rev.* 73, pp. 1476-1477, June 15, 1948.

TISZA, LASZLO. Phase Transition in the Hydrogen Halides. (Abstract). *Phys. Rev.* 72, p. 161, July, 1947.

TISZA, LASZLO. On a Connection between the Fountain Effect, Second Sound and Thermal Conductivity in Liquid Helium, II. (Letter to the Editor). *Phys. Rev.* 72, pp. 353-354, August, 1947.

TISZA, LASZLO. On the Classification of Phase Transitions. *Phys. Rev.* 72, p. 532, September, 1947.

TISZA, LASZLO. The Theory of Liquid Helium. *Phys. Rev.* 72, pp. 838-854, November 1, 1947.

VALLEY, GEORGE E., JR. The Radioactive Decay of Slow Positive and Negative Mesons. *Phys. Rev.* 72, pp. 772-783, November 1, 1947.

VALLEY, GEORGE E., JR. and B. ROSSI. On the Mean Life of Negative Mesons. (Letter to the Editor). *Phys. Rev.* 73, pp. 177-178, January 15, 1948.

VAN DE GRAAFF, ROBERT JEMISON, W. W. BUECHNER, A. SPERDUTO, E. A. BURRILL and H. FESHBACH. Further Experiments on the Elastic Single Scattering of Electrons by Nuclei. *Phys. Rev.* 72, pp. 678-679, October 15, 1947.

WARREN, BERTRAM E. X-Ray Studies of Randomness in Various Materials. (Chapter 4 in *Chemical Architecture*, edited by R. E. Burk and O. J. Grummitt. *Frontiers in Chemistry* Vol. 5, pp. 101-120, New York: Interscience, 1948.)

WEISSKOPF, VICTOR F. Neutron Diffusion. (Chapter 3 in *The Science and Engineering of Nuclear Power*, edited by Clark Goodman, Vol. 1, pp. 87-97, Cambridge, Mass.: Addison-Wesley Press, 1947.)

WEISSKOPF, VICTOR F. On the Production Process of Mesons. (Letter to the Editor). *Phys. Rev.* 72, p. 510, September 15, 1947.

WHITE, JAMES E. A Continuous Variable Acoustic Impedance. *Acoustical Soc. Am. J.* 19, pp. 846-849, September, 1947.

#### THE INSTITUTE LIBRARIES

CHAMBERLAIN, MARGUERITE. Review of *Guide to the Literature of Mathematics and Physics*, by Nathan Grier Parke, 3d. New York: McGraw-Hill, 1947. *Rev. Sci. Inst.* 18, pp. 787-788, October, 1947.

PERRY, JAMES W., LORNA FERRIS and S. C. STANFORD. The Use of Punched Cards in American Libraries. (In Association of Special Libraries and Information Bureaux. *Report of Proceedings of the 22d Conference, Sept. 20 and 21, 1947.* pp. 40-54. London: Association, 1947.)

PERRY, JAMES W., C. S. GROVE, JR. and ROBERT S. CASEY. Codification of Materials. *Ind. Eng. Chem.* 39, pp. 1261-1264, October, 1947.

PERRY, JAMES W., LORNA FERRIS and KANARDY TAYLOR. Bibliography on the Uses of Punched Cards. *J. Documentation* 3, pp. 250-269, March, 1948.

PERRY, JAMES W. Indexing, Classifying and Coding the Chemical Literature. *Ind. Eng. Chem.* 40, pp. 476-477, March, 1948.

PERRY, JAMES W. *Chemical Russian, Self-Taught*. Easton, Pa.: J. Chem. Educ., 1948.

PERRY, JAMES W. The Utilization of Scientific Knowledge. *Sci. Monthly* 66, pp. 413-417, May, 1948.

TATE, VERNON D. Photographic Reproduction and Related Processes. (In Federation International de Documentation. *Rapports de la 17<sup>me</sup> Conference*; Berne, August 25-30, 1947.)

WARREN, SIBYL E. Metallurgical Books: A Bibliography, Classified by Subject Matter, of Metallurgical and Near-Metallurgical Books Published in the Years 1936-1946. Pt. 1-3. *Metals Rev.* 21, No. 3, pp. 25 and 27; No. 4, pp. 41 and 43; No. 5, pp. 41 and 43, March, April, May, 1948.

#### ADMINISTRATION

BAKER, EVERETT M. The Future of M. I. T. *Tech Eng. News* 29, pp. 279-281, 296, May, 1948.

BAKER, EVERETT M. The Future of the Fraternity. *Deke Quarterly*, February, 1948.

BUNKER, JOHN W. M. Education Problems of Graduate Student Theses Based on Sponsored Research. *J. Eng. Educ.* 38, p. 385, January, 1948.

BURCHARD, JOHN E. and LINCOLN R. THIESMEYER. *Combat Scientists*. Boston: Little, Brown & Co. (Atlantic Monthly Press), 1947.

BURCHARD, JOHN E. The Humanities and Social Sciences in a Technological Education. *J. General Educ.* 2, p. 171, April, 1948.

BURCHARD, JOHN E. *Q. E. D. — M. I. T. in World War II*. Cambridge, Mass.: The Technology Press; New York: John Wiley & Sons, Inc., 1948.

BURCHARD, JOHN E., *Editor*. *Rockets, Guns and Targets*. Boston: Little, Brown & Co. (Atlantic Monthly Press), 1948.

HUNTER, DARD. *Papermaking, the History and Technique of an Ancient Craft*. Second edition, New York: A. A. Knopf, Inc., 1947.

HUNTER, DARD. The Story of Paper Told in the Paper Museum. *Paper Trade J.* 124, pp. 343-355, May, 1948.

KILLIAN, JAMES R., JR. *Government Research in Educational Institutions: Its Benefits and Hazards*. (A paper presented at Navy Research Conference, Washington, D. C., November, 1947, and printed, along with other conference papers, in a booklet published by the Navy Industrial Association, Inc., New York City.)

KILLIAN, JAMES R., JR. M. I. T. Redeploys for Peace. *Technology Review* 50, p. 371, May, 1948.

KILLIAN, JAMES R., JR. Quality vs. Quantity in College Education. *Wellesley Mag.* 32, p. 250, April, 1948.

KILLIAN, JAMES R., JR. Research for Education. *Technology Review* 50, p. 29, November, 1947.

KILLIAN, JAMES R., JR. Research Policies at M. I. T. *J. Eng. Educ.* 38, p. 181, November, 1947.

ROWLANDS, JOHN J. *Cache Lake Country.* New York: Norton and Company, 1947.

SHERWOOD, THOMAS K. and W. H. TUCKER. Vacuum Dehydration Using Liquid Absorbents. *Ind. Eng. Chem.* 40, p. 832, May, 1948.

#### OTHER PUBLICATIONS

STETSON, HARLAN T. Articles on Sun, Air, Atmosphere, Earth, Ionospheric for *Encyclopedia Americana*. New York. 1946-1947 printings.

STETSON, HARLAN T. *Sunspots in Action.* New York: Ronald Press, 1947.

STETSON, HARLAN T. and GREENLEAF W. PICKARD. A Study of Tropospheric Reception at 42.8 mc. and Meteorological Conditions. *I. R. E. Proc.* 35, pp. 1445-1450, December, 1947.

STETSON, HARLAN T. Exploring the Ionosphere. (In *The Book of Knowledge Annual*. New York: Grolier Press, 1948.)

STETSON, HARLAN T. Sunspots and Radio. *Radiocraft* 19, No. 5, pp. 24-26, February, 1948.

STETSON, HARLAN T. Report of the Cosmic Terrestrial Research Laboratory, 1946-1947. *Astronomical J.* 53, No. 5, p. 139, March, 1948.

STETSON, HARLAN T. and GREENLEAF W. PICKARD. Simultaneous Observations of Field-Intensity Measurements of WWV at Needham, Massachusetts and at Intervale, New Hampshire During the Summer of 1947. *Terr. Magnetism & Atmospheric Elect.* 53, pp. 67-77, March, 1948.

STETSON, HARLAN T. Report of Special Committee on Cosmic Terrestrial Relationships. *Am. Geophys. Union Trans.* 29, pp. 436-440, June, 1948.

## THESES PRESENTED FOR DOCTORS' DEGREES

*(Not available in printed form. Photostat or microfilm copies may be obtained from the Reference Librarian.)*

### DEPARTMENT OF BIOLOGY

#### DOCTOR OF PHILOSOPHY

HENDERSON, RICHARD. Nutritional Advantage of Concurrent Feeding of Essential Amino Acids. June, 1948.

SINSHEIMER, ROBERT LOUIS. Development of Methods of Microspectroscopy and Low Temperature Spectroscopy for Biological Research. June, 1948.

WEBB, ALFRED MOHR. Release of Vitamin B Complex Factors by Damaged Living Cells. September, 1947.

### DEPARTMENT OF CHEMICAL ENGINEERING

#### DOCTOR OF SCIENCE

CADOGAN, WILLIAM PATRICK. Adsorption of Hydrocarbon Gases and Their Mixtures. June, 1948.

CHERTOW, BERNARD. Adsorption of Binary Mixtures of Gaseous Hydrocarbons — Equilibria and Kinetics. June, 1948.

ISBIN, HERBERT STANFORD. Preparation and Evaluation of Solid Catalysts for the Decomposition of Hydrogen Peroxide. September, 1947.

McBRIDE, GUY THORNTON, JR. Gasification of Carbon by Carbon Dioxide in a Fluidized Powder Bed. June, 1948.

MICHAELS, ALAN SHERMAN. Measurement of Interfacial Tension at Elevated Pressure and Temperature. June, 1948.

REED, WILLIAM ALLEN. Studies in the Partial Oxidation of Methane with Metal Oxides. February, 1948.

SCURLOCK, ARCH CHILTON. Stabilization and Propagation of Flames in High-Velocity Gas Streams. June, 1948.

### DEPARTMENT OF CHEMISTRY

#### DOCTOR OF PHILOSOPHY

BLACK, DONALD MILLER. Synthesis of Some Enyne Epoxy Compounds. September, 1947.

COLLINS, DAVID VERNON. Preparation and Properties of Some Derivatives of D-Erythrose. February, 1948.

CORRSIN, LESTER. Preparation and Vibrational Spectra of Pyridine-d<sub>5</sub>. June, 1948.

CRANDALL, JOHN LOU. Vanadate-Tartrate Solutions. June, 1948.

DOUSLIN, DONALD RAYMOND. Critical Constants and Equation of State of Neopentane. June, 1948.

EVANS, HOWARD TASKER, JR. Study of the Constitution of the 6-Heteropolymolybdates: the Crystal Structures of Ammonium and Potassium Molybdotellurates. June, 1948.

FAWCETT, FRANK SHUMATE. Methods for the Synthesis of Unsaturated Eight-Membered Ring Compounds. June, 1948.

GOLIBERSUCH, EDWARD WILLIAM. Study of the Chemistry of Trivalent Columbium. February, 1948.

GROVENSTEIN, ERLING, JR. Metalation of Styrene and Its  $\alpha$ - $\beta$ -Methyl Homologues with Special Reference to Polymerization by Organosodium Compounds. June, 1948.

LEVINE, SAMUEL W. Compressibility and Critical Constants of n-Pentane. June, 1948.

LITTLE, ERNEST LEWIS, JR. Use of Alkylaryl Hydrocarbons and Dienes in Alfin Catalysis. September, 1947.

MAGAT, PHYLLIS LOUISE. Rearrangement of Allyl Groups in Three Carbon Systems: Ketones. September, 1947.

MARSH, FRANK DENNIS. Metalation of Some Vinyl Systems by Amyl-sodium. June, 1948.

NACE, HAROLD RUSS. Syntheses in the 8-Aminoquinoline and Tropinone Series. JUNE, 1948.

PENNER, SIEGFRIED EDMUND. Use of Branched-Chain Olefins in Alfin Catalysis. June, 1948.

PRIEST, HOMER FARNUM. Fluorides and Oxyfluorides of Tungsten. February, 1948.

TAVES, MILTON ARTHUR. Synthesis of Compounds in the Furo (3,2-b) Quinoline and the Thieno (3,2-b) Quinoline Ring Systems. February, 1948.

TOWLE, PHILIP HAMILTON. Preparation and Rearrangement of some N-Allyl- and N-Benzyl-N, N-Dialkylamine Oxides. June, 1948.

*DEPARTMENT OF CIVIL AND SANITARY ENGINEERING*  
DOCTOR OF SCIENCE

HANSEN, ROBERT JOSEPH. Development of Experimental Technique for Controlled Impulsive Loading of Simple Beams. February, 1948.

LAMBE, THOMAS WILLIAM. Capillary Phenomena in Cohesionless Soils. June, 1948.

TAJIRIAN, FARAJ DER VAHAN. Analysis of Rectangular Plates Under Various Loading and Boundary Conditions. February, 1948.

*DEPARTMENT OF ECONOMICS AND SOCIAL SCIENCE*  
DOCTOR OF PHILOSOPHY

ASHBROOK, ARTHUR GARWOOD, JR. Federal Wage-Price Policy for a Full Employment Economy. September, 1947.

MILLER, JOHN WADE, JR. Analysis of Union-Management Co-operation Based Primarily on Experience in the Steel Industry. June, 1948.

*DEPARTMENT OF ELECTRICAL ENGINEERING*

DOCTOR OF SCIENCE

TULLER, WILLIAM GORDON. Theoretical Limitations on the Rate of Transmission of Information. June, 1948.

TUTTLE, DAVID FEARS, JR. Network Synthesis for Prescribed Transient Response. June, 1948.

*DEPARTMENT OF FOOD TECHNOLOGY*

DOCTOR OF PHILOSOPHY

LAMDEN, MERTON PHILIP. Non-Enzymatic Browning of Ascorbic Acid. September, 1947.

DOCTOR OF SCIENCE

PHILLIPS, ARTHUR R. WILLIAM, JR. Studies on the Microbiology of Frozen Precooked Foods. September, 1947.

*DEPARTMENT OF GEOLOGY*

DOCTOR OF PHILOSOPHY

ALLAN, JOHN DONALD. Geological Studies of the Lynn Lake Area, Northern Manitoba. June, 1948.

BELL, KENNETH GRENVILLE. Geology of the Boston Metropolitan Area. June, 1948.

HAMBURGER, GABRIELLE EVA. Crystal Structure of Tourmaline. June, 1948.

TUTTLE, ORVILLE FRANK. Structural Petrology of Planes of Liquid Inclusions. June, 1948.

YODER, HATTEN SCHUYLER, JR. Stability Relations of Grossularite. June, 1948.

DOCTOR OF SCIENCE

FREDERICKSON, ARMAN FREDERICK. Mineralogy of a Drill Core of Arkansas Bauxite. September, 1947.

*DEPARTMENT OF MATHEMATICS*

DOCTOR OF PHILOSOPHY

ANDREW, MERLE M. Application of Lagrangian Procedures to an Electromagnetic System Consisting of a Wave Guide, an Orifice, and a Cavity. June, 1948.

BOGERT, BRUCE PLYMPTON. On the Separability of One Variable in Certain Linear Partial Differential Equations. June, 1948.

DUGUNDJI, JAMES. Fundamental Group for Spaces Which are not LC<sup>1</sup>. February, 1948.

GIEVER, JOHN BERTRAM. On the Equivalence of Two Continuous Homology Theories. June, 1948.

GILBERT, EDGAR NELSON. Asymptotic Solution of Relaxation Oscillation Problems. June, 1948.

KELLY, JOHN BECKWITH. On Certain Classes of Algebraic Integers. June, 1948.

LANING, J. HALCOMBE, JR. Mathematical Theory of Lubrication-Type Flow. September, 1947.

REDHEFFER, RAYMOND Moos. Separation of Laplace's Equation. June, 1948.

SCHEID, FRANCIS JAMES. On the Asymptotic Shape of the Cavity Behind an Axially Symmetric Nose Moving Through an Ideal Fluid. June, 1948.

THOMSEN, DONALD LAURENCE, JR. On the Separation of Variables in the Two-Dimensional Scalar Helmholtz Equation. September, 1947.

YEVICK, MIRIAM AMALIE LIPSCHUTZ. Lebesque Density Theorem in Abstract Measure Spaces. September, 1947.

*DEPARTMENT OF MECHANICAL ENGINEERING*

DOCTOR OF SCIENCE

FISHER, JOHN CROCKER. Mechanism for the Plastic Flow of Certain Simple Alloys. September, 1947.

FLOWERS, FRED FORT. Some Design Considerations for Constant-Power Variable-Speed Electrical Transmissions. June, 1948.

LESSEN, MARTIN. On the Stability of the Laminar Boundary Layer Between Parallel Streams. June, 1948.

PLUNKETT, ROBERT. Forced Vibrations of a Rotating Propeller. June, 1948.

WU, MING-HUA LEE. Subharmonic Resonance of System Having Non-Linear Spring with Variable Coefficient. June, 1948.

*DEPARTMENT OF METALLURGY*

DOCTOR OF SCIENCE IN METALLURGY

AVERBACH, BENJAMIN LEWIS. Dimensional Changes in Hardened Gage Steels. September, 1947.

COUGHANOUR, LESLIE WARREN. Viscosity of Aqueous Suspensions of Various Minerals. September, 1947.

GOLD, LOUIS. Preparation of Large Metallic Crystals and Some Ultrasonic Studies with Particular Reference to Beryllium. September, 1947.

HARRIS, WILLIAM JAMES, JR. Quantitative Study of the Austenite-Martensite Reaction. February, 1948.

HATCH, GERALD GORDON. Sulfur Equilibria Between Iron Blast Furnace Slags and Liquid Iron Saturated with Carbon. June, 1948.

KAMM, ROBERT LUSCOMBE. Plastic Deformation in the Cold Pressing of Metal Powders. September, 1947.

ROBERTSON, WILLIAM DONALD. Electrical and Chemical Properties of Magnesium-Tin and Magnesium-Lead Intermetallic Compounds and Adjacent Compositions. June, 1948.

STEINBERG, MORRIS ALBERT. Determination of the Plastic Flow Mechanism in Ductile Metals. June, 1948.

TEITEL, ROBERT JERRELL. Beryllium-Iron System. June, 1948.

WINKLER, THEODORE BOGER. Equilibrium Study of the Distribution of Phosphorus Between Molten Iron and Basic Slags. June, 1948.

WLODEK, TADEUSZ WŁADYSŁAW. Magnetic Method for Studying the Plastic Deformation During Dynamic Loading. June, 1948.

*DEPARTMENT OF METEOROLOGY*

DOCTOR OF SCIENCE

BROOKS, DOUGLAS LEE. Measurement of Atmospheric Radiation Applied to the Heat Transfer by Infra-Red Radiation in the Free Atmosphere. June, 1948.

CRAIG, RICHARD ANSEL. Observations and Photochemistry of Atmospheric Ozone and Their Meteorological Significance. June, 1948.

DOLEZEL, EDWARD JOSEPH. Study of the Sea-Breeze Potential for the Case of an Off-Shore General Wind. February, 1948.

HOWELL, WALLACE EGBERT. Growth of Cloud Drops in Uniformly Lifted Air. June, 1948.

LORENZ, EDWARD NORTON. Case of Applying the Hydrodynamic and Thermodynamic Equations to Atmospheric Models. February, 1948.

MACHTA, LESTER. Study of the Observed Deviations from the Geostrophic Wind. June, 1948.

SPOHN, CLIFFORD ADAMS. Study of Some Relationships of Pressure Change Centers and of the Nature of Changes in Total Hemispherical Pressure. June, 1948.

*DEPARTMENT OF PHYSICS*

DOCTOR OF PHILOSOPHY

ALPERT, NELSON LEIGH. Study of the Solid State by Means of Nuclear Magnetic Resonance Phenomena. June, 1948.

BEARD, CHARLES IRVIN. Microwave Spectra of Thiocyanates and Isothiocyanates. February, 1948.

BOAS, MARY LAYNE. Photodisintegration of  $H^3$ . February, 1948.

CALLEN, HERBERT BERNARD. Phenomenological Theory of Irreversible Processes. September, 1947.

DAVISSON, CHARLOTTE MEAKER. Gamma Ray Absorption Coefficients. June, 1948.

EPSTEIN, SAUL THEODORE. Investigation of a Particle of Spin 3/2. September, 1947.

FRENCH, JAMES BRUCE. Shift of Energy Levels Due to Radiative Coupling June, 1948.

FRISCH, DAVID HENRY. Nuclear Binding Energies. September, 1947.

GALT, JOHN KIRTLAND. On the Attenuation of Sound in NaCl Crystals. September, 1947.

GARRISON, JOHN BIRMINGHAM. Behavior of Superconductors in the Microwave Region. September, 1947.

GLUCKSTERN, ROBERT LEONARD. Power Loss for a Charge Distribution Moving Parallel to a Surface of Finite Conductivity. June, 1948.

GUINDON, WILLIAM GARTLAND. Discussion of the Effect of the Tensor Force in the Deuteron. February, 1948.

HALL, CECIL EDWIN. Dark-Field Electron Microscopy. February, 1948.

HERLIN, MELVIN ARNOLD. Breakdown of a Gas at Microwave Frequencies. June, 1948.

JULIAN, RENNE STEPHEN. Hyperfine Separation of Atomic Deuterium. September, 1947.

KYHL, ROBERT LOUIS. Investigation of Gas Spectra in the Microwave Range. September, 1947.

LAX, MELVIN. Production of Mesons by Electromagnetic Means. September, 1947.

MCKINLEY, WILLIAM ALBERT, JR. Theory of the Elastic Scattering of Relativistic Electrons from Nuclei. September, 1947.

MAXWELL, EMANUEL. Surface Impedance of Tin at 24,000 Mc/sec in the Superconducting and Normal States. June, 1948.

NAGLE, DARRAGH EDMUND. Hyperfine Structure of Atomic Hydrogen. September, 1947.

NOLLE, ALFRED WILSON. Some Aspects of Dynamic Elasticity of Rubber-Like Materials. September, 1947.

PARKER, NATHAN GRIER, III. Matrix Optics. June, 1948.

PEASLEE, DAVID CHASE. Deuteron-Induced Reactions. February, 1948.

POSS, HOWARD LIONEL. Measurement of Nuclear Magnetic Moments by Resonance Absorption. June, 1948.

ROTH, WILFRED. Study of the Absorption of Ultrasonics in Metals as a Function of Wave Length and Grain Size. February, 1948.

SANDS, MATTHEW LINZEE. Meson Component of the Cosmic Radiation. June, 1948.

SIEGEL, LESTER AARON. Molecular Rotation in Crystals. June, 1948.

STERGIOPoulos, CHRISTOS GEORGE. Experimental Investigation of Excited States of  $\text{Li}^7$  and  $\text{Be}^{10}$ .

STRAIT, EDWARD NATHAN, JR. Investigation of Energy Relationships in the Reactions  $\text{Be}^9(\text{p},\text{d})\text{Be}^8$  and  $\text{Li}^7(\text{d},\text{p})\text{Li}^8$  by Magnetic Analysis. June, 1948.

STRANDBERG, MALCOLM WOODROW PERSHING. Research on Resonant Molecular Absorption at Microwave Frequencies. February, 1948.

THOMPSON, ROBERT WALTER. Disintegration of Mesons. June, 1948

**TITTLE, CHARLES WILLIAM.** Slowing Down and Diffusion of Neutrons in Hydrogenous Media. February, 1948.

**TYSON, JAMES KING.** Investigation of Nuclear Reactions Involving Charged Particles. June, 1948.

**WILLIAMS, ROBERT WALTER.** Origin and Structure of Large Cosmic-Ray Air Showers. February, 1948.

DOCTOR OF SCIENCE

**KENT, ROCKWELL, III.** Applicability of Hollow Cathode Discharge to Analytical Problems. June, 1948.

**MAHLMAN, GEORGE WILLIAM.** Work Functions and Conductivity of Oxide-Coated Cathodes. June, 1948.

**YEVICK, GEORGE JOHANNUS.** N-Body Problem in Quantum Mechanics. September, 1947.

## INDEX OF AUTHORS OF STAFF PUBLICATIONS

Adams, F. J.: 291, 292  
Alpert, N. L.: 306, 307  
Amdur, I.: 289  
Anderson, L. B.: 285  
Arguimbau, L. B.: 294  
Ashdown, A. A.: 289  
Austin, J. M.: 306  
Averbach, B. L.: 304  
Babcock, J. B., 3d: 292  
Baker, E. M.: 312  
Baker, T. E.: 292  
Ballantine, D. S.: 296  
Balsbaugh, J. C.: 294  
Barry, F. W.: 301  
Bartholemew, E. L., Jr.: 304  
Bartlett, H. R.: 296  
Beard, C. I.: 307  
Beckwith, H. L.: 285  
Bennett, H. S.: 285, 286  
Beranek, L. L.: 294  
Bever, M. B.: 304  
Biondi, M. A.: 307  
Bishop, R. L.: 292, 294  
Bitter, F.: 307  
Blake, C. H.: 286  
Boas, R. P., Jr.: 299  
Bolt, R. H.: 307  
Bone, A. J.: 292  
Breckenridge, R. G.: 294  
Breger, I. A.: 298  
\*Breit, G.: 309  
Bridge, H.: 310  
Brown, E. C.: 292, 294  
Brown, G. S.: 294  
\*Brown, R. L.: 295  
Brown, S. C.: 307, 310  
Brownlow, J. M.: 294  
Bryan, J. G.: 301  
\*Buck, R. C.: 299  
Buechner, W. W.: 307, 311  
Buerger, M. J.: 298, 299  
Bunker, J. W. M.: 312  
Burbank, R. D.: 295, 299  
Burchard, J. E.: 292, 312  
\*Burr, G. S.: 287

\*Burrill, E. A.: 307, 311  
\*Burton, M. S.: 304  
Burwell, J. T., Jr.: 301  
Callen, H. B.: 294  
Campbell, D. P.: 294  
\*Campbell, W. H., Jr.: 287  
Campbell, W. L.: 297  
\*Carrier, G. F.: 300  
\*Casey, R. S.: 312  
\*Caso, E.: 293  
Chamberlain, M.: 311  
\*Chance, B.: 296  
\*Chandrasekharan, K.: 299  
Chapman, L. B.: 306  
Cheatham, T. P.: 294  
Chu, L. J.: 294  
Coffin, L. F.: Jr., 302  
Cohen, M.: 304  
Collins, S. C.: 301  
Condoyannis, G. E.: 306  
Cope, A. C.: 289  
\*Copperman, A.: 292  
Coryell, C. D.: 289, 290  
Crawford, G. M.: 304  
Crout, P. D.: 299  
\*Dailey, B. P.: 307  
David, E. E., Jr.: 294  
\*Davies, T. H.: 289  
Davis, L.: 308  
\*de Hoffman, F.: 308  
\*Dench, E. C.: 309  
Deneus, A. R. T.: 287  
De Robertis, E. D. P.: 286  
Deutsch, K. W.: 297  
Deutsch, M.: 307  
Dietz, A. G. H.: 287  
Douglass, R. D.: 299  
\*Dowker, C. H.: 300  
Dugundji, J.: 300  
Duntley, S. Q.: 307  
Dwight, H. B.: 294, 295  
Edelman, G. M.: 301, 303  
Edgerton, H. E.: 295  
Edwards, R. R.: 289  
\*Eisenstein, A. S.: 291

\*Not on Institute Staff, 1947-48.

Eppes, J. V. D.: 303  
 \*Erdős, P.: 299  
 Evans, F. R.: 304  
 Evans, H. T.: 289, 295, 299  
 Evans, R. D.: 307, 308  
 \*Evans, R. O.: 308  
 Everhart, E.: 307  
 Fano, R. M.: 295  
 Farnsworth, D. L.: 304  
 Fay, R. D.: 295  
 Feld, B. T.: 308  
 \*Ferris, L.: 312  
 Feshbach, H.: 309, 310, 311  
 Festinger, L.: 293  
 Finch, R. B.: 301  
 \*Fisher, J. C.: 302  
 \*Fletcher, S. G.: 304  
 \*Fortier, O. V.: 295  
 Franklin, P.: 300  
 \*Frederickson, A. F.: 305  
 Freeman, H. A.: 293  
 Friedman, F. L.: 309  
 \*Gadsden, C.: 301  
 Gailus, W. J.: 287  
 \*Gallagher, J.: 311  
 Galloway, W. C.: 295  
 Gee, A.: 289  
 Getting, I. A.: 295  
 \*Giacomini, A.: 307  
 Gilliland, E. R.: 288  
 Glendenin, L. E.: 289, 290  
 \*Goldblith, S. A.: 298  
 Goldman, S.: 295  
 \*Goldsmith, H. H.: 308  
 Goodman, C.: 309  
 Gordon, C. H.: 301  
 \*Gordon, E.: 305  
 Gould, B. S.: 286  
 Grant, N. J.: 304, 305  
 Greene, W. C.: 297  
 Greenfeld, S. H.: 287, 288  
 \*Grossi, F. X.: 290  
 \*Grossman, N.: 302, 303  
 \*Grove, C. S., Jr.: 312  
 Guild, L. P.: 297, 298  
 Hall, C. E.: 286  
 \*Hannan, W. S., Jr.: 305  
 \*Hansen, A. H.: 293  
 Hardy, A. C.: 309  
 Harrington, T. M.: 290  
 Harris, R. S.: 297, 298  
 Harrison, G. R.: 309  
 \*Hart, O. W.: 303  
 Hauser, E. A.: 288  
 Hawthorne, W. R.: 302, 303  
 Hayward, C. R.: 305  
 Hazen, H. L.: 295  
 \*Hazen, W. E.: 310  
 \*Heins, A. E.: 309  
 Herlin, M. A.: 307, 310  
 Hersey, M. D.: 302  
 \*Higinbotham, W. A.: 311  
 \*Hildebrand, J. H.: 289  
 Hill, T. M.: 288  
 \*Holden, M. E. T.: 290  
 Homerberg, V. O.: 306  
 Horwood, M. P.: 292  
 Houghton, H. G.: 306  
 \*Howard, R. T., Jr.: 304  
 Howatt, G. N.: 294  
 \*Huckaba, C. E.: 290  
 Hunsaker, J. C.: 285  
 \*Hunsaker, J. P.: 303  
 Hunter, D.: 312  
 Huntress, E. H.: 289  
 Hurewicz, W.: 300  
 Hurley, P. M.: 299  
 \*Ibsen, H. W.: 308  
 Irvine, J. W.: Jr., 289, 290, 308  
 Izzo, P. T.: 291  
 \*Janeway, C. A.: 291  
 Jenkins, D. H.: 293  
 \*Jovellanos, J. U.: 302  
 \*Kac, M.: 300  
 Kahn, S.: 290  
 Kaufmann, A. R.: 305  
 Kaye, J.: 302  
 Keenan, J. H.: 302  
 Kelly, B.: 292  
 Kennedy, R. W.: 285  
 Kerr, D. E.: 307, 310  
 Keyes, F. G.: 290  
 Killian, J. R., Jr.: 312, 313  
 King, G. W.: 310  
 \*King, W. J.: 302  
 \*Kinney, T. D.: 291  
 Knickerbocker, I.: 293  
 \*Kolb, F. J.: 288  
 Kopal, Z.: 296  
 Kretzmer, E. R.: 295  
 Lambe, T. W.: 292  
 \*Lane, C. G.: 304  
 \*Lange, K.: 308  
 Lawrance, R. B., 310

- \*Lawson, A. W., Jr.: 295
- \*Lax, M.: 309
- Leary, W. A.: 302
- Leavitt, H. J.: 293
- \*Le Beau, D. S.: 288
- Levinson, N.: 300
- Lewis, F. M.: 306
- Lin, C. C.: 300
- Lion, K. S.: 286
- \*Little, R. W.: 301
- \*Livengood, J. C.: 303
- Lockhart, E. E.: 297
- Loftfield, R. B.: 290
- Logemann, H., Jr.: 286
- Loofbourow, J. R.: 286, 287
- Lord, R. C.: 290
- McAdams, W. H.: 288
- \*McElvain, S. M.: 291
- MacGregor, C. W.: 302, 303
- McGregor, D.: 293
- \*McIntosh, L. R.: 307
- McNally, J. R., Jr.: 310
- MacNee, A.: 301
- \*McQuade, A. J.: 301
- Mahoney, T. H. D.: 297
- \*Mandelbrojt, S.: 301
- Manning, G. C.: 306
- Marcus, P. M.: 310
- Marinsky, J. A.: 290
- Marvin, G. G.: 290
- M. I. T. Electrical Engineering Department. Center of Analysis: 296
- \*Matthias, B. T.: 296
- Maxwell, E.: 310
- \*Mears, R. B.: 305
- Meissner, H. P.: 288
- \*Merrill, E. W.: 288
- Milas, N. A.: 290
- Miller, M. C.: 297
- \*Miller, W. W.: 307
- Mirabelli, E.: 292
- \*Miranda, F. deP.: 297
- Moon, P.: 296
- \*Morehouse, C. K.: 291
- Moreno, T.: 296
- Morton, A. A.: 290
- Munsell, H. E.: 298
- Myers, C. A.: 293
- \*Nagle, D. E.: 307
- \*Naughton, J. J.: 306
- \*Nickerson, J. T. R.: 298
- Nightingale, G.: 298
- \*Nogami, H. H.: 299
- Norris, C. H.: 292
- Norton, F. H.: 305
- Norton, J. T.: 305
- \*Overberger, C. G.: 289
- Ozeroff, W. J.: 310
- Padelford, N. J.: 293
- Peabody, D., Jr.: 287
- Peacock, A. C.: 287
- Penner, S. E.: 290
- Perry, J. W.: 311, 312
- \*Peters, J. L.: 286
- Phillips, A. W., Jr.: 298
- Piccioni, O.: 310
- \*Pickard, G. W.: 313
- Pigors, P.: 293
- \*Pollard, H.: 299
- Poss, H. L.: 307, 310
- \*Priest, H. F.: 291
- \*Prieto Isaza, J.: 305
- Proctor, B. E.: 298
- Radke, M. J.: 293
- Rae, J. B.: 297
- Rarita, W. R.: 310
- Redheffer, R. M.: 300
- Reed, W. A.: 303
- Reissner, E.: 300
- Richards, L. G.: 304
- \*Richman, P. L.: 296
- Rightmire, B. G.: 285, 303
- Rocca, R. J.: 304
- Rohsenow, W. M.: 303
- \*Rosenthal, D.: 305
- Rossi, B. B.: 310, 311
- Rowlands, J. J.: 313
- \*Sakmann, B. W.: 303
- Salem, R.: 300
- Samuelson, P. A.: 293, 294
- Sands, M. L.: 310
- \*Sard, R. F.: 310
- Scatchard, G.: 290, 291
- Scattergood, A.: 291
- Scheinberg, I. H.: 291
- Schell, E. H.: 288
- \*Schiff, I.: 309
- Schmitt, F. O.: 286, 287
- Schuhmann, R., Jr.: 305
- Schumb, W. C.: 291
- Schwarz, E. R.: 303
- Scott, J. F.: 287
- \*Scott, K.: 307

\*Not on Institute Staff, 1947-48.

Seamans, R. C., Jr.: 285  
 Selfridge, O. G.: 300  
 \*Sewell, E. F.: 291  
 Shaler, A. J.: 305  
 Shapiro, A. H.: 301, 302, 303  
 Shaw, M. C.: 303  
 Sheehan, J. C.: 291  
 Sherwood, T. K.: 313  
 Shrock, R. R.: 299  
 \*Silvey, J. O.: 287  
 \*Sinsheimer, R. L.: 286, 287  
 Sizer, I. W.: 287  
 Slater, J. C.: 310, 311  
 Sloane, A.: 303  
 Smith, A. G.: 310  
 \*Solow, A. A.: 292  
 Spedden, H. R.: 305  
 \*Spencer, D. E.: 296  
 Sperduto, A.: 307, 311  
 Staley, H. R.: 287  
 \*Stanford, S. C.: 311  
 Starr, V. P.: 306  
 \*Stein, P. R.: 308  
 Stempnitzky, I.: 296  
 Stetson, H. T.: 313  
 Stevens, C. L.: 291  
 Strang, C. D., Jr.: 303  
 Swain, C. G.: 291  
 \*Tapia, M. A.: 297  
 Tate, V. D.: 312  
 Taylor, C. F.: 302, 303  
 Taylor, D. W.: 292  
 Taylor, E. S.: 302  
 \*Taylor, K.: 312  
 \*Taylor, M. E.: 305  
 Telkes, M.: 305  
 \*Thiesmeyer, L. R.: 312  
 \*Thimann, K. V.: 297  
 Thompson, J. B.: 299  
 Thurston, J. N.: 296

\*Tierney, W. D.: 303  
 Tinlot, J. H.: 311  
 Tisza, L.: 311  
 \*Trager, H. G.: 293  
 Troescher, C. B.: 298  
 Trump, J. G.: 296  
 \*Tucker, W. H.: 313  
 Uhlig, H. H.: 305, 306  
 Valley, G. E., Jr.: 311  
 Van de Graaff, R. J.: 307, 311  
 Vivian, J. E.: 288  
 Von Hippel, A. R.: 296  
 Voss, W. C.: 287  
 Wadsworth, G. P.: 301  
 Wallman, H.: 301  
 Warren, B. E.: 311  
 Warren, S. E.: 312  
 \*Wasserman, A.: 286  
 Weber, H. C.: 288  
 Weems, W. R.: 285  
 Weisskopf, V. F.: 311  
 White, J. E.: 295, 311  
 \*Whitney, R. P.: 288  
 Wiener, N.: 301  
 Wilbur, J. B.: 292  
 \*Williams, L. O.: 298  
 Williams, R.: 310  
 Williams, R. S.: 306  
 \*Williams, S. B.: 293  
 Wulff, J.: 305  
 Wurster, W. W.: 285  
 \*Wurzburg, F. L., Jr.: 309  
 Young, L. C.: 294  
 Yurenka, S.: 287  
 Zabel, C. W.: 308  
 Zacharias, J. R.: 308  
 Zeldin, S. D.: 299  
 Zief, M.: 291  
 Znamensky, G. A.: 306  
 \*Zygmund, A.: 300

\*Not on Institute Staff, 1947-48.

## INDEX OF AUTHORS OF DOCTORS' THESES

Allen, J. D.: 316  
Alpert, N. L.: 318  
Andrew, M. M.: 316  
Ashbrook, A. G., Jr.: 315  
Averbach, B. L.: 317  
Beard, C. I.: 318  
Bell, K. G.: 316  
Black, D. M.: 314  
Boas, M. L.: 318  
Bogert, B. P.: 316  
Brooks, D. L.: 318  
Cadogan, W. P.: 314  
Callen, H. B.: 318  
Chertow, B.: 314  
Collins, D. V.: 314  
Corrsin, L.: 314  
Coughanour, L. W.: 317  
Craig, R. A.: 318  
Crandall, J. L.: 314  
Davisson, C. M.: 318  
Dolezel, E. J.: 318  
Douslin, D. R.: 314  
Dugundji, J.: 316  
Epstein, S. T.: 318  
Evans, H. T., Jr.: 315  
Fawcett, F. S.: 315  
Fisher, J. C.: 317  
Flowers, F. F.: 317  
Frederickson, A. F.: 316  
French, J. B.: 318  
Frisch, D. H.: 318  
Galt, J. K.: 319  
Garrison, J. B.: 319  
Giever, J. B.: 316  
Gilbert, E. N.: 316  
Gluckstern, R. L.: 319  
Gold, L.: 317  
Golibersuch, E. W.: 315  
Grovenstein, E., Jr.: 315  
Guindon, W. G.: 319  
Hall, C. E.: 319  
Hamburger, G. E.: 316  
Hansen, R. J.: 315  
Harris, W. J., Jr.: 317  
Hatch, G. G.: 317  
Henderson, R.: 314  
Herlin, M. A.: 319  
Howell, W. E.: 318  
Isbin, H. S.: 314  
Julian, R. S.: 319  
Kamm, R. L.: 317  
Kelly, J. B.: 317  
Kent, R., 3d: 320  
Kyhl, R. L.: 319  
Lambe, T. W.: 315  
Lamden, M. P.: 316  
Laning, J. H., Jr.: 317  
Lax, M.: 319  
Lessen, M.: 317  
Levine, S. W.: 315  
Little, E. L., Jr.: 315  
Lorenz, E. N.: 318  
McBride, G. T., Jr.: 314  
Machta, L.: 318  
McKinley, W. A., Jr.: 319  
Magat, P. L.: 315  
Mahlman, G. W.: 320  
Marsh, F. D.: 315  
Maxwell, E.: 319  
Michaels, A. S.: 314  
Miller, J. W., Jr.: 315  
Nace, H. R.: 315  
Nagle, D. E.: 319  
Nolle, A. W.: 319  
Parke, N. G., 3d: 319  
Peaslee, D. C.: 319  
Penner, S. E.: 315  
Phillips, A. W., Jr.: 316  
Plunkett, R.: 317  
Poss, H. L.: 319  
Priest, H. F.: 315  
Redheffer, R. M.: 317  
Reed, W. A.: 314  
Robertson, W. D.: 317  
Roth, W.: 319  
Sands, M. L.: 319  
Scheid, F. J.: 317  
Scurlock, A. C.: 314  
Siegel, L. A.: 319  
Sinsheimer, R. L.: 314  
Spohn, C. A.: 318  
Steinberg, M. A.: 318

Stergiopoulos, C. G.: 319  
Strait, E. N., Jr.: 319  
Strandberg, M. W. P.: 319  
Tajirian, F. Der V.: 315  
Taves, M. A.: 315  
Teitel, R. J.: 318  
Thompson, R. W.: 319  
Thomsen, D. L., Jr.: 317  
Tittle, C. W.: 320  
Towle, P. H.: 315  
Tuller, W. G.: 316  
Tuttle, D. F., Jr.: 316  
Tuttle, O. F.: 316  
Tyson, J. K.: 320  
Webb, A. M.: 314  
Williams, R. W.: 320  
Winkler, T. B.: 318  
Wlodek, T. W.: 318  
Wu, M.-H. L.: 317  
Yevick, G. J.: 320  
Yevick, M. A. L.: 317  
Yoder, H. S., Jr.: 316