

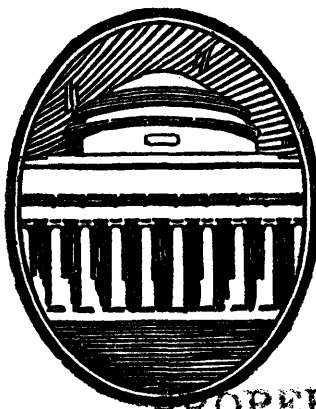
MASSACHUSETTS INSTITUTE
OF TECHNOLOGY BULLETIN

PRESIDENT'S REPORT
ISSUE

VOLUME 87

5 MAR 1952

NUMBER 1



PROPERTY OF
S. G. HARVEY

OCTOBER, 1951

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.

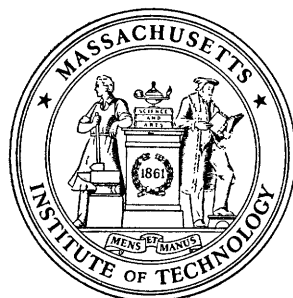
Issues of the BULLETIN include the reports of the President and of the Treasurer, the General Catalogue, the Summer Session, and the Directory.

MASSACHUSETTS INSTITUTE
OF TECHNOLOGY
BULLETIN

President's Report Issue

1950-1951

VOLUME 87



NUMBER I

OCTOBER, 1951

PUBLISHED BY THE INSTITUTE, CAMBRIDGE

THE CORPORATION, 1951-52

Chairman

KARL T. COMPTON

President

JAMES R. KILLIAN, JR.

Secretary

WALTER HUMPHREYS

Treasurer

JOSEPH J. SNYDER

LIFE MEMBERS

W. CAMERON FORBES
PIERRE S. DU PONT
HARRY J. CARLSON
GERARD SWOPE
FRANKLIN W. HOBBS
JOSEPH W. POWELL
WALTER HUMPHREYS
VICTOR M. CUTTER
JOHN R. MACOMBER
ALFRED L. LOOMIS
HARLOW SHAPLEY

ALFRED P. SLOAN, JR.
LAMMOT DU PONT
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
DONALD F. CARPENTER
HORACE S. FORD
GEORGE A. SLOAN

SPECIAL TERM MEMBERS

Term expires June, 1952
BEAUCHAMP E. SMITH

Term expires June, 1953
WILLIAM A. COOLIDGE

Term expires June, 1954
RALPH LOWELL

Term expires June, 1955
JOHN M. HANCOCK

PRESIDENT OF THE ALUMNI ASSOCIATION

ALFRED T. GLASSETT

ALUMNI TERM MEMBERS

Term expires June, 1952
HAROLD BUGBEE
C. GEORGE DANDROW
JAMES MCGOWAN, JR.

Term expires June, 1953
RAYMOND H. BLANCHARD
THOMAS D'A. BROPHY
THOMAS H. WEST

Term expires June, 1954
RUDOLF F. HAFFENREFFER
ROBERT T. HASLAM
GEORGE J. LENESE

Term expires June, 1955
PIERRE F. LAVEDAN
C. ADRIAN SAWYER, JR.
CHARLES A. THOMAS

Term expires June, 1956
JOHN A. LUNN
HOWARD H. McCLINTIC, JR.
DAVID A. SHEPARD

REPRESENTATIVES OF THE COMMONWEALTH

HIS EXCELLENCY, PAUL A. DEVER, *Governor*
HON. STANLEY E. QUA, *Chief Justice of the Supreme Judicial Court*
JOHN J. DESMOND, JR., *Commissioner of Education*

TABLE OF CONTENTS

REPORT OF THE PRESIDENT	PAGE
SUMMARY OF THE YEAR	7
SCHOOL OF INDUSTRIAL MANAGEMENT	8
UNDERGRADUATE EDUCATION	10
Committee on Undergraduate Policy	10
Curriculum Changes	11
General Education	13
Undergraduate Housing	14
The Road Ahead	16
ADVANCED EDUCATION AT THE INSTITUTE	19
Post-Doctoral Study	19
Summer School Program	20
DEFENSE RESEARCH	22
THE DEVELOPMENT PROGRAM	23
ADMINISTRATIVE CHANGES	25
STATISTICS OF THE YEAR	26
Finances	26
Enrollment	28
Student Aid	28
PERSONNEL	29
Corporation	29
Faculty	30
Administration	33
CONCLUSION	34
REPORTS OF ADMINISTRATIVE OFFICERS	
Dean of Students	35
Dean of the Graduate School	50
Registrar	54
Director of Admissions	84
Director of Libraries	87
Director of the Division of Business Administration	98
Director of the Division of Industrial Cooperation	102
Adviser to Foreign Students	103
Placement Officer	108
Industrial Liaison Office	110
Medical Director	112
Executive Vice-President of the Alumni Association	118

SCHOOL OF ENGINEERING	PAGE
Aeronautical Engineering	120
Air Science	129
Building Engineering and Construction	130
Chemical Engineering	134
Civil and Sanitary Engineering	137
Electrical Engineering	143
General Science and General Engineering	151
Graphics	152
Mechanical Engineering	153
Metallurgy	169
Meteorology	170
Round Hill Field Station	175
Military Science and Tactics	176
Naval Architecture and Marine Engineering	177
SCHOOL OF SCIENCE	
Biology	180
Chemistry	181
Food Technology	183
Geology	186
Mathematics	188
Physics	190
SCHOOL OF ARCHITECTURE AND PLANNING	
Architecture	196
Bemis Foundation	198
City and Regional Planning	200
SCHOOL OF HUMANITIES AND SOCIAL STUDIES	
Economics and Social Science	202
English and History	203
Modern Languages	206
Museums and Exhibitions	208
SCHOOL OF INDUSTRIAL MANAGEMENT	
Business and Engineering Administration	210
INTERDEPARTMENTAL LABORATORIES	
Acoustics	214
Electronics	219
Nuclear Science and Engineering	223
Spectroscopy Laboratory	223

TABLE OF CONTENTS

5

REPORT OF THE TREASURER	PAGE
I	
Auditors' Certificate and Report of Auditing Committee	226
Financial Review	227
Balance Sheet Schedule A	232-3
Statement of Income and Expense Schedule B	234
Report of Technology Loan Fund Committee	235
Report of Trustees of the M. I. T. Pension Association	236
M. I. T. Pension Association Investments	237
II	
Statement on Accounts	238
BALANCE SHEET — SUPPORTING SCHEDULES:	
General Investments A-1	239
Investments of Funds Separately Invested A-2	245
Investments — Summary	249
General Investments — 1941-51	250
Summary of Funds	251
Endowment Funds, Income for General Purposes A-3	252
Endowment Funds, Income for Designated Purposes and Unexpended Income Thereof A-4	254
Student Loan Funds A-5	265
Building Funds A-6	266
Other Invested Funds:	
General Purposes A-7	267
Designated Purposes A-8	269
Agency Funds A-9	274
Annuity Funds A-10	277
General Investments Gain and Loss Account A-11	277
Students' Notes Receivable A-12	278
Accounts Receivable A-13	278
Contracts in Progress A-14	279
Inventories, Prepaid Expenses and Deferred Charges A-15	280
Students' Advance Fees and Deposits A-16	281
Withholdings, Deposits, and Other Credits A-17	281
Gifts and Other Receipts for Current Expenses A-18	282
Educational Plant Assets A-19	306
Principal Gifts and Appropriations for Educational Plant A-20	307

TABLE OF CONTENTS

	PAGE
INCOME AND EXPENSE STATEMENTS — SUPPORTING SCHEDULES:	
Students' Fees	B-1 310
Allocation of Investment Income and Gifts and Other Receipts for Current Expense	B-2 311
Research Contracts	B-3 312
Other Income	B-4 313
Salaries and Wages — Staff Salaries	B-5 314
Salaries and Wages — Wages Laboratory Service	B-5 315
Salaries and Wages — Wages Accessory to Teaching	B-5 316
Departmental Expenses	B-6 317
Library and Museum Expenses	B-7 318
Clerical Salaries and Administrative Office Expenses	B-8 318
General and Administrative Expenses	B-9 319
Plant Operation	B-10 320
Medical Department	B-11 321
Undergraduate Budget Board	B-12 321
Auxiliary Activities	B-13 322

III

GIFTS, GRANTS AND BEQUESTS RECEIVED DURING YEAR	323
SUMMARY OF GIFTS, GRANTS AND BEQUESTS RECEIVED 1947-1951	336
A BRIEF DESCRIPTION OF THE ENDOWMENT AND OTHER INVESTED FUNDS OF THE INSTITUTE	337
LIST OF PERIODICAL PUBLICATIONS, BOOKS AND REVIEWS BY MEMBERS OF THE STAFF	366
Index of Authors	419
THESES PRESENTED FOR DOCTORS' DEGREES	410
Index of Authors	425

Report of the President

TO THE MEMBERS OF THE CORPORATION:

IN MY REPORT a year ago, I gave special attention to the policies appropriate for our institution in a period of national rearmament and indefinite emergency. I ventured to suggest that we should hold fast to our normal program and long-term objectives, this being the most effective way we could serve the nation in the present period. I suggested further that we should hold ourselves in a state of readiness to meet any sudden change in national policy or need, and that we should be prepared to accept additional responsibilities in behalf of national defense.

This "strategy for uncertainty" has guided the Institute during the past year. At the urgent request of the Government we undertook the heavy responsibility of additional defense research, but we were able to do this while addressing ourselves vigorously to the maintenance and refinement of our educational program and other normal activities.

During this past year we established a School of Industrial Management and changed the Division of Humanities into a School of Humanities and Social Studies. Recommendations of the Committee on Educational Survey were implemented further by a reorganization of the Faculty's committee structure to provide better planning and supervision of the undergraduate program, and by the approval of a revised and extended program of general education. Several professional courses completed important curriculum revisions, and further progress was made in extending the scope and variety of our Summer Session. A new dormitory, Burton House, was brought into operation — a conclusive step in making M. I. T. a residential college. The Hydrodynamics Laboratory and Towing Tank was completed and dedicated. Under construction are the Metals Processing Laboratory and the John Thompson Dor-

rance Laboratory for Biology and Food Technology. And finally, we successfully completed a twenty-million-dollar fund campaign.

SCHOOL OF INDUSTRIAL MANAGEMENT

The decision last December to establish a School of Industrial Management at M. I. T. was an event of major importance in the history of the Institute. As of course you know, the school was proposed by our fellow member, Alfred P. Sloan, Jr., and was made possible by a grant of \$5,250,000 from the Alfred P. Sloan Foundation, Inc.

As conceived by Mr. Sloan, the school will seek to correlate the complex problems of management in modern technical industry with science, engineering, and research.

"It has been my observation over an experience of many years in technical industry," said Mr. Sloan, when he joined with Dr. Compton in announcing the new school, "that executives with a background of science and engineering are unusually well qualified to deal with the intricate problems of industrial management in our technical enterprises. And American enterprise is passing more and more into that area. That really is the basis of my concept in establishing this School at M. I. T."

Few realize the broad and exacting demands made upon the industrial executive of today [Mr. Sloan continued], especially in large-scale enterprises. While the exercise of sound business judgment will always be the keystone of a successful industrial executive and a progressive enterprise, yet to reach the highest level of effectiveness, executive decisions must be supported by a scientific appraisal of all related facts and circumstances. Industrial management has passed through a long process of development as our industrial age has evolved. Today it has become in every sense of the word, a matter of science. Therefore, it seems entirely logical that a scientific background offers an unusually healthy climate for the development of the industrial executive of tomorrow.

Mr. Sloan's vision of the need to be served will guide us as details of the School's program are worked out. It will be our aim to exploit fully our opportunity to train executives whose knowledge of science and technology and of the social sciences will help them more effectively to deal with the complex problems of management in our industrial society.

Research is to be emphasized in the School's program, not only for the purpose of making creative contributions in this field, but also to insure that the teaching in the School does not become routine and outdated. For such research activities, M. I. T. seems uniquely prepared to make an outstanding contribution. The cross-fertilization which will here be possible between science, engineering, the social sciences, and men thinking in terms of management, will provide exceptional opportunity for pioneering and creative contribution to management science. The School will also seek to evolve special methods for maintaining close contacts with industry.

Two important steps have been taken toward the establishment of the School of Industrial Management. The first was the purchase of Lever House as the home of the School. This fine building, at 50 Memorial Drive, stands on a plot of land adjoining the Institute's grounds. It is now being remodeled to provide the most ideal possible quarters. We expect to occupy the building by the beginning of the second term. The Department of Business and Engineering Administration, which will be a component of the School, will be housed in this building, together with the Department of Economics and Social Science. The building, which has been named the Alfred P. Sloan Building, will also provide on its sixth floor ample quarters for a long-needed Faculty Club which will serve the entire Institute as well as the School of Industrial Management.

The second step was the appointment of E. P. Brooks, '17, Vice-President and Director of Sears, Roebuck and Company, as Dean of the School.

During this academic year we hope to go forward with the organization of the School so that it may be formally opened by the fall of 1952.

UNDERGRADUATE EDUCATION

I wish to draw particular attention, in this report, to developments within and without the classroom which affect our undergraduate education. The new School of Industrial Management will broaden the scope of our educational offering. In addition we have moved ahead in several other ways to insure the effectiveness of our undergraduate program.

Committee on Undergraduate Policy. Effective supervision of the undergraduate curriculum as a whole, its objectives, its standards, and its philosophy of education, has been made the concern of a Faculty Committee on Undergraduate Policy, as recommended by the Educational Survey Report. Under the chairmanship of Professor Walter G. Whitman, this committee has proceeded skillfully to carry out its assignment. During its first year it has paid particular attention to problems of the freshman year. Innovations initiated by the committee include the designation of a faculty adviser for each section of freshman students. This has led to a closer student-faculty relationship than before, and the freshmen have responded by inviting the advisers to meet with them at various times. The committee also sponsored orientation lectures for freshmen early in the fall term and a review period at the end of each term of the freshman year when no classes were scheduled for the last week before term-end examinations. On its recommendation, the Faculty has appointed a special committee charged with the responsibility of devoting itself intensively to the curriculum of the first two years, which is basic to all courses.

One of the major assignments of the Committee on Undergraduate Policy was to study the Faculty's committee structure with a view to proposing changes which would increase the effective participation by faculty members in the formula-

tion of educational policies. Proposals of the committee were discussed, modified, and approved by the Faculty at its March meeting, and a new committee structure is now in effect. In addition to the special committee already mentioned, other important new faculty committees include those on Student Aid and on Student Environment. To implement this new Committee on Student Aid, the Executive Committee has established a new administrative post, Director of Student Aid. Dean Pitré has been appointed to this post, and he will serve as chairman of the committee. Under policies established by the committee, he will have the responsibility of co-ordinating all forms of undergraduate student aid—loans, scholarships, and employment.

Curriculum Changes. Changes of curricula and teaching methods in the various departments are continually taking place. The spirit of these changes is the same throughout the Institute: to increase the flexibility of the program, to respond to new professional demands, to enlarge the opportunity for creative achievement in the undergraduate years, to integrate the various aspects of the student's work and help to make the student's college experience become meaningful as a unified whole.

Let me give a few examples of some of the changes made by several departments this past year to improve the undergraduate offerings.

(a) In accordance with a general trend at the Institute, the curricula of several courses have been modified to permit the student more freedom in electives. For example, the Department of Chemical Engineering has dropped the language requirement to allow the student more choice in his junior and senior years. The Department of Meteorology has thoroughly revised its undergraduate curriculum and has introduced alternate sequences of courses for students with other professional objectives than work as weather forecasters.

The Mechanical Engineering Department has expanded

its option system in the fourth year and has provided time for an additional humanities subject. The option groupings can fulfill a wide variety of student interests: Air Conditioning and Refrigeration, Materials and Materials Processing, Design, Internal Combustion Engines, Production, Textiles, and Jet Propulsion. Significant is the fact that this new program, giving greater scope to the interests and enthusiasm of students, was worked out in close collaboration with the department's Corporation Visiting Committee, which urged and encouraged a program less heavily weighted, as in past years, on the side of thermodynamics.

(b) The Physics Department, in addition to the most thoroughgoing reorganization of the content and sequence of courses in twenty years, has paid special attention to the improvement of teaching. Senior members of the staff have taken part in teaching at all levels of instruction and special attention has been paid to training younger staff members in teaching methods. An apprentice system, whereby a number of junior staff members have been attached to senior members for the purpose of learning teaching methods from them, has proved most successful, judging from the outstanding teaching success of the younger men who have learned in this way.

(c) A plan for employment of juniors and seniors was worked out with Geophysical Service Incorporated of Dallas by the Department of Geology this past summer. Each participating student spends the summer as an employee in one of the company's thirty or more geophysical field parties. This program is a part of the department's developing program in geophysics.

(d) A four-year undergraduate program in Biochemical Engineering has been offered by the Department of Food Technology on the recommendation of its Visiting Committee. This curriculum is designed to prepare men for industries, such as the pharmaceutical industry, which require a knowledge of chemical engineering, microbiology, and biochemistry.

(e) Interesting innovations have been taking place in the two options of Course IX, General Engineering and General Science. Last May M. I. T. and Harvard University jointly announced plans for a five-year program aimed at increasing the number of broadly trained science and mathematics teachers available to secondary schools and junior colleges.

The course will lead to the degrees of Bachelor of Science in General Science at M. I. T. and Master of Arts in Teaching at Harvard. The undergraduate part of the program will be given largely at M. I. T. under the jurisdiction of Course IX, although some Harvard courses may be taken as early as the third year. Thereafter, students will take courses at both institutions and draw on the technical resources of both. During the fifth year, students will teach part time at local high schools, under the direction of the Faculty of the Harvard School of Education.

As you know, we have had for three years a summer program for teachers of science in secondary schools, under a grant from the Westinghouse Educational Foundation. This new degree program with Harvard enables us to take another step in discharging our responsibility in helping to educate teachers of high caliber for high and preparatory schools, and to meet the critical shortage of teachers.

General Education. Last year I reported the recommendation of the Committee on Educational Survey that M. I. T. strengthen its program in the humanities and social sciences. Impressive progress has been made in implementing this recommendation.

In December we announced the establishment of a new School of Humanities and Social Studies, with John E. Burchard, who since 1948 had been Dean of the Division of Humanities, as Dean of the new school. The School of Humanities and Social Studies has responsibility for planning and administering the program of general education as a part of the common curriculum in science and engineering. It will, in addition,

offer professional work leading to graduate as well as undergraduate degrees in Economics and Social Science.

Subsequent to the establishment of this school, the Faculty approved a new four-year program in the humanities for students in science and engineering. Under this program all freshmen and sophomores will be required to take a two-year basic sequence of courses in the humanities, followed by four elective courses in the junior and senior years in such areas as economics, history, political science, literature, philosophy, music, or fine arts. Students in professional courses who wish to devote more time to the humanities and social sciences will be able to take two additional courses in this field during their last two years. Much study has gone into the planning of the humanities sequence, and we are evolving an integrated program which promises to make a significant contribution to the education of the professional man.

During the year the Institute received a grant of \$150,000 from the Carnegie Corporation to be used over a period of five years in strengthening our program in general education. This grant was one of three made to institutes of technology by the Carnegie Corporation in recognition of the responsibilities of these institutions in educating men for positions of leadership and management responsibility. We are using this grant in a variety of ways, including releasing two or three of our professors each year from normal teaching duties so that they can make careful studies of programs in general education at other institutions; the appointment each year of a distinguished teacher of humanities as a visiting professor, these appointments to be known as the Carnegie Visiting Professorships in the Humanities; the provision of stipends for young men appointed to our humanities faculty so that they may have half of their time free for scholarship; and finally, experiments in honors groups in the humanities.

Undergraduate Housing. One of the long-range *educational* goals of the Institute has been to provide an environment for

its students which performs in the broadest sense an educational function in itself. The addition of Baker House and now of Burton House gives us a housing system, including fraternities, which is ample for our present student body. This fall, for the first time in the history of the Institute, we could offer every freshman an opportunity to live in a dormitory.

The addition of nearly a thousand new accommodations in the brief period of two years has required many changes in dormitory policies and operations. There have been growing pains, and we must expect still further adjustments before the system is operating with the effectiveness desired by students, Faculty, and Administration.

The Advisory Committee on Dining and Housing Facilities, representative of the Faculty and Administration, has been working intensively and imaginatively to give us a student housing system dedicated to the all-round development of the student. On its recommendation, we have extended the faculty residence plan, long successful in the Graduate House, to each of the major undergraduate units: Baker House, Burton House, and the East Campus. These faculty members, chosen because of their broad background and their demonstrated interest in working informally with students, have not been asked to accept any responsibility for discipline or maintenance. They will be in residence in the student houses to help in enriching student life outside the classroom, to contribute to a closer faculty-student relationship, to facilitate communications between students and staff, and in general to extend the opportunities available to each student for his rounded education. At the suggestion of the Student Dormitory Committee we have a co-operative section in Burton House where students care for their own rooms.

Students and staff have an exceptional opportunity to work together with good will and common purpose in devising sound policies for our enlarged dormitory system. To accomplish this teamwork we must clearly distinguish between the

responsibilities which the Institute must assume and the responsibilities which are appropriate to student government.

Basic to the success of our residential system is the maintenance by the students themselves of a responsible and respected student government in the dormitories. This kind of student government is a tradition at M. I. T., and I am confident that in our rapidly enlarged housing system, the student residents, accepting their full responsibilities as citizens of this community, can maintain a form of self-government that will insure good working conditions, orderly, gentlemanly conduct, and pleasant living. The Institute proposes to support the students in every way possible in the conduct of this kind of self-government and in the building of a residential system of the same high standards as our educational program.

The Road Ahead. The steady refinement of undergraduate education within and without the classroom, as I have outlined it, is an earnest of this community's creative interest in the undergraduate. While steady progress has been made in advancing undergraduate education, many problems remain which will require boldness and imagination to solve. Questions which are presently commanding attention include:

(1) What kind of graduate should we seek to produce in the years immediately ahead? Given our present resources, what kind of educational program will best prepare our graduates for present-day society? Such questions are easier to answer in a professional school such as M. I. T. than in a liberal arts college, since professional objectives can be more objectively defined. This does not mean, however, that we should not be constantly testing our program in the light of changing conditions.

It is especially important in the planning of our new program in general education that we have clearly stated objectives for the undergraduate program.

(2) How can we provide adequate incentives for outstanding undergraduate teaching? In our type of institution research is of such fundamental importance that it constitutes a major incentive to our staff. This is as it should

be. The incentive for research accomplishment should not, as indeed it does not, displace all incentive for creative accomplishment in teaching. The ideal teacher, of course, is the man who is creatively effective in both research and teaching.

These are truisms, but the fact remains that our universities and professional schools have a special problem in maintaining the incentives and environment through which staff members are kindled with enthusiasm for creative work in the classroom. To state it another way, universities need to create an environment where teachers of undergraduates feel that they can add to their reputations through the development of better undergraduate programs, better teaching materials, and better teaching methods. Perhaps we would have more outstanding undergraduate teachers in our colleges if we knew better how to create in the classroom the equivalent of the creative accomplishment of the research laboratory.

At the Institute we should not draw back from making bold changes in the organization of our undergraduate school if such changes would help to accomplish this result.

Our present organization may be the best, but I suggest that we should test it against two alternatives. The first is the college-within-the-university type of organization which makes the undergraduate program more of an entity in itself. The establishment of our Undergraduate Policy Committee is a step in this direction. It recognizes more explicitly that there are problems, methods, policies, and attitudes unique to the undergraduate program in contrast to those of the Graduate School.

The second alternative to our present program is to differentiate more sharply between the lower two years and the upper two years of the undergraduate school. The upper two years, together with the graduate program, are the truly professional part of our curriculum, the part of our program in which we unquestionably have unexcelled resources; the first two years are general education in preparation for the second two years of professional work. Should we more explicitly recognize the differences between the tactics and strategy of the lower division and the upper division?

As a result of the Combined Plan and transfers from

other colleges, we have an increased number of students starting in the Institute at the beginning of the junior year. This further suggests the possibility of the upper division as a unit in itself, drawing students both from our lower division and from a wide variety of other colleges.

I am not suggesting that we adopt either of these alternatives, but rather that we examine them to see if they possess advantages adaptable to our own unified undergraduate program. Some variation of these two plans may hold the key to providing better incentives to creative undergraduate teaching and to insuring a condition where undergraduate teaching can be given further attractiveness along with graduate teaching and research.

(3) How can we insure continuing high quality in our entering classes? The severe drop during the past several years in the number of students electing science and engineering for college study is an acute national problem that requires energetic efforts to solve. This year our freshman class is about the same size as it was last year, but we, too, have experienced a sharp drop in the number of qualified applicants.

As an institution we must be aggressive in encouraging more applicants for admission and in spreading the word about the national shortage of engineers and scientists. Toward this end we are undertaking the organization of a greatly enlarged alumni organization for the recruitment of students. This organization, which will include over one thousand alumni, has been planned by our Director of Admissions, Professor B. A. Thresher, and will be known as the Alumni Educational Council. The Secretary of the Institute, Professor W. H. Gale, has undertaken the responsibility of carrying the organization through. Members of the Educational Council will supplement and assist our effective corps of Honorary Secretaries.

Thoughtful consideration is being given to all three of these basic questions by the Faculty, the Administration, and the students. I believe that the past year's activities give evidence that constructive answers are being worked out, and that undergraduate education at the Institute is showing steady improvement.

ADVANCED EDUCATION AT THE INSTITUTE

The emphasis in this report on undergraduate education at the Institute does not mean any lack of attention to our Graduate School. It is flourishing. Last year it had an enrollment of 1,675. During the year the school awarded 752 degrees, of which 196 were doctorates, 65 professional engineer degrees, and 491 master's degrees.

An interesting study throwing light on the contribution of one department in the graduate training of scientists has been made by Professor Philip M. Morse of the Department of Physics. Professor Morse has analyzed the record of M. I. T.'s graduate students in physics in the eight-year period 1934-1941, using the 1949 edition of *American Men of Science* as a measure of achievement. The study shows that in the period covered, nearly 10 per cent of the doctor's degrees in physics awarded in the United States were awarded by M. I. T. From a further analysis of available data, it appeared that the fifty-seven M. I. T. doctors of this period listed in *American Men of Science* are more than 10 per cent of the physicists obtaining doctors' degrees in the eight years under study who have reached a degree of reputation sufficient for them to be listed in that directory.

We have long stood high in our output of advanced degrees in engineering. It is interesting to see the growing contribution of the Institute in the sciences.

Post-Doctoral Study. During the past year we received a grant of \$175,000 from the Commonwealth Fund to enable the Department of Biology to provide post-doctoral training for men who have completed their medical education. Our Department of Biology has been attracting an increasing number of men who have completed their work for the M.D., and who wish to acquire advanced research techniques in the field of biology which will make them more effective for careers of research in the field of medicine.

Since World War II we have attracted an increasing

number of scholars engaged in post-doctoral study and research. A number of these mature men and women come to the Institute on its invitation and are given appointments as "Guests." Others come on post-doctoral fellowships awarded either by the Institute or by outside agencies. The group joins our community, not for the purpose of studying for degrees, but in order to work with members of our faculty and in our laboratories at a level beyond our Graduate School degree program.

I suggest that the time is approaching when we should give more formal recognition to this advanced group. We might appropriately establish an institute or foundation for post-doctoral studies, thus adding to our Undergraduate School and Graduate School a formally recognized foundation for advanced study. Through some such organization those who now work with us under the unsatisfactory title of "Guests" could be given more adequate status and recognition as fellows. We could also include those who hold post-doctoral fellowships and who have no organizational home at the Institute since they are not students and therefore are not registered in either the undergraduate or graduate programs.

We have an exceptionally attractive environment at the Institute for this kind of advanced study, and I recommend that we develop it in a more formal way as the third component of our program.

Summer School Program. Five professional conferences and nineteen special summer courses brought over 2,200 men and women to the M. I. T. campus this summer, in addition to our regular students who returned for summer work. Some 400 organizations had representatives here, including over 300 industrial companies and 40 United States Government agencies. In a majority of the special summer programs we could have had half again as many in attendance if we had had the facilities and the instructors to take care of them. We were able to house most of the summer guests at Baker House

or elsewhere on the campus, and this has added to the attractiveness of our Summer Session.

To help members of the community at large keep in touch with new scientific developments is one of the major responsibilities of a technological institution. I believe we can take pride in our strong summer program and the special conferences throughout the year through which, in the words of William Barton Rogers, this institution helps to keep the nation's progress "commensurate, step by step, with the advances of scientific and practical discovery." At the same time, the contacts with members of industry, education, and government help faculty members to keep in touch with the needs and demands of our society.

Plans for the summer activities were made by Professor Walter H. Gale before his appointment as Secretary of the Institute in May, and Frederick G. Fassett, Jr., who was named Director of the Summer Session at that time, was in charge of the summer program.

These conferences and courses were in addition to the Foreign Student Summer Program, sponsored and administered by a student committee, which brought eighty men and women from thirty countries of Europe and the Middle East and Asia to M. I. T. for study and research during the summer months. M. I. T. summer activities also included the work at East Machias, Maine, of Camp Technology, the Institute's surveying camp; at the Nova Scotia Center for Geological Sciences near Antigonish, Nova Scotia, where special field training in geology was conducted in co-operation with the Nova Scotia universities under the sponsorship of M. I. T. and the Nova Scotia Department of Mines; and in various other places on the continent of North America made possible by the plan already mentioned for summer employment with geophysics field parties.

The chief problem of our active Summer Session arises from its success. There is a demand and a temptation to multiply the number of special courses and conferences to the

point where we overload our faculty. It is my hope that we can avoid doing this, and that we can man more of our summer programs with teachers drawn from other institutions.

DEFENSE RESEARCH

Since June 1, 1950, the Institute has accepted responsibility for the organization and management of several "Hartwell" type projects for the Government. These projects involved little laboratory research; they were panels of experts so briefed and organized that they could be uninhibited in thinking about their assigned problem — in each project a strategically important "systems" problem. The groups did their work in a relatively short period (three to six months) and then dispersed. Through these ad hoc analytical groups, which were pioneered by the Institute, a new order of civilian ingenuity has been brought to bear on complex problems of systems and strategy.

One of these, Project Charles, was completed this past summer under the leadership of Dr. Wheeler Loomis of the University of Illinois. Partly as a result of its recommendations, the Institute is now undertaking the organization of a laboratory in Bedford, Mass., which will serve all three armed forces through research on air defense. This laboratory, known as Project Lincoln, will be housed in a building provided by the U. S. Air Force. Its Director is Dr. Loomis, its Associate Director, Professor Jerrold Zacharias of our Physics Department.

Other "Hartwell" type projects undertaken by the Institute have been directed by Professor Zacharias, Professor Walter G. Whitman, and Dean John E. Burchard.

The Institute is making important contributions to our national security through a number of other important projects. In behalf of one of these we are adding an additional story to our Gas Turbine Laboratory to provide laboratory facilities for our combustion group in Chemical Engineering.

These defense projects impose heavy burdens and sacrifices on our staff. We have accepted them in response to insistent appeals from the Government and only after becoming convinced of their importance and that we possessed special resources of background, highly expert staff, and management, which placed us under special responsibility.

THE DEVELOPMENT PROGRAM

The successful completion of our intensive Development Program was announced last February and fittingly celebrated last May by a Victory Dinner in New York honoring Mr. Sloan. The campaign, carried to completion under the brilliant leadership of our fellow member, Marshall B. Dalton, raised over twenty-five million dollars, including the grant of the Alfred P. Sloan Foundation for the School of Industrial Management.

Of the \$25,350,000 subscribed, approximately 26 per cent was pledged by corporations, 24 per cent by individuals, and 50 per cent by foundations and other sources.

At the start of the Development Program, the Executive Committee of the Corporation asked that practically all contributions of any kind made to the Institute during the campaign should be counted toward the total. The total amount reported, therefore, includes some gifts and grants given during the campaign period for current operations, as well as those given specifically for the objectives of the campaign. The final total did not for this reason include funds for endowment in the amount originally set as an objective. Neither did it provide for two of the buildings originally projected — (1) a laboratory for the physical sciences, to bring together our widely scattered and inadequate facilities in electronics and nuclear science, and (2) a gymnasium. These unrealized objectives are unfinished business, and we are seeking funds to carry them through. The Visiting Committee for the Department of Physics in its last report emphatically urges sustained efforts to secure funds for the addition to our permanent facilities for physics.

With the above two exceptions, the campaign did provide for the additional buildings and plant modernization recommended by representatives of the Faculty, Administration, and Corporation in a survey of the Institute's needs and opportunities which was made after the war. The buildings made possible by the Development Program constitute the most substantial additions to our plant since the Institute moved to Cambridge, and it is anticipated that they will provide a comparable opportunity for the Institute to take advantage of new opportunities in education and research.

When all the objectives of the Development Program have been reached, major building needs will have been amply met, and we should not need to seek other major funds for buildings for a long time. From this point on our fund raising should be directed mainly toward increasing the Institute's permanent funds. I am confident that gifts and bequests will be forthcoming to create endowment and other funds adequate for the Institute's increased responsibilities.

I have suggested that we should seek to add at least two million dollars a year on the average to these permanent funds, while maintaining our present level of gifts for current use. Since 1940, the book value of the Institute's total invested funds has increased from thirty-six million dollars to fifty-four million dollars. This rate of growth, while gratifying, can be accelerated. Funds for endowment are the most difficult of all to obtain, but additional endowment is M. I. T.'s most acute need at the present time. Especially do we need funds adequately to endow our permanent tenure salaries. We need at least twenty additional endowed professorships. As I pointed out last year we need more endowment for scholarships. It is my hope and that of the Treasurer that every possible gift to the Institute from now on be earmarked for these and other permanent funds.

By vote of the Executive Committee, the bequest of

Mrs. Matthew Astor Wilks, when received, will be added to the reserve for faculty salaries.

To provide the organization for a sustained fund-raising effort in line with these objectives, the Executive Committee has authorized the appointment of an administrative officer, Secretary of the Institute, with primary responsibility for fund raising, and the establishment of a permanent Development Office. In addition, the Corporation at this annual meeting appoints a standing Corporation Committee on Development.

ADMINISTRATIVE CHANGES

The year brought numerous changes in our administrative personnel. Pietro Belluschi, distinguished architect of Portland, Oregon, became Dean of Architecture in January, and E. Francis Bowditch, Headmaster of Lake Forest Academy, became Dean of Students in July. Dean Brooks assumed his duties last month. We welcome these distinguished new officers to the Institute.

As I have mentioned, we have established a new administrative post, Secretary of the Institute, an officer who will assist the Secretary of the Corporation and have administrative responsibility for our fund raising, public relations, and the development of our Alumni Educational Council. Walter H. Gale, Associate Professor of Aeronautical Engineering and former Director of the Summer Session, has been appointed to this post. Associated with Professor Gale will be Ralph T. Jope, newly appointed Director of our permanent Development Office.

In order to provide centralized administration of our plant operation and maintenance, dormitory system, and dining facilities, together with other business operations such as personnel and construction, we have established the Division of Business Administration. Robert M. Kimball, widely experienced at the Institute and formerly Administrative

Associate Director of the Los Alamos Laboratory, has been appointed Director of this division.

To handle the Institute's large volume of publications, we have established the Office of Publications, and we are fortunate in being able to secure as Director of this office, Frederick G. Fassett, Jr., from 1938 to 1945 Editor of the *Technology Review*, and for the past six years Director of Publications of the Carnegie Institution of Washington. Mr. Fassett is also serving as Director of the Summer Session and Director of the Technology Press.

STATISTICS OF THE YEAR

Finances. The year 1950-1951 ended with an excess of expense of \$14,465 on operations totaling \$23,483,000.

The Institute's endowment and other funds now have a total book value of \$54,409,000 invested in securities and other assets with a market value of \$64,773,000. Plant assets stand at \$28,577,000, about \$4,363,000 above last year. For the fourth successive year the income allocation to funds sharing the general investments was at 4.0 per cent of book value. Unallocated investment income in the amount of \$530,000 was added to the balance of undistributed investment income, bringing the total of this "income stabilization" fund up to \$773,000.

The volume of sponsored research totaled \$15,020,000, compared to \$12,858,000 in the previous year and \$15,473,000 in 1948-1949. The following comparative percentage distribution of the major elements of income and expense shows the marked effects of sponsored research on the Institute's fiscal operations.

DISTRIBUTION OF MAJOR ELEMENTS OF INCOME AND EXPENSE

INCOME

	<i>Per Cent</i>		
	1939-40	1949-50	1950-51
Tuition.....	48	20	17
Investment Income.....	32	6	6
Gifts and Other Receipts.....	7	9	9
Research Contracts: For Direct Expense...	3	50	53
For Indirect Expense..	0	8	8
Dormitories, Dining Services.....	10	7	7
	<u>100</u>	<u>100</u>	<u>100</u>

EXPENSE

	<i>Per Cent</i>		
	1939-40	1949-50	1950-51
Academic.....	61	23	21
General Administrative.....	13	10	10
Plant Operation.....	10	8	7
Research Contracts: Direct.....	3	50	53
Medical and Other.....	4	2	2
Dormitories, Dining Services.....	9	7	7
	<u>100</u>	<u>100</u>	<u>100</u>

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.....	1,463,798	2,382,681
1947-1948.....	868,859	2,191,822
1948-1949.....	622,386	2,536,802
1949-1950.....	2,749,413	6,528,089
1950-1951.....	4,720,904	9,145,107

The total of gifts shown above for 1950-1951 does not include the subscriptions payable in the future to the Development Program.

Enrollment. The student body numbered 5,171 in 1950-1951, compared with 5,458 in 1949-1950. The estimated enrollment for 1951-52 is 4,775. Twenty-five per cent of last year's total were veterans, as compared to thirty-seven per cent the previous year. Twenty-six per cent by actual count were married, as compared to the twenty-two per cent estimated for 1949-1950. Seventy-six women were enrolled. A total of 252 American colleges and universities and 121 foreign institutions were represented. Foreign students numbered 470, and these students represented fifty-nine foreign countries. The Institute continues to enroll the highest percentage of foreign students of any college in the country.

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

ENROLLMENT AT M. I. T.

	<i>Freshman</i>	<i>Total Undergraduate</i>	<i>Total Graduate</i>	<i>Total</i>
1940-1941.....	605	2,379	759	3,138
1945-1946.....	703	1,160	378	1,538
1946-1947.....	907	3,811	1,361	5,172
1947-1948.....	884	4,138	1,524	5,662
1948-1949.....	819	3,831	1,602	5,433
1949-1950.....	744	3,856	1,602	5,458
1950-1951.....	784	3,496	1,675	5,171
1951-1952 (est.).....	725	3,100	1,675	4,775

Student Aid. The demands on the undergraduate scholarship funds and the Technology Loan Fund continued to increase this past year because of general financial conditions and the fact that fewer students were studying under the G.I. bill. There were 545 undergraduate scholarships granted, totaling \$154,563. Some undergraduates held both scholarships and loans. Two hundred forty-two men received loans as of June, 1951, bringing the cumulative total from 3,009 (June, 1950)

to 3,251 men. This group of 242 men were loaned \$134,589, bringing the cumulative total loaned from \$2,179,511 (June, 1950) to \$2,314,100 (June, 1951).

Total graduate scholarships and fellowships for 1950-1951 amounted to \$268,132, and these scholarships and fellowships were granted to 244 recipients. This compares with a total of \$227,228 distributed to 267 recipients in 1949-1950. The number of fellowships sponsored by industrial companies totaled 85, with an aggregate stipend of \$175,360.

There were 979 students placed in part-time jobs in 1950-1951 by our Student Personnel Office, as compared with 508 in 1949-1950. The 1950-1951 group earned \$130,220 as compared with \$124,934 earned by the 1949-1950 group.

PERSONNEL

The death in May of Mrs. Richard C. Maclaurin, widow of President Maclaurin, brought sadness to all of us who knew of her lifetime of devotion and service to the Institute. It is with deep sorrow that we record this loss. As President's wife from 1909-1920, through her warmth and spirit she endowed those years with a unique grace. No one recalling that period of the Institute's history fails to remark on the lively and lovable personality who presided over the President's house. That her two sons have since joined the Institute staff has kept the relationship a close one in subsequent years.

Corporation. Albert H. Wiggin, Life Member of the Corporation since 1931, died on May 21 at the age of 83, after a long illness. Other changes in Corporation membership have taken place by reason of the term expirations of Messrs. Frederick S. Blackall, Jr., Thomas D. Cabot, Luis de Florez, and A. Warren Norton.

We were pleased to welcome Mr. George A. Sloan to Life Membership in October of 1950. New Alumni Term Members to serve for five years from June, 1951 are John A. Lunn, Howard H. McClintic, Jr., and David A. Shepard. Alfred T.

Glassett replaces John A. Lunn as President of the Alumni Association.

Faculty. The deaths of Edward L. Moreland, the beloved retired Executive Vice-President of the Institute and former Dean of Engineering; of Dugald C. Jackson, for twenty-seven years Head of the Department of Electrical Engineering; and of Frederick S. Woods, who joined the Mathematics Department in 1890 and was Head of the Department upon his retirement and appointment as Emeritus Professor in 1934, must regretfully be recorded. The active staff lost one of its most valued members through the death on January 22 of Professor John R. Loofbourow, Executive Officer of the Department of Biology and Chairman of the Faculty. Earle F. Watts, Associate Professor and Executive Officer in the Division of Graphics, died on March 10.

Herbert B. Dwight, Professor in the Department of Electrical Engineering, retired from full-time service on June 30 with the title of Professor Emeritus, but will continue as Lecturer on a part-time basis, beginning with the current year.

Professor John C. Slater resigned as Head of the Department of Physics and has been appointed Harry B. Higgins Professor of the Solid State, the first appointment which will carry the title "Institute Professor." Professor Slater has been granted a leave of absence for the coming year to carry on research at the Brookhaven National Laboratory.

Resignations were accepted this past year from Professor William L. Campbell, Head of the Department of Food Technology, Captain James M. Farrin of the Department of Naval Architecture and Marine Engineering, and Professor William R. Hawthorne of the Department of Mechanical Engineering. Dr. Egon Orowan, who joined the Faculty of the Institute in April 1950, will succeed Professor Hawthorne as George Westinghouse Professor of Mechanical Engineering.

Resignations were accepted also from Associate Professors Lieutenant Colonel Burton B. Bruce, John T. Burwell,

Lieutenant Colonel John W. Fitzpatrick, and Howard R. Staley, and from Assistant Professors Dominic Amara, Captain Philip B. Anderson, John L. Bastian, William C. Bauer, Captain William Bell III, Major Lyman R. Blake, Lyle B. Borst, Donald E. Boynton, Godfrey T. Coate, Lieutenant Colonel James E. Foster, Major Harold Grossman, Lieutenant Colonel Finis G. Johnson, George T. Johnson, Arthur F. Kip, Pei-Moo Ku, Eugene S. Machlin, Robert H. MacMillan, Svante Mellgren, George L. Nelson, Demetrios A. Polychrone, Keith E. Rumbel, Charles O. Smith, and Richard Taylor.

Matthew R. Copithorne, Carle R. Hayward, George W. Swett, and Robert S. Williams resigned on June 30 upon completing five years as part-time Lecturers after retirement.

Promotions to full Professorships included Isadore Amdur, Francis Bitter, Charles P. Kindleberger, Herman P. Meissner, Charles H. Norris, and William H. Radford.

The following were promoted to the grade of Associate Professor: E. Cary Brown, William W. Buechner, Donald P. Campbell, Stephen H. Crandall, Robert M. Fano, Major Augustine M. Fragala, Lieutenant Colonel Samuel L. Hall, Patrick M. Hurley, Klaus Liepmann, Thomas F. Malone, Lloyd Rodwin, Lockhart B. Rogers, Amos J. Shaler, Prescott A. Smith, H. Guyford Stever, and George W. Whitehead.

The following were promoted to the grade of Assistant Professor: Harl P. Aldrich, Jr., John S. Archer, Raymond F. Baddour, Jordan J. Baruch, John M. Blum, James C. Bresee, Elery F. Buckley, Nils Christensen, John R. Coleman, Morton Finston, Herman C. Fischer, Edward R. Funk, Jacob M. Geist, Werner H. Gumpertz, James M. Ham, John H. Kempster, William D. Kingery, F. Ralph Kotter, Elmer E. Larrabee, Leo B. Moore, Robert B. Newman, W. H. Sterg O'Dell, Henry M. Paynter, Pekka Rautala, Ronald E. Scott, Herbert A. Shepard, Gregory Tucker, and Albert B. Van Rennes.

New faculty appointments included the following: Manson Benedict, Professor of Nuclear Science, and Visiting Pro-

fessors Yu-Hsiu Ku in Electrical Engineering and Laurens Troost in Naval Architecture and Marine Engineering; Associate Professors James A. Brown in Naval Architecture, Carvel Collins in English and History, George A. Miller in Economics, Walter A. Rosenblith in Electrical Engineering. Walter Wrigley, appointed Associate Professor in Aeronautical Engineering, was also appointed Associate Director of the Instrumentation Laboratory.

New Assistant Professors included Stanley Backer, Arthur D. Brickman, Robert C. Dean, Jr., and Chin-Tse Yang in Mechanical Engineering; George H. Buchi and David P. Shoemaker in Chemistry; Alan S. Michaels in Chemical Engineering; Osman K. Mawardi in Electrical Engineering; Morris Halle in Modern Languages; Karl U. Ingard, William L. Kraushaar, and Harold C. Schweinler in Physics; Captain John F. Clearo, Captain Clifford D. Coble, Major Joseph F. Gricius, and Captain Floyd Trayham in Air Science and Tactics; and Captain Willard Anderson, Major John P. Cox, Jr., Major Nat Giambelluca, Lieutenant Colonel Samuel L. Hall, Major Mark T. Muller, Lieutenant Colonel Woodrow W. Reagan, and Lieutenant Colonel John S. Shapland in Military Science and Tactics.

Leaves of absence for parts of the year have been granted to Dean John E. Burchard to enable him to accept an invitation to Australia, to Professors Joseph H. Keenan and Norbert Wiener to enable them to accept Fulbright Lectureships abroad, and to Assistant Professor Robert W. Kennedy. Leaves for the year beginning in July have been granted to Professors William T. Martin, Head of the Department of Mathematics, and Frederick J. Adams, Head of the Department of City and Regional Planning, and leave for Admiral Edward L. Cochrane, Head of the Department of Naval Architecture and Marine Engineering, has been extended to June 30, 1952. Walter G. Whitman, Head of the Department of Chemical Engineering since 1934, has been granted leave to accept an appointment as Chairman of the Research and Development Board of the

Department of Defense in Washington. As reported above, Professor John C. Slater, Head of the Department of Physics, has been granted leave to June 30, 1952.

Other leaves of absence have been granted to Professors Richard M. Bissell and Ivan A. Getting; to Associate Professors Zdenek Kopal, Max F. Millikan, Lloyd Rodwin, and Amos J. Shaler; to Assistant Professors Robert H. Eustis, Nicholas Grossman, Karl U. Ingard, Ralph Rapson, and Gibbs W. Sherrill.

The following members of the academic staff have been granted leaves of absence to work on special D.I.C. projects: Professors Albert G. Hill and Jerrold R. Zacharias; Associate Professors Alex Bavelas, Joseph C. R. Licklider, Walt W. Rostow, and George E. Valley.

Administration. Administrative appointments not mentioned elsewhere are as follows:

C. Stark Draper became Head of the Department of Aeronautical Engineering on July 1, succeeding Dr. Jerome C. Hunsaker who has asked to be relieved of administrative responsibility for the department, but who will continue as a Professor until his retirement next year. Dr. Draper, Professor of Aeronautical Engineering, has been deputy head of the department and will continue as Director of the Instrumentation Laboratory.

The following have been appointed Acting Heads of their respective departments: Edwin R. Gilliland in Chemical Engineering, Bernard E. Proctor in Food Technology, Norman Levinson in Mathematics, and Nathaniel H. Frank in Physics. Gordon S. Brown has been named Associate Head of the Department of Electrical Engineering. Professor Richard S. Bear has been appointed Executive Officer of the Department of Biology.

Paul M. Chalmers has been made Associate Director of Admissions. Other administrative appointments include the following: David A. Dudley and Arthur L. Bryant as Assistant Directors of Admissions, Warren D. Wells as Assistant Registrar. William H. Carlisle, Jr., has been appointed Manager of

Student Personnel in which capacity he will undertake to provide increased opportunity for students to obtain jobs at the Institute. Dr. James H. Means has been added to the staff of the Medical Department.

A year's leave of absence has been granted to John I. Mattill, Assistant Director of the News Service.

Faculty members have been chosen for residence in the undergraduate dormitory units as follows: Professor John T. Rule and family will live in Burton House; Frederick G. Fassett, Jr., and family will live in Baker House; and Professor S. Curtis Powell in Munroe House with Kenneth F. Gordon as associate resident. Professor Avery A. Ashdown will continue as resident at Graduate House.

Professor Gordon S. Brown has been elected Chairman of the Faculty.

CONCLUSION

This report can touch upon only a few of the manifold activities of this great institution, and it can give credit only to the barest few of the many able and loyal people who make important contributions to our program. The progress that we have made is the work, not of any one group, but of the combined efforts of Corporation, Faculty, Administration, alumni, and students. In this my annual report to the Corporation, I express appreciation to the members of the Corporation for the wise policies formulated by them which have encouraged and promoted this fruitful harmony among all our family and helped to make M. I. T. a happy place in which to work and study.

Respectfully submitted,

JAMES R. KILLIAN, JR.
President.

October 1, 1951

ADMINISTRATIVE OFFICERS

DEAN OF STUDENTS

Because of the death of Dean Everett Moore Baker, the work of the office of the Dean of Students was necessarily devoted to carrying on the basic principles and plans which he established until his permanent successor could be named. These included the further development of M. I. T. as a residential college, strengthening and improving the organized student government, improvement of extracurricular activities and other factors that make up the educational environment outside the classroom, and increased emphasis on that part of the student's education which concerns his relationships with other people and his responsibilities to society.

The Advisory Committee on Housing and Dining devoted much of its attention during the year to an intensive study of the effectiveness with which the dormitory system contributes to the educational program. As a result, the committee recommended the institution of a faculty resident program, with one member of the faculty in residence in each of the major dormitory units. Concurrently, the committee reviewed the services afforded dormitory residents, examining each service in the light of its contribution to the objectives. By a reorganization of certain of the services, economies were effected which have made it possible to retain the present rental rates. In addition, the committee recommended the establishment of a co-operative unit, housing about 200 students, in which the students will have complete responsibility for the care of their own rooms. The charges for such rooms are to be kept at a minimum as an inducement to those students who now find it necessary for financial reasons to live off campus. The Administration has accepted the above recommendations of the committee.

In line with the desire to improve living conditions at the Institute, Riverside Hotel was purchased by the Institute, and during the year the transition to a well-equipped dormitory was completed. This has added another 600 student rooms to those already available, making a total of about 2,000 accommodations. Riverside Dormitory was officially dedi-

cated on June 11, 1951, as the Alfred E. Burton House, named in honor of the Dean of Students from 1902 to 1922. At the dedication attended by Dean Burton's family, the chief address was given by Mr. Justice Harold H. Burton of the Supreme Court of the United States, a son of Dean Burton.

The establishment of commons meals two years ago in Baker House proved to be so successful that the committee recommended the extension of commons meals to all first-year students in the dormitories beginning in the fall of 1951. Commons meals will be available on a voluntary basis to all other dormitory residents either in Walker Memorial or in the Graduate House. Students in Burton House, where there is only a Snack Bar, may take their meals either at Baker House or the Graduate House.

In order to achieve wider faculty participation, Professor Lockhart B. Rogers of the Chemistry Department was added to the committee in the early spring for a term of three years and Professor Thomas M. Hill of the Department of Business and Engineering Administration was named to the committee for a term of four years beginning in the fall of 1951.

Following the decision by the administration to adopt a faculty resident program for the dormitories, a resident was chosen for each of the major units. Mr. Frederick G. Fassett, Jr., and his family are in the Everett Moore Baker House, Professor and Mrs. John T. Rule in Burton House, and Professor S. Curtis Powell in Munroe House on the East Campus. All three of these faculty members have been vitally interested in education and in the students' adjustment to the learning

<i>Tabulation 1*</i>	<i>1949-1950</i>		<i>1950-1951</i>	
	<i>Number</i>	<i>Per Cent</i>	<i>Number</i>	<i>Per Cent</i>
Dormitories (including Women's Dormitory)	1,084	20	1,314	25
Barracks	200	4	....	..
Graduate House	452	8	450	9
Student House	38	1	38	1
Westgate and Westgate West	271	5	271	5
Fraternities	873	16	890	17
Rooming houses or at home	2,540	46	2,208	43
<i>Total</i>	<u>5,458</u>	<u>100</u>	<u>5,171</u>	<u>100</u>

* Statistics are as of the fifth week of fall term.

process for many years, and their presence on the campus will be a great step forward in the increase of efficiency of faculty-student communications. They will have no specific duties, and they will not be concerned with either discipline or maintenance of the dormitories, but they will aid, in whatever way seems appropriate to each, in the improvement of educational opportunities and environment outside the classroom.

The tabulation on page 36 indicates the distribution of living quarters of students during the past two years.

Fraternities

Although fraternities throughout the nation have been under pressure from various quarters to justify their existence, they have continued to serve a very useful purpose on the M. I. T. campus. In previous years there has been a tendency toward a decreasing number of men, but this year the trend has been toward increasing membership. The fraternities increased their efforts in rushing and pledged a total of 260 students during the fall rushing week. This brought the total fraternity membership, including pledges, to 890 men.

The Alpha Club, which for the last three years has been a provisional member of the Interfraternity Council, achieved full membership in the spring of 1951 and was installed as a local chapter of the national Alpha Epsilon Pi fraternity. It is M. I. T.'s third largest fraternity with 46 members. Furthermore, this chapter concluded the year at the top of all M. I. T. fraternities scholastically with the unusually high spring term average of 3.72. Pi Lambda Phi rated second and Alpha Tau Omega third in scholastic standing.

The Pegis Club continued to fulfill satisfactorily the terms of its provisional status and will in the near future petition for acceptance as M. I. T.'s 26th fraternity.

Probably the most significant event for M. I. T. fraternities was the decision of the Corporation Ad Hoc Committee on Fraternity Housing in favor of making Institute land available by lease to M. I. T. fraternities. This Corporation Committee has studied intensively the immediate and long-range aspects of M. I. T. fraternities. Believing that they will in the future continue to make a valuable contribution to student life, the Committee decided that more fraternities should have the

opportunity to build houses on campus if this can be done without interfering with the Institute's plans for developing dormitory and recreational facilities. Since the release of this report, five different fraternities have shown interest in the acquisition of campus land.

A development which may change significantly the character of M. I. T. fraternities is that part of the recommendation of the Advisory Committee on Dining and Housing Facilities that, starting with the fall term, 1953, all freshmen who are not obliged to live at their family homes for financial reasons be required to live on campus. This recommendation, designed to enrich student life and to provide all freshmen with the benefit of at least one year of campus living, if accepted, may result in a difficult transition for the Interfraternity Council and a diminished total fraternity membership thereafter. It has naturally met with a difference of opinion on the part of the fraternities. One counter proposal is that the change be postponed until 1954 to allow fraternities more time to build up a reserve of membership. This counter proposal and other possibilities will be discussed with the Interfraternity Council and alumni representatives during the next few months, a final decision not being reached until it is certain that the action is in the best interest of M. I. T. student life.

The deferred rushing committee of the Interfraternity Council earlier this spring issued a report favoring the postponement of rushing until at least the spring term of the freshman year but further recommended that it not be adopted until there is no longer a threat of a drastically reduced student body as a result of the national emergency.

The deferred rushing committee also recommended that during Rush Week a "clearing house" be established in Walker Memorial to co-ordinate and centralize rushing procedures. This will be done this fall and will be a step forward in co-operation among the M. I. T. fraternities.

The formation of the Interfraternity Council Public Relations Committee, designed to keep member fraternities aware of the importance of good public relations and to improve the quality of news releases from the fraternities, is another indication of the desire of the Interfraternity Council to be a credit to M. I. T.

In an effort to counteract constantly increasing food prices, the House Managers and Stewards Committee met with the Director of Dining and Housing at M. I. T. to investigate the probability of member fraternities taking advantage of the centralized buying at the Institute. Next fall the work of this Committee will be continued.

Student Life and Activities

Student life and activities have been unusually vigorous during the past year. Despite the uncertainty of the times, most of the 102 extracurricular activities have continued their programs vigorously. The one-year-old Freshman Co-ordinating Committee of the Institute Committee continued its study of freshman orientation, recommending that Freshman Weekend for the class of 1955 be held entirely on campus, and the committee early in the year started plans for the event.

Two new hobby clubs entered the field, the M. I. T. Electric Railroaders and the Science Fiction Club; a new professional society, the Marketing Club; a new professional honorary group for aeronautical engineers, Gamma Alpha Rho; and a fifth organization indicative of M. I. T.'s students' continued interest in international affairs, the International Association. The Liberal Arts Society, Techtet (a musical group), Techtronics (a professional society), the Jazz Society, Pi Tau Pi Sigma, and the Progressive Club all failed to fulfill the Walker Memorial Committee's requirements for recognized school organizations and have been dropped from the active list. The Institute of Radio Engineers combined with the American Institute of Electrical Engineers, thus bringing the total number of recognized organizations to 102 in accordance with a new standard method of counting the organizations.

The overcrowded social calendar which resulted in poor attendance at many affairs last year was corrected somewhat this year by a better scheduling of events. The All-Tech Dance was discontinued but the All-Tech Sing was revived and met with wide-spread approval. The Sigma Nu Fraternity won the singing competition.

Wishing to commemorate Dean Everett Moore Baker, a group of about 35 students in September, 1950, organized a Memorial Committee and, in a fund drive which was concluded

in January, 1951, received over \$15,000 in contributions from students, faculty members, and alumni. Each year the income from this fund will be used in a way which the Baker Memorial Committee, in co-operation with members of the founding group, believes to be most suited for a memorial project. This year the Committee decided to commence its work with a thorough evaluation of student life at M. I. T.

Coincident with the opening of Baker House and in anticipation of the organization of Burton House, the Dormitory Committee has been reorganized. Under the new system, questions of interest only to members of each house are debated and settled at house committee meetings; and three representatives from each house committee handle broader issues at meetings of a streamlined Dormitory Committee. Thus, East Campus, Baker House, and Burton House each has its own governing group, and their activities are co-ordinated by the Institute Dormitory Committee.

This new combination of house autonomy and inter-house co-operation has already resulted in greatly increased interest in community matters on the part of dormitory residents; one example of this being the Dormitory Judicial Committee which this last year has competently handled many infractions of good conduct without referring the cases, as was the practice in the past, to the Judicial Committee of Institute Committee.

More active consideration of judicial matters by the Dormitory Committee has greatly aided the Institute Judicial Committee because it also has accepted new responsibilities. At least 12 difficult cases of misbehavior have been considered by this over-all judicial group; each case being investigated and adjudged in an exceptionally mature way. Six of the cases were referred to the Office of the Dean of Students with recommendations for final action.

The Public Relations Committee in co-operation with the Admissions Office expanded its preparatory school division to help introduce more students from New England preparatory schools to M. I. T.

A special committee of Institute Committee, the Student Government Investigating Committee, submitted recommendations at the end of the year for a complete reorganization of Institute Committee designed to broaden representation and to

enable the group to devote more time to legislative problems and less to administrative problems. A new committee was established to continue a study of the problem.

The Combined Professional Society revised its faculty evaluation questionnaire in such a way that the results were obtained by IBM and were available to the instructors one month after the questionnaire was distributed.

WMIT continued to expand this last year, extending its coverage across the Charles River to the four Beacon Street fraternities in the vicinity of the Harvard Bridge. Furthermore, a large number of radio forums and interviews with Institute officials greatly increased the effectiveness of communications in the community.

In the summer of 1951, the Foreign Students Summer Project arranged for 77 students from 30 foreign countries to study and live at M. I. T. for the summer. In this fourth year of operation, all the students lived in the Graduate House, and each had at least one American roommate. The many efforts of the National Students Association continued to flourish, including this last year a program in co-operation with the World Students Service Fund whereby M. I. T. students aided Delhi Polytechnic in India.

Freshman Orientation

The orientation program for the Class of 1954 was held on the Institute campus this year and was attended by 654 students. It was conducted much as in past years with talks by campus student leaders and members of the faculty and administration, tours of the Institute, and an athletic and social program. During the first three weeks of the fall term, lectures were given by Professors Warren K. Lewis and John T. Rule and Dr. Dana L. Farnsworth on the meaning of a professional education, the course content of the freshman year, and the adjustment of the student to new conditions prevailing at the Institute. These were designed to supplement the material presented to the freshmen during Orientation Week.

Attitude Toward Military Service

Throughout the year, most of our students were threatened almost constantly by the uncertainties surrounding their rela-

tionship to the Armed Forces. A letter from the President and the Acting Dean of Students was sent to all students urging them to continue their education until it became clear where and how their services could be utilized in the best interests of the entire nation. Although there were some instances of undue anxiety about the possibility of military service, in general the attitude of the students was remarkably good. Scholarship did not suffer to an appreciable degree, and practically all students took the point of view that military service, though unpleasant and undesired, is a necessity for survival and will be accepted with good spirit when required.

Student Aid

More than \$300,000 was granted to undergraduates during the past academic year from scholarship endowment funds, the Technology Loan Fund, and gifts from organizations outside of the Institute.

<i>Tabulation</i>	<i>1950-1951</i>		<i>1949-1950</i>	
	<i>Number</i>	<i>Award</i>	<i>Number</i>	<i>Award</i>
Freshman Scholarships . .	232	\$ 61,455.00	255	\$ 73,050.00
Other Undergraduate Scholarships	313	93,108.32	283	82,321.32
Total Scholarships	545	\$154,563.32	538	\$155,371.32
Undergraduate Loans	242	134,589.00	218	113,130.00
Total Aid to Under- graduates	700*	\$289,152.32	708*	\$268,501.32

* Allowing for individuals receiving both scholarship and loan.

The above tabulation represents awards from Institute held funds. During 1950-1951, an additional 62 students were helped to the extent of \$33,825 as follows: the Foundry Educational Foundation gave \$4,400 to help 11 undergraduates; the James C. Melvin Trust granted \$9,775 to 25 students; the Teagle Foundation, Inc. of New York contributed \$17,650 to 22 students; the American Smelting & Refining Company aided 3 students to the extent of \$1,500, and the National Association of Engine and Boat Manufacturers, Inc. gave 1 student a \$600 grant.

From both graduate and undergraduate students the Loan Fund Board received 353 applications during 1950-1951 and acted favorably upon 303 or 85.8 per cent, \$162,006 being loaned. For 1949-1950 the corresponding figures were: 295, 264, 89.5 per cent and \$137,851.

The cumulative record of the Fund from its establishment in 1930 up to June, 1951, appears in Tabulation.

CUMULATIVE RECORD OF THE TECHNOLOGY LOAN FUND TO JUNE 29, 1951

	<i>At June 30, 1951</i>	<i>At June 30, 1950</i>		<i>Net Changes During 1950-1951</i>
<i>Items of Outgo:</i>				
Number of Men Receiving Loans	3,215	3,009	up	206
Total Amount Loaned	\$2,341,517	\$2,179,511	up	\$162,006
Average Per Capita Loan	\$728	\$724	up	\$4
<i>Items of Income:</i>				
Number of Men Whose Indebtedness Has Been Completely Discharged	2,319	2,241	up	78
Principal Repayments in Advance	\$609,902	\$591,855	up	\$18,047
Other Principal Repayments	\$1,201,904	\$1,151,034	up	\$50,870
Total Principal Repayments	\$1,811,806	\$1,742,889	up	\$68,917
Total Principal Matured, Considering "Advance Repayments" as Matured When Paid	\$1,843,285	\$1,774,257	up	\$69,028
<i>Collection Ratio, i.e., Percentage</i>				
of Total Maturities Paid	98.2	98.2		
Matured Principal in Arrears	\$22,134	\$22,633	down	\$499
Actual "Written Off" Accounts	\$9,344	\$8,734	up	\$610
Total Maturities Unpaid	\$31,478	\$31,367	up	\$111
Percentage "Written Off" to Total Loans	0.4	0.38	up	0.02
Percentage Matured Loans in Arrears plus Amount "Written Off" to Total Loans	1.34	1.43	down	0.09
Interest Received	\$234,184	\$229,623	up	\$4,561
Times Interest Received to Matured Loans in Arrears plus Amount "Written Off"	7.4	7.2	up	0.2
<i>Notes Outstanding</i>	\$520,366	\$427,887	up	\$92,479

On January 1, 1951, Mr. William Hamilton Carlisle, Jr., was appointed to co-ordinate student employment from an organizational as well as a placement point of view. Further co-ordination in the whole plan of student aid is being contemplated for the future, and it is hoped that in another year more can be accomplished in this area. Typical of the useful-

ness of this program has been the experience in Burton House. Student help has been used without exception for cleaning rooms and general maintenance of this dormitory. This has resulted not only in lowered cost but in improved morale of the students rooming in the dormitory. During the academic year completed in June, 1951, 988 individuals earned \$131,104.80 in part-time jobs on the campus and in the metropolitan area of Boston.

Veteran Enrollment

The decrease of veteran enrollment during the college year followed the expected shrinkage. Since it is now more than six years since the close of hostilities of World War II and with changes the Veterans Administration has announced, the number of young men entering college under the provisions of these Public Laws will probably decline to a very small number in the next few years.

The comparative numbers of veterans for the past two years is given in the following table:

<i>Tabulation</i>	<i>Veterans Enrolled under P.L. 16 or 346 and their Percentage of Total Registration</i>	
	<i>1949-50</i>	<i>1950-51</i>
Fall Term.....	1,991 (37%)	1,286 (25%)
Spring Term.....	1,761 (34%)	1,049 (22%)
Summer Term.....	467 (22%)	352 (15%)

Student-Faculty Committee

The Student-Faculty Committee, under the joint chairmanship of Professor George B. Thomas, Jr. and Mr. Frederick J. Bumpus, '51, continues to do an outstanding job of fulfilling its primary objective of promoting friendly understanding between students and faculty. The Student-Faculty Room which was opened last year was used for 84 combined meetings of staff and students. The various freshman sections sponsored a total of 31 teas for their various instructors and advisers.

Among the activities sponsored by the Committee during the academic year were: (1) a remedial reading course, given under the auspices of the Department of English and History as an elective; (2) a forum devoted to a discussion of the Humanities program; (3) a supplement to the regular catalogue, containing more detailed descriptions of certain selected subjects; (4) encouraging the formation of student-faculty com-

mittees within the various courses at the Institute. Such committees now exist in Courses II, X, and XVII.

The Committee also met with the Undergraduate Policy Committee to express the students' views on certain problems under discussion by the Policy Committee.

Musical Activities

The Music Department under the able direction of Professor Klaus Liepmann has continued its remarkable contribution to the improvement of the educational environment of the Institute. Following the completion of the Music Room of the Hayden Library, continual record concerts have been maintained throughout every day. These have been attended by large numbers of students. At any particular time one can always see 10 to 40 or more students enjoying these programs. All the musical organizations which were mentioned last year have continued to be quite active. In addition various small string, wood-wind, and brass ensembles have met informally. Of the public performances given by these organizations perhaps the most outstanding was the presentation in Jordan Hall of Haydn's *Creation* by the M. I. T. Choral Society and Glee Club. A summary of the chief musical extracurricular activities follows:

1. Orchestra concerts were held jointly at Colby Junior College and Mount Holyoke College. The orchestra joined the M. I. T. Glee Club and Choral Society in the presentation of Haydn's *Creation* and in a concert of four Bach cantatas. The orchestra also performed during the Assembly Ball.
2. The Concert Band combined with the Tufts College Band in a concert at Tufts College and another one at the Hatch Memorial Shell in Boston.
3. The M. I. T. Choral Society (a mixed choral group consisting of members of the Glee Club and staff, secretaries, and student wives) presented Haydn's *Creation* in Jordan Hall and a concert of Bach cantatas at Walker. It also participated during a concert in the Parish House of the Payson Park Church in Belmont and at Tech Night at the Boston Pops.

4. The Glee Club gave concerts with the Bradford and Lasell Junior Colleges and combined in informal concerts with Wheelock and Simmons Colleges. In addition, they appeared at several local entertainments and aided in the presentation of Haydn's *Creation* and appeared at Tech Night at Pops in Symphony Hall.
5. The Logarithms were in great demand for various alumni dinners during which they entertained with barbershop songs.

The All-Tech Sing, which has been so successful in past years, was allowed to lapse for one year, but this year it was revived with marked success. The Baton Society organized the All-Tech Sing as well as Tech Night at Pops.

Nine concerts were given by various visiting musical groups, of which four were sponsored by the School of Humanities and Social Studies.

Hobby Shop

The Hobby Shop has continued to grow in size and in usefulness. Whereas nine years ago it had 25 members, this year it has a membership of approximately 500 or 10 per cent of the entire Institute enrollment. The contribution of Mr. Joseph F. MacAllister and his staff has been notably successful in giving students a type of activity which is different enough from his school work to give him real relaxation.

Psychological Service

Dr. John V. Gilmore has continued the work begun last year in clinical psychology. He has had the assistance of Miss Mary Evelyn Dutton, a psychometrist, in administering tests and in other routine procedures of service. Dr. Gilmore's work has been largely devoted to five different types of activity:

1. Diagnosis — A large portion of his work has consisted in diagnosing abilities, educational skills, interests, and emotional adjustment.
2. Referral — This consists of referring students to other specialists or responsible persons who can give them

more direct and suitable treatment than a psychologist is able to do. The largest number of referrals were to the psychiatrists in the Medical Department.

3. Counseling — This consists of conferences and interviews with students on problems of serious import to the student but not of the emotional type that calls for psychiatric treatment.
4. Conferences with parents, faculty members, deans, and psychiatrists about students who have been referred to the office for help.
5. Co-operation with the Director of Admissions in the selection of students.

Students have been referred to the clinical psychologist from other staff members of the Office of the Dean of Students, from faculty members, from other students who had already received help, and from members of the Medical Department. When one student has been helped by the psychologist, it is not uncommon for several of his roommates or friends to come asking for guidance. Ideally an interview should precede the administering of tests, but the pressure of work became so great that at times testing had to be done following a very short interview, and the test result was discussed afterwards with the student.

The tests which have proved most useful during the past year have included the Wechsler-Bellevue Test for general over-all ability, the Ohio State Psychological Test for the diagnosis of reading comprehension skills, the Cooperative English Reading Form C2T Test for determining vocabulary, speed of reading, and level of comprehension, the Kuder Preference Record (Vocational) for determining vocational areas of interest, the Kuder Preference Record (Personal) for diagnosing student reaction to groups of people and whether he is interested in the theoretical or practical approach to problems, the Stanford Scientific Aptitude Test for determining aptitudes in this field. As a measure of emotional status and the determination of the nature of the defense mechanisms, three tests were used: the Sentence Completion, Draw a Person, and the Thematic Apperception Test. Administration of the whole battery of

tests required six to eight hours of the student's time, but an enormous amount of information was gained that was of great use to the student and his counselor.

During the year approximately 200 students were seen one or more times by this service, but in about 33 per cent one long interview was sufficient to solve the problem or determine its extent. The other 67 per cent went through various testing procedures.

Close co-operation was maintained at all times with the Medical Department, and the service has been of great aid to that department in certain research projects that are under way.

Weekly meetings of the Dean's Office staff to which were invited representatives of the Medical Department, Admissions Office, representative faculty members, and others interested in general problems of the adjustment of students, were held throughout the year. At these meetings general questions such as student counseling, morale, faculty-student relationships, sources of dissatisfaction, and any other problems involved in the adaptation of students to college life were discussed. These meetings were not designed to achieve any particular purpose other than to improve communication between the Dean's Office and other departments of the Institute and to increase awareness of common problems.

Athletics

The Athletic Department has made further progress in its efforts to interest as many students as possible in participation in activities which will be helpful to them while here as well as in later life. Because of the many controversies that have arisen in other institutions about the emphasis and commercialization of athletics, it is considered advisable to formulate the basic policies and philosophy of our athletic program.

The Department is organized on the principle that the development of a sound body, skilled and co-ordinated, is an integral part of education at the Institute. To this end there is offered a sane program of intramural and intercollegiate athletics, physical education and recreation, initiated and administered by students for students with the assistance of competent staff leadership and the provision of adequate facilities by the Institute. Through keeping very strictly in

mind the needs and desires of the students and not becoming dependent on outside groups or on gate receipts for finances, the evils of commercialization and exploitation of certain sports have been avoided.

Organization of an athletic program with these principles in mind differs from that which is current in most institutions in several ways. The role of the athletic director is quite definitely that of consultant, adviser, and co-ordinator rather than that of dictator. Under this system efficiency may apparently suffer at times, but the student gains many more educational benefits due to the fact that he may participate, not only in the sport itself, but in the planning for it, in its management, and in its financing.

This year approximately 22 per cent of the undergraduate students enrolled at the Institute participated in one or more college sports. An additional 37 per cent participated in intramural athletics. It is definitely known that a considerable percentage of the remaining students were engaged in athletics and recreational activities outside the formal program so that it is quite certain that more than 65 per cent of the student body were active in athletics.

In the 18 intercollegiate and 8 intramural sports, 913 regularly scheduled contests were held.

Of the intercollegiate sports, three squads compiled outstanding records. The Rifle Team won the National College Rifle Championship in which 125 other colleges and universities competed. Two representatives of the Rifle Team were named to the All-American Rifle Team. The Sailing Team won a series of spring competitions which was climaxed by winning the National Collegiate Sailing Championship at M. I. T. Seven other colleges representative of all areas of the United States competed. In crew the Varsity placed sixth and the Freshmen, second, in the Intercollegiate Rowing Association Championship held at Marietta, Ohio.

In September, 1950, Mr. Thomas L. Hilton was promoted to Assistant Dean of Students. In June, 1951, the new position of Director of Student Aid was created, and Dean Thomas P. Pitré was appointed to that post. In this post Dean Pitré will be in charge of all programs concerned with financial aid to the students, whether it be by employment, scholarship, or loans.

In February, 1951, the appointment of Mr. E. Francis Bowditch as Dean of Students to succeed Dean Everett Moore Baker was announced by President Killian. Dean Bowditch, formerly Headmaster of Lake Forest Academy, Lake Forest, Illinois, comes to the Institute with a rich experience in education, including the headmastership of two schools, a period as Assistant Freshman Dean at Harvard, and teaching at Milton Academy. He began his duties in July, 1951. The house on Memorial Drive next door to the Everett Moore Baker House, which was formerly owned and occupied by the late Professor Forris Jewett Moore, has been willed to the Institute. Dean and Mrs. Bowditch will make their home there, thus furthering the faculty resident program in the most effective manner possible.

DANA L. FARNSWORTH
Acting Dean of Students — 1950-1951

DEAN OF THE GRADUATE SCHOOL

For the academic year 1950-1951 the Graduate School was slightly larger than in 1949-1950: Graduate students constituted 32 per cent of the total student body. The numbers involved depend upon the dates chosen to represent a given academic year. The numbers selected are more meaningful if weighted to represent an equivalence in full-time students. A basis for computing such equivalence was presented in the report corresponding to this one for 1948-1949.

TABLE I

<i>Applications, Admissions and Enrollment for 1950-1951</i>	
Applications — regular graduate students	2,042
Applications — special graduate students	150
Total Applications	2,192
Admitted — regular students	845
Enrolled — new	476
Enrolled — continuing	1,055
Enrolled — specials	144
Total Enrollment (as of November 1, 1950) =	1,675

The ratio of applicants to admitted still exceeds 2:1. Of the 845 newly-admitted students, 284 had received their bacca-

laureate from M. I. T. The large number who, having been admitted, failed to register, namely 369, may reflect the lure of high salaries in industry for scientists and engineers and perhaps the uncertainty of student military status in the fall of 1950.

Of the 1,675 graduate students, 859 were full-time regular graduate students, 669 held part or full-time academic appointments, and 147 were specials. During the year these numbers varied from time to time, but the order of magnitude of changes in the several categories was not significant.

Special graduate students taking one or two regularly scheduled subjects per term increase the numerical count but not significantly the load on the Faculty, provided there is sufficiently wide distribution of subjects elected by them.

TABLE II
Special Graduate Students in 1950-1951

	<i>Term I</i>	<i>Term II</i>
Number students registered.....	144	122
Subjects taken.....	124	119
Number taking one subject only.....	100	89
Final grades below 3.5*.....	92	36
Final grades above 3.5.....	52	86
Number of foreign students in above.....	14	7
Final grades below 3.5.....	6	2
Final grades above 3.5.....	8	5

* Any graduate student whose Cumulative Academic Rating is below 3.5 is warned in the first instance of unsatisfactory academic standing and in absence of improvement may be required to withdraw.

Graduate Students from the Armed Services often having special objectives and varied preparation, require more administrative and instructional time than most other full-time students. These numbered 165, included in totals of Table I.

Foreign students, previous to the enlargement of the Exchange-Visitor Program of the State Department and before the extensive use of the Smith-Mundt type of visa were of necessity full-time students. Some degree of special attention, both advisory and instructional, was essential to circumvent language difficulties, preparation differences, and for many, an entirely new sort of student-teacher relationship.

Under current visa regulations, it is permitted to offer

part-time employment to qualified students of alien citizenship. This makes it possible for some of the ablest applicants to attend our school despite restrictions on export of foreign currencies for educational purposes.

The number of qualified applicants for admission from foreign countries continues to exceed the number of vacancies created by graduation. The preparation of those admitted, while in general adequate, often differs from that of our own nationals to an extent that makes advisable an initial registration in certain undergraduate subjects of instruction.

TABLE III

Foreign Student Component of Enrollment for Fall Term 1950-1951

Admitted	69
Continuing	84
	<hr/>
Total Foreign Student Enrollment	153

Thirty-five countries, exclusive of the United States and Canada, were represented.

A forecast of enrollment in 1951-1952 is particularly pertinent in view of the substantial diminution of G.I. beneficiaries and the increasing requirements of the Armed Services. As of June 30, 1951, the end of the academic year covered in this report, there were in hand 1,512 applications for admission, as compared with 1,951 twelve months previous. Expected vacancies from graduations and withdrawals were of the order of 700 as in the previous year. Already admitted for 1951-1952 were 794 men; 800 were admitted last year. An increased number of nominations is anticipated from Federal agencies including the Armed Services. Applications from foreign students appear to be no less than usual. The high qualifications of many applicants in the past few years not accepted on account of stabilization of enrollments gives added reason to expect that no serious shrinkage of numbers in the Graduate School is to be anticipated unless military requirements on young men become more severe. The over-admissions for September are on the same basis of experience as in June, 1949 and 1950.

Once again, in the summer of 1950 there arose the problem of student status and the needs of the Armed Services. Believ-

ing that in an uncertain state of world affairs every effort should be made to maintain our educational program free from premature disruption, this office has sought to assist students and military authorities to recognize the value of continuing professional study in the national interest. The response from the Selective Service System and military officers has been, in general, sympathetic to the views presented.

In relation to the above situation, the Committee on Graduate School Policy has recorded its recognition of the probability of increased numbers of persuasive requests for approval of theses the content of which might require military classification. During the academic year, 19 such theses were accepted, approval was granted for initiation of 15 more.

For the five-year period, September, 1946, through June, 1951, 71 theses with security classification were authorized out of a total of 3,156. Each such proposal individually is appraised by the Committee on Graduate School Policy and approved only when judged to be in the national interest. Approval for classification is required before initiating a thesis, with an occasional exception when in the course of research the use of classified data is discovered to be essential for the proper professional completion of the task. Classified theses are sequestered by an official of the Central Library cleared to take custody. It is recognized that classified research is incompatible with a truly academic atmosphere.

In respect to minor requirements for a doctorate, increasing interest of students in subjects not offered at the Institute but available at Harvard University under the co-operative arrangement for exchange of graduate student facilities between the two institutions, has resulted in selection of such fields as anthropology and philosophy. Arrangements for minor programs in such areas are handled by our Dean of the School of Humanities and Social Studies.

Industrially sponsored fellowships for graduate students for the academic year 1950-1951 numbered 85, paying approximately \$175,360. Four new fellowships were established by the following sponsors: American Smelting and Refining Company (2), General Motors Corporation (Research Laboratory Division), and Visking Corporation. The Institute is deeply appreciative of the aid to its educational program for graduate

students rendered by the donors of industrially sponsored fellowships.

Additional graduate scholarship aid from gifts and accumulated income from invested funds of the Institute was available in the sum of \$98,736, making a total of \$274,096 available from all sources. Net scholarship assistance of \$268,132 was awarded among 244 recipients.

M. I. T. Swope Fellowships were awarded to Dale Ursini von Rosenberg in Chemical Engineering and to Edwin Weiss in Mathematics.

During the period from July 1, 1950, through June 30, 1951, there were conferred 752 advanced degrees, distributed as follows:

Advanced Degrees Conferred 1950-1951

	<i>S.M.</i>	<i>Engineer</i>	<i>Sc.D.</i>	<i>Ph.D.</i>	<i>Total</i>
October 1950.....	137	9	18	28	192
January 1951.....	87	2	19	19	127
June 1951.....	267	54	55	57	433
Total.....	491	65	92	104	752

JOHN W. M. BUNKER

REGISTRAR

The class graduating in June, 1952 will be the last of the large postwar classes. Thereafter, registration in the Undergraduate School will again be relatively stable while registration in the Graduate School will probably continue at the present figure, which has proved fairly stable during recent years. The comparative growth of the two schools is best shown by considering the relative registrations before and after the two World Wars.

Prior to World War I, the total enrollment was about 1,800 with relatively few graduate students, about 1 out of 40. The Institute did not have a Graduate School, few students entered M. I. T. for graduate work, and most of our graduates went elsewhere for advanced study.

Immediately after World War I, there was a temporary increase in the number of undergraduates, but undergraduate

registration finally stabilized at about 2,400 and showed little change until World War II. As compared to the registration prior to World War I, this figure showed an increase of about 35 per cent in undergraduate registration. On the other hand, the number of graduate students increased steadily during this period; the Graduate School was established and by 1940 had a registration of over 700, representing 1 graduate student out of 4 on the campus. In most departments the same faculty taught both undergraduate and graduate students, and the laboratories were in the same buildings which proved a stimulating environment for undergraduates. Many of the more capable undergraduates, by carrying a slight overload, started their graduate work in the senior year, and this has become an established procedure for students intending to pursue advanced study.

The recent Freshman classes have averaged slightly over 750 students which indicates that beginning in 1952 the Undergraduate School will be of the order of 3,000 students, showing an increase of 25 per cent over the enrollment figure prior to World War II. The registration in the Graduate School for the last few years has been over 1,600 or slightly more than double the prewar figure, indicating that, by 1952, 1 out of 3 will be a graduate student.

The statistics for the year 1950-1951 and the summary statistics for the preceding years follow.

JOSEPH C. MACKINNON

**STATISTICS ON
REGISTRATION AND DEGREES**

REPORT OF THE REGISTRAR FOR THE YEAR 1950-1951

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

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

Year	Number of Students	Year	Number of Students	Year	Number of Students
1865-66	72	1894-95	1,183	1923-24	2,949
1866-67	137	1895-96	1,187	1924-25	2,938
1867-68	167	1896-97	1,198	1925-26	2,813
1868-69	172	1897-98	1,198	1926-27	2,671
1869-70	206	1898-99	1,171	1927-28	2,712
1870-71	224	1899-00	1,178	1928-29	2,868
1871-72	261	1900-01	1,277	1929-30	3,066
1872-73	348	1901-02	1,415	1930-31	3,209
1873-74	276	1902-03	1,608	1931-32	3,188
1874-75	248	1903-04	1,528	1932-33	2,831
1875-76	255	1904-05	1,561	1933-34	2,606
1876-77	215	1905-06	1,466	1934-35	2,507
1877-78	194	1906-07	1,397	1935-36	2,540
1878-79	188	1907-08	1,415	1936-37	2,793
1879-80	203	1908-09	1,461	1937-38	2,966
1880-81	253	1909-10	1,479	1938-39	3,093
1881-82	302	1910-11	1,506	1939-40	3,100
1882-83	368	1911-12	1,559	1940-41	3,138
1883-84	443	1912-13	1,611	1941-42	3,055
1884-85	579	1913-14	1,685	1942-43	3,048
1885-86	609	1914-15	1,816	1943-44	1,579
1886-87	637	1915-16	1,900	1944-45	1,198
1887-88	720	1916-17	1,957	1945-46	1,538
1888-89	827	1917-18	1,698	1946-47	5,172
1889-90	909	1918-19	1,819	1947-48	5,662
1890-91	937	1919-20	3,078	1948-49	5,433
1891-92	1,011	1920-21	3,436	1949-50	5,458
1892-93	1,060	1921-22	3,505	1950-51	5,171
1893-94	1,157	1922-23	3,180		

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

TABLE 2. THE CORPS OF INSTRUCTORS

	'38	'39	'40	'41	'42	'43	'44	'45	'46	'47	'48	'49	'50
Faculty Members of the Staff . . .	273	282	285	292	313	319	317	330	379	398	413	435	436
Professors	90	98	99	95	97	97	107	113	110	118	124	131	132
Associate Professors	98	89	92	99	104	108	105	103	128	131	131	141	137
Assistant Professors	72	83	83	86	98	99	92	101	125	137	133	138	144
Ex-Officio	6	7	7	7	8	9	10	10	11	11	10	10	8
Professors Emeriti (Lecturers) . .	—	—	—	—	—	—	—	—	—	—	14	13	13
Instructors	3	3	3	2	3	3	—	—	—	—	—	—	—
Technical Instructors	—	—	—	1	1	1	1	1	1	—	—	—	—
Research Associates	4	2	1	2	2	2	2	2	2	—	—	2	2
Library Fellows	—	—	—	—	—	—	—	—	2	1	1	—	—
Other Members of the Staff . . .	368	401	396	395	370	306	222	252	694	846	824	861	940
Instructors	97	99	91	101	100	97	70	82	119	154	142	151	145
Technical Instructors	—	—	—	6	7	8	6	8	14	17	15	15	13
Administrative Assistant	—	—	—	—	—	—	—	—	1	—	—	—	2
Teaching Assistants	—	—	—	—	—	1	—	—	—	—	—	—	—
Teaching Fellows	52	52	55	52	60	52	8	18	74	77	72	91	98
Fellows in Applied Math	—	—	—	—	—	—	—	—	4	3	—	—	—
Assistants	79	78	85	87	75	49	44	47	127	137	116	124	122
Consultant	—	—	—	—	—	—	—	—	—	—	—	1	—
Lecturers	28	31	31	17	18	16	7	7	11	10	13	11	22
Research Consultant	—	—	—	—	—	1	—	—	—	—	—	—	—
Research Associates	25	36	35	47	34	23	33	39	151	176	155	120	105
Research Assistants	72	90	91	84	64	59	54	51	193	272	311	348	433
Research Fellows	15	15	8	—	—	—	—	—	—	—	—	—	—
National Research Council Fellows	—	—	—	1	—	—	—	—	—	—	—	—	—
Staff Members (D. I. C.)	—	—	—	—	12	—	—	—	—	—	—	—	—
Total	641	683	681	687	683	625	539	582	1073	1244	1237	1296	1376
Other Members of the Faculty . .	28	28	32	37	40	39	44	52	60	67	50	50	54
Professors Emeriti (not Lecturers)*	27	27	31	36	39	38	43	51	59	66	49	49	53
Non-Resident	1	1	1	1	1	1	1	1	1	1	1	1	1

*Beginning 1948-49

TABLE 3. CLASSIFICATION OF STUDENTS BY COURSES AND YEARS

COURSE NAME AND NUMBER	1948-49						1949-50						1950-51					
	YEAR						YEAR						YEAR					
	1	2	3	4	G	Total	1	2	3	4	G	Total	1	2	3	4	G	Total
Aeronautical Engineering XVI	58	52	52	47	95	304	40	44	37	50	85	256	45	40	22	33	97	237
Aeronautical Engineering (Cooperative) XVI-B																		
Architecture IV-A	27	41	33	29	17	147	25	30	39	31	19	144	40	37	30	21	21	162
Architecture (IV-A) Fifth Year						22				25		25				32		32
Biology																		
Quantitative VII	5	14	19	3	29	70	8	14	12	16	22	72	11	13	13	9	33	79
Physical VII-A		2	1	2	2	7		5	1	6	1	13			4	2	4	8
Chemical VII-B																		
Building Engineering and Construction XVII	12	31	32	25	11	111	11	31	35	33	14	124	14	21	30	38	13	116
Business and Engineering Administration XV	47	95	111	160	36	449	46	99	115	122	33	415	45	67	106	118	39	371
Chemical Engineering X	124	114	128	72	105	543	98	84	128	94	129	533	103	73	81	93	119	473
Chemical Engineering Practice X-A, X-B						68				35	28	63				27	41	68
Chemistry V	33	34	41	34	138	280	35	30	28	43	145	281	42	20	31	28	151	272
City Planning IV-B		2	7	2	24	35	2	2	1	5	23	33	1	1	1	3	24	30
Civil Engineering I	47	53	62	47	49	258	56	49	61	57	44	267	56	56	58	57	47	274
Army Engineer (in Civil Eng. Department)																		
Economics and Engineering XIV	†	28	42	14	2	85	5	16	25	35	4	81	2	7	20	27	57	113
Economics and Natural Science	†					1												
Electrical Engineering VI	190	158	134	143	273	898	167	160	130	133	262	852	160	136	99	111	255	761
Electrical Engineering (Cooperative) VI-A																		
Food Technology XX, XX-A	7	10	12	11	19	59	1	5	11	15	14	46	5	8	7	9	20	49
General Engineering IX-B			22	35		57			22	40		62			11	33		44
General Science IX-A																		
Geology XII				2	5	7			4	6		10						15
Group Psychology	4	14	14	5	24	61	7	22	19	11	27	86	5	17	22	19	36	99
Industrial Economics	†				4	4					46	46						
Marine Transportation XIII-C																		
Marine Transportation (XIII-C) Fifth Year	4	8	12	7		24	2	7	8	6		23	1	4	10	5		20
Mathematics XVIII	16	13	23	7	78	137	12	26	18	26	83	165	11	17	29	15	68	140
Mechanical Engineering II	124	130	193	117	127	691	106	133	134	189	131	693	110	98	96	138	121	563
Mechanical Engineering (Cooperative) II-B																		
Metalurgy III	9	38	41	19	85	192	10	45	47	40	89	231	12	25	40	46	95	218
Ceramics (in Metallurgy Department)																		
Meteorology XIX	8	6	9	10	33	66	3	9	6	12	35	65	7	6	8	11	39	71
Naval Architecture and Marine Eng. XIII	14	18	12	10	08	61	17	9	22	12	12	66	17	14	12	19	11	73
Naval Construction and Engineering XIII-A						98					98	98						91
Physics VIII	89	78	73	49	180	469	93	77	66	70	172	478	97	79	72	61	203	512
Sanitary Engineering XI						16					21	21						22
Total	819	939	1,150	943	1,602	5,453	744	807	1,038	1,177*	1,602	5,458	784	739	909	1,064*	1,675	5,171

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

† Group Psychology discontinued June 1949.

‡ After June 1950 included in Economics and Engineering XIV.

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

No.	NAME	OPTION	Opr.	YEAR																TOTAL	COURSE NUMBER
				1		2		3		4		G		Tot.							
				Opt.	Tot.	Opt.	Tot.	Opt.	Tot.	Opt.	Tot.	Opt.	Tot.								
I	Civil Engineering	{ 1. Theory and Design 2. Planning and Administration 3. Construction and Management	1 2 3	56	56	56	58	24	27	24	27	24	27	47	50	277	I				
II	Mechanical Engineering	{ 1. Power Manufacturing 2. Material, Design, and Mfg. 3. Automotive Engineering Textile Technology	1 2 3	110	98	96	96	44	47	44	47	44	47	113	121	563	II				
II-B	Mechanical Engineering — Cooperative					34	36	35	20	88	88	20	88			54	II-B				
III	Metalurgy	{ 1. Metallurgy 2. Mineral Engineering	1 2	12	25	40	40	11	11	11	11	46	7	13	108	231	III				
IV-A	Architecture	Fifth Year		40	37	30	30	34	32	30	34	32	30	21	21	194	IV-A				
IV-B	City Planning			42	20	1	1	24	3	24	3	28	3	24	272	IV-B					
V	Chemistry	{ 1. Electric Power 3. Electrical Communications 4. Electronic Applications	1 3 4	160	136	99	99	54	30	41	111	40	355		761	VI					
VI	Electrical Engineering	{ 1. Electric Power 3. Electrical Communications 4. Electronic Applications	1 3 4				11	16	16	16	8	17	44		52	139	VI-A				
VII	Quantitative Biology			11	13	13	13	4	4	4	9	9	33	33	79	VII					
VII-A	Physical Biology			97	79	72	72	8	8	8	61	2	203	2	79	VII-A					
VII-B	Chemical Biology			103	77	81	81	11	11	11	33	7	119	41	473	VII-B					
VIII	Physics										27	22	22	22	22	115	VIII				
IX-A	General Engineering			5	17	13	13	9	9	9	16	19	36	36	99	IX-A					
IX-B	General Engineering			17	14	12	12	3	3	3	3	19	11	11	73	IX-B					
X	Chemical Engineering Practice — Graduate			1	4	4	4				5	13			91	X					
X-A	Chemical Engineering Practice — Undergraduate										8	12			28	X-A					
X-B	Sanitary Engineering			2	7	10	10	10	10	10	10	12	27	27	113	X-B					
XII	Geology	{ 1. Geology 2. Geophysics	1 2												57	XII					
XIII	Naval Architecture and Marine Engineering			37	49	63	63	21	21	21	103	118	39	39	371	XIII					
XIII-A	Naval Construction and Engineering		A B	45	40	40	40	22	22	22	33	33	97	97	237	XIII-A					
XIII-C	Marine Transportation			14	21	28	28	2	2	2	38	38	13	13	116	XIII-C					
XIV	Economics and Engineering	{ 1. Human Relations 2. Industrial Economics	1 2								7	10	20	27	113	XIV					
XV	Business and Engineering	{ A. Physical Sciences B. Chemical Sciences	A B	45	49	63	63	21	21	21	103	118	39	39	371	XV					
XVI	Aeronautical Engineering			45	40	40	40	22	22	22	33	33	97	97	237	XVI					
XVI-B	Aeronautical Engineering (Cooperative)														17	XVI-B					
XVII	Building Engineering and Construction	{ 1. Heavy Construction 2. Light Construction	1 2	14	21	28	28	2	2	2	38	38	13	13	116	XVII					
XVIII	Mathematics			11	17	17	17	6	6	6	6	6	68	68	140	XVIII					
XIX	Meteorology			5	7	8	8				7	7	39	39	71	XIX					
XX	Food Technology			5	8	8	8				9	9	20	20	49	XX					
XX-A	Food Technology														49	XX-A					
Total				784	739	999	999	**1,064	**1,064	**1,064	1,675	1,675	5,171	5,171	Total						

* First Year, 20. Second Year, 38. Third Year, 33. ** This total includes fifth year in Architecture and Marine Transportation.

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

COURSE	YEAR					TOTAL	COURSE
	I	2	3	4	G		
I Civil Engineering	1	—	1	1	—	3	I
II Mechanical Engineering	1	1	2	2	11	17	II
III Metallurgy	—	—	1	2	2	5	III
IV-A Architecture	2	—	—	2	1	5	IV-A
Fifth Year	—	—	—	2	—	2	(Fifth Year)
IV-B City Planning	—	—	—	1	—	1	IV-B
V Chemistry	—	—	1	1	4	6	V
VI Electrical Engineering	2	1	1	5	38	47	VI
VII Quantitative Biology	—	1	1	—	5	7	VII
VIII Physics	2	2	1	5	16	26	VIII
IX-B General Engineering	—	—	—	1	—	1	IX-B
X Chemical Engineering	1	—	—	1	8	10	X
X-A Chemical Engineering Practice	—	—	—	—	1	1	X-A
XIV Economics and Engineering	—	—	—	—	5	5	XIV
XV Business and Engineering Administration	1	1	—	—	2	4	XV
XVI Aeronautical Engineering	—	—	1	—	23	24	XVI
XVII Building Engineering and Construction	—	—	1	1	2	4	XVII
XVIII Mathematics	—	3	2	—	11	16	XVIII
XIX Meteorology	—	—	—	4	17	21	XIX
XX Food Technology	—	—	1	—	7	8	XX
Total	10	9	13	28	153	213	Total

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

COURSE	YEAR					TOTAL	COURSE
	I	2	3	4	G		
I Civil Engineering	—	3	2	2	1	8	I
II Mechanical Engineering	1	1	5	2	6	15	II
III Metallurgy	—	1	1	—	1	3	III
IV-A Architecture	—	1	1	1	—	3	IV-A
Fifth Year	—	—	—	1	—	1	(Fifth Year)
V Chemistry	—	—	1	1	2	4	V
VI Electrical Engineering	1	1	5	3	7	17	VI
VII Quantitative Biology	—	—	—	—	1	1	VII
VIII Physics	—	2	1	1	7	11	VIII
IX-A General Science	—	—	2	2	—	4	IX-A
IX-B General Engineering	—	—	2	5	—	7	IX-B
X Chemical Engineering	1	2	2	2	4	11	X
XI Sanitary Engineering	—	—	—	—	1	1	XI
XII Geology	—	1	—	1	—	2	XII
XIII Naval Architecture and Marine Engineering	—	1	—	—	2	3	XIII
XIII-A Naval Construction and Engineering	—	—	—	—	1	1	XIII-A
XIV Economics and Engineering	—	—	1	2	6	9	XIV
XV Business and Engineering Administration	1	—	1	3	1	6	XV
XVI Aeronautical Engineering	—	1	3	1	8	13	XVI
XVII Building Engineering and Construction	—	—	—	1	—	1	XVII
XVIII Mathematics	—	1	—	—	4	5	XVIII
XIX Meteorology	—	1	—	1	2	4	XIX
XX Food Technology	—	1	—	1	1	3	XX
Total	4	17	27	30	55	133	Total

* Excludes 53 special students

TABLE 5. CLASSIFICATION OF STUDENTS BY COURSES SINCE 1943

	1943-44	1944-45	1945-46	1946-47	1947-48	1948-49	1949-50	1950-51
<i>School of Engineering</i> Total	1,276	976	1,225	4,092	4,398	4,094	4,055	3,287
Aeronautical Engineering XVI, XVI-B	199	136	208	425	346	304	274	276
Building Engineering and Construction XVII.	9	11	15	70	98	111	124	116
†Business and Engineering Administration XV	68	61	73	490	556	449	415	—
Chemical Engineering X, X-A, X-B, X-C	278	185	220	695	693	611	596	541
Civil Engineering I	72	62	63	209	220	258	277	277
††Economics and Engineering XIV	—	—	—	4	69	87	81	—
Electrical Engineering VI, VI-A	237	218	303	1,091	1,215	1,051	996	900
General Engineering IX-B	20	10	12	32	51	62	44	44
Mechanical Engineering II, II-B	200	139	178	718	749	691	711	617
Metallurgy III	40	36	31	135	155	203	243	231
†Meteorology XIX	19	15	12	46	46	66	65	71
Naval Architecture and Marine Eng. XIII, XIII-C	52	25	26	85	85	92	92	101
Naval Construction and Engineering XIII-A	79	75	81	78	101	98	98	91
Sanitary Engineering XI	3	3	3	14	14	16	21	22
<i>School of Science</i> Total	265	187	269	895	1,037	1,090	1,151	1,176
§Biology and Public Health VII, VII-A, VII-B, VII-T	42	13	21	66	85	77	85	89
Chemistry V	95	77	108	272	292	280	281	272
**Food Technology XX, XX-A	—	—	4	29	41	59	46	49
General Science IX-A	3	1	3	3	6	7	10	15
Geology XII	6	3	4	27	38	61	86	99
Mathematics XVIII	19	20	36	105	116	137	165	140
Physics VIII	100	73	93	393	459	469	478	512
<i>School of Architecture and Planning</i> Total	30	30	40	156	179	204	202	224
Architecture IV-A	30	30	40	156	144	169	169	194
*City Planning IV-B	—	—	—	—	35	35	33	30
<i>School of Humanities and Social Studies</i> Total	—	—	—	—	—	—	—	484
Business and Engineering Administration XV	—	—	—	—	—	—	—	371
Economics and Engineering XIV	—	—	—	—	—	—	—	113
†Economics and Eng. or Natural Science, Industrial Economics, and Group Psychology	8	5	4	29	48	45	50	—
Grand Total	1,579	1,198	1,538	5,172	5,662	5,433	5,458	5,171

* Prior to February 1947 included in Architecture.

† September 1946, Meteorology changed from Course XIV to Course XIX, Economics and Engineering Course XIV started.

‡ June 1944, Public Health discontinued.

§ Prior to July 1945, included in Biology and Public Health.

¶ After June 1950 included in Economics and Engineering XIV.

** June 1950, School of Humanities and Social Studies started.

†† School of Engineering to new school.

* Business and Engineering Administration and Economics and Engineering changed from

† From July 1945 to September 1946, Course VII-B, September 1946, changed to Course XX.

‡ Business and Engineering Administration and Economics and Engineering changed from

TABLE 6
GEOGRAPHICAL CLASSIFICATION OF STUDENTS SINCE 1946

UNITED STATES	1946	1947	1948	1949	1950
<i>North Atlantic</i> Total	3,441	3,837	3,633	3,590	3,297
Connecticut	194	213	199	199	174
Maine	36	44	43	52	41
Massachusetts	1,569	1,817	1,710	1,672	1,523
New Hampshire	43	54	51	47	45
New Jersey	300	337	311	307	286
New York	936	1,009	981	973	901
Pennsylvania	300	285	262	267	258
Rhode Island	46	57	53	51	49
Vermont	17	21	23	22	20
<i>South Atlantic</i> Total	341	351	343	308	319
Delaware	16	17	14	8	13
District of Columbia	72	57	59	49	44
Florida	53	54	66	65	69
Georgia	17	14	15	10	12
Maryland	65	79	68	61	61
North Carolina	26	29	26	18	20
South Carolina	16	19	12	11	8
Virginia	51	56	63	65	67
West Virginia	25	26	29	21	25
<i>South Central</i> Total	196	210	194	200	175
Alabama	22	21	15	25	20
Arkansas	16	19	15	14	11
Kentucky	18	17	25	28	25
Louisiana	24	26	29	20	18
Mississippi	11	12	10	9	12
Tennessee	32	41	36	33	25
Texas	73	74	64	71	64
<i>North Central</i> Total	664	675	641	659	633
Illinois	181	189	175	174	151
Indiana	25	31	37	38	41
Iowa	16	21	20	22	11
Kansas	22	21	17	14	17
Michigan	79	83	88	97	94
Minnesota	40	41	31	35	38
Missouri	75	68	61	58	48
Nebraska	16	19	18	28	20
North Dakota	8	8	5	3	2
Ohio	158	144	136	140	158
South Dakota	5	4	2	3	4
Wisconsin	39	46	51	47	49
<i>Western</i> Total	258	276	282	290	284
Arizona	4	8	6	7	11
California	95	95	97	99	102
Colorado	17	21	22	28	16
Idaho	9	6	7	8	8
Montana	6	7	10	8	7
Nevada	4	3	4	3	3
New Mexico	10	11	7	7	8
Oklahoma	29	34	39	33	32
Oregon	20	25	22	17	20
Utah	8	13	13	15	14
Washington	54	49	50	58	52
Wyoming	2	4	5	7	11
<i>Territories and Dependencies</i> Total	13	11	20	26	28
Alaska	—	1	2	4	5
Canal Zone	—	—	3	6	5
Hawaii	7	7	9	12	12
Puerto Rico	6	3	6	4	6
Total for United States	4,913	5,360	5,113	5,073	4,736

(Continued on page 64)

ADMINISTRATIVE OFFICERS

TABLE 6 — (Continued)
GEOGRAPHICAL CLASSIFICATION OF STUDENTS SINCE 1946

FOREIGN COUNTRIES	1946	1947	1948	1949	1950
Total	259	302	320	385	435
Afghanistan	—	—	—	1	—
Africa	—	1	—	—	—
Argentina	8	7	8	9	8
Australia	—	4	2	2	6
Austria	—	—	—	1	2
Bahamas	—	—	—	—	1
Belgian Congo	1	—	—	—	—
Belgium	—	1	1	4	5
Bolivia	—	—	1	2	2
Brazil	9	10	12	13	12
British Honduras	1	—	—	—	—
British West Indies	3	2	1	3	5
Burma	—	—	—	1	—
Canada	53	57	60	76	80
Canary Islands	—	—	—	—	1
Ceylon	—	—	—	1	—
Chile	2	1	1	1	—
China	24	30	22	21	18
Colombia	3	6	6	6	14
Costa Rica	1	—	—	—	—
Cuba	17	20	16	17	18
Cyprus	1	1	1	1	—
Czechoslovakia	—	2	2	1	1
Denmark	2	—	1	—	1
Dominican Republic	—	1	1	2	—
Ecuador	—	1	1	3	—
Egypt	1	3	6	6	4
England	7	8	13	12	9
Finland	—	2	2	2	4
France	5	14	10	15	12
French West Indies	1	1	1	—	—
French Indochina	—	—	—	1	—
Gold Coast	—	—	—	1	—
Greece	—	4	6	6	12
Guatemala	2	1	4	3	4
Honduras	1	2	2	—	—
Hong Kong	—	—	—	5	11
Hungary	—	2	—	—	1
Iceland	5	2	4	3	3
India	13	25	27	34	34
Iran	—	—	—	—	1
Iraq	4	5	3	5	6
Ireland	—	—	—	—	1
Israel	1	3	2	3	14
Italy	2	2	3	4	7
Japan	—	—	—	—	1
Kenya	—	—	—	—	1
Korea	—	—	1	1	2
Lebanon	2	—	—	2	1
Libya	1	—	—	—	—
Luxembourg	1	—	1	1	—
Malaya	—	—	1	2	2
Mexico	10	9	11	13	15
Morocco	—	1	—	1	—
Mozambique	—	—	—	1	2
Netherlands East Indies	—	3	3	2	—
Netherlands West Indies	—	1	1	2	2
Netherlands	2	1	2	1	3
Newfoundland	1	—	—	—	—
New Zealand	—	—	2	2	3

(Continued on page 65)

TABLE 6—(Continued)
GEOGRAPHICAL CLASSIFICATION OF STUDENTS SINCE 1946

FOREIGN COUNTRIES	1946	1947	1948	1949	1950
Nicaragua	—	—	1	2	3
Nigeria	—	—	—	—	1
Norway	22	26	33	31	25
Pakistan	—	—	—	1	3
Panama	5	2	2	—	—
Peru	10	9	5	3	5
Philippines	7	6	11	13	10
Poland	1	—	—	1	1
Portugal	1	2	2	5	4
Rhodesia	1	—	—	—	—
Salvador	2	2	2	—	—
Scotland	1	—	—	2	3
Singapore	—	1	—	1	3
South Africa	—	1	—	—	1
Spain	1	2	4	2	1
Sweden	2	4	3	3	6
Switzerland	2	4	2	3	2
Tanganyika	—	—	—	1	1
Thailand	—	—	—	3	4
Turkey	11	8	6	5	2
Union of South Africa	4	2	3	4	7
Uruguay	1	1	1	4	7
United States of Indonesia	—	—	—	—	3
Venezuela	4	—	3	7	15
Yugoslavia	—	—	1	1	—
Grand Total, United States and Foreign	5,172	5,662	5,433	5,458	5,171

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	37	10	1	6	54
Second Year	22	43	5	20	90
Third Year	1	22	40	43	106
Fourth Year	—	—	3	3	6
Graduate Year	—	—	76	400	476
Total	60	75	125	472	732

TABLE 8. WOMEN STUDENTS CLASSIFIED BY COURSES AND YEARS

Course	Year					Total
	I	2	3	4	G	
II Mechanical Engineering . . .	—	—	—	I	—	I
IV-A Architecture	4	3	I	—	—	8
Fifth Year	—	—	—	4	—	4
IV-B City Planning	—	—	—	I	I	2
V Chemistry	—	I	—	—	6	7
VI Electrical Engineering	—	—	I	—	—	I
VII Quantitative Biology	2	3	—	—	8	13
VIII Physics	I	3	2	—	7	13
IX-A General Science	—	—	I	—	—	I
IX-B General Engineering	—	—	—	2	—	2
X Chemical Engineering	2	—	I	—	—	3
XII Geology	—	I	—	—	I	2
XIV Economics and Engineering .	—	I	—	—	—	I
XV Business and Engineering Administration	I	—	—	—	—	I
XVI Aeronautical Engineering . .	—	—	—	—	2	2
XVIII Mathematics	I	I	2	—	6	10
XIX Meteorology	I	—	—	—	—	I
XX Food Technology	I	—	—	I	2	4
Total	13	13	8	9*	33	76

* This total includes fifth year in Architecture.

TABLE 9. OLD AND NEW STUDENTS

Year	1945-46	1946-47	1947-48	1948-49	1949-50	1950-51
Students registered at end of last academic year (including specials)	653	2,762	4,118	3,663	3,639	3,461
Students who have previously attended the Institute but were not registered at end of last academic year (including specials)	62	1,242	261	262	189	186
New students who entered by examination	313	460	530	501	433	510
New students who entered without examination	336	241	294	261	241	206
New students who entered from other colleges as candidates for degrees	136	406	396	645	877	732
New students (specials, not candidates for degrees)	38	61	63	101	79	76
Total	1,538	5,172	5,662	5,433	5,458	5,171

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

<i>College</i>	<i>College</i>	<i>College</i>
Aeronautical University . . . 2	Duke University 3	Massachusetts State Teachers College 1
Akron University 1	Duquesne University 3	Massachusetts, University of 11
Alabama Polytechnic Inst. . . 4	Eastern Nazarene College . . 1	Maryland, University of . . . 2
Alabama, University of 4	Emmanuel College 2	Maryville College 2
Alfred University 6	Emory University 2	Miami University (Ohio) . . . 11
Amherst College 10	Fenn College 1	Michigan State College 8
Antioch College 3	Fisk University 1	Michigan, University of 21
Arizona, University of 3	Florida, University of 4	Michigan Western State Teachers' College 1
Arkansas, University of 2	Fordham University 2	Middlebury College 3
Armour Institute of Tech. . . . 1	Franklin College 1	Minnesota, University of . . . 12
Baldwin-Wallace College 1	Franklin and Marshall Coll. . 2	Mississippi State College . . . 6
Ball State Teachers' College . . 1	General Motors Institute . . . 2	Missouri School of Mines and Metallurgy 6
Bard College 3	George Washington Univ. . . . 5	Missouri, University of 5
Bates College 1	Georgetown University 2	Montana School of Mines 2
Bennington College 2	Georgia School of Technology . 9	Montana State College 2
Bethany College 2	Georgia, University of 1	Mt. Holyoke College 1
Boston College 15	Gettysburg College 3	Nebraska, University of 7
Boston University 5	Good Counsel College 1	Nevada, University of 2
Bowdoin College 6	Goucher College 1	Newark Coll. of Engineering . . 2
Bridgewater College 1	Grinnell College 1	New Hampshire, Univ. of . . . 9
Brigham Young University . . . 4	Hamilton College 5	New Jersey State Teachers College 1
Brooklyn College 14	Hardin-Simmons University . . 1	New Mexico School of Mines . . 1
Brooklyn Polytechnic Inst. . . 6	Harvard University 41	New Mexico, University of . . . 1
Brown University 13	Haverford College 3	New York State College for Teachers 1
Bryn Mawr College 4	Hiram College 1	New York State Maritime College 4
Bucknell University 2	Hobart College 1	New York University 20
Buffalo, University of 1	Holy Cross, College of the . . . 4	North Carolina State College . . 5
California Inst. of Tech. . . . 15	Howard College 1	North Carolina, University of 1
California, University of at Berkeley 23	Howard University 2	North Dakota Agric. College . . 1
California, University of at Los Angeles 4	Idaho, University of 1	Northeastern University 18
Calvin College 1	Illinois Inst. of Technology . . 8	North Texas State Teachers College 2
Carleton College 1	Illinois, University of 15	Northwestern University 8
Carnegie Inst. of Technology . . 14	Indiana Technical College . . . 1	Notre Dame, University of . . . 7
Case Inst. of Technology 11	Institute of Paper Chemistry . 1	Norwich University 5
Catholic University of America 3	Iona College 1	Oberlin College 3
Chicago Technical College 1	Iowa State College 6	Occidental College 1
Chicago, University of 9	Jackson College 1	Ohio Northern University 1
Cincinnati, University of 5	Johns Hopkins University . . . 7	Ohio State University 6
Citadel, The 7	Juanita College 2	Ohio University 2
Clark University 3	Kansas State College of Agric. and Applied Science 4	Ohio Wesleyan University 4
Clemson College 2	Kansas, University of 7	Oklahoma Agric. and Mech. College 7
Coe College 2	Kent State University 1	Oklahoma, University of 4
Colgate University 1	Kentucky, University of 4	Oregon State College 6
College of City of New York . . . 33	Kenyon College 2	Pacific Union College 1
College of Wooster 4	Lafayette College 6	Pennsylvania State College . . . 11
Colorado School of Mines 2	Lawrence Inst. of Technology . . 1	Pennsylvania, University of . . . 13
Colorado, University of 6	Lehigh University 5	Pittsburgh, University of 4
Colorado, University of 6	Lincoln University 1	Pomona College 5
Columbia College 3	Louisiana Polytechnic Inst. . . 1	Pratt Institute 3
Columbia University (N. Y.) . . 18	Louisiana State University and Agric. and Mech. Coll. . . 9	Princeton University 16
Connecticut, University of . . . 2	Louisville, University of 1	Principia College 2
Cooper Union 6	Lowell Textile Institute 4	Purdue University 18
Cornell University 15	Macalester College 2	Queens College, N. Y. 4
Creighton University 1	Maine, University of 14	Radcliffe College 1
Dartmouth College 11	Manhattan College 1	Reed College 1
Davidson College 1	Marquette University 1	Rensselaer Polytechnic Inst. . . 23
Davis and Elkins College 1	Massachusetts Inst. of Tech. . 51	
Delaware, University of 5		
Denison University 1		
Denver, University of 3		
Detroit, University of 1		
DePauw University 3		
Dickinson College 1		
Drexel Inst. of Technology 1		

TABLE 10. LIST OF AMERICAN COLLEGES AND UNIVERSITIES
WITH NUMBER OF GRADUATES ATTENDING THE INSTITUTE (*Continued*)

<i>College</i>	<i>College</i>	<i>College</i>
Rhode Island School of Design 1	Temple University 3	Washington, University of . . 14
Rhode Island State College 3	Tennessee Polytechnic Inst. . 1	Washington-Jefferson College 3
Rice Institute 1	Tennessee, University of . . 1	Washington-Lee University . . 3
Ripon College 5	Texas Agric. and Mech. College 9	Washington University 5
Rochester, University of 4	Texas Technological College . 5	Wayne University 3
Rose Polytechnic Institute 3	Texas, University of 7	Webb Inst. of Naval Arch. . . 10
Rutgers University 1	Toledo, University of 3	Wellesley College 4
St. Bonaventure College 1	Trinity College 3	Western Maryland College . . 1
St. Francis Coll. (Brooklyn) . . . 1	Tri-State College 4	Wesleyan University 3
St. Joseph's College 1	Tufts College 20	West Virginia University . . . 6
St. Lawrence University 2	Tulane University of Louisiana 3	Whitman College 1
St. Louis University 2	Tulsa, University of 1	Municipal University of Wichita 1
St. Michael's College 1	Union College (N. Y.) 11	William and Mary College . . 14
San Diego State College 2	U.S. Airforce Inst. of Tech. . . 1	Williams College 6
Seattle University 3	U.S. Coast Guard Academy . . 19	Wisconsin, University of . . . 11
Shurtleff College 1	U.S. Merchant Marine Academy 5	Worcester Polytechnic Inst. . 13
Simmons College 1	U.S. Military Academy 25	Yale University 18
Smith College 2	U.S. Naval Academy 87	Yeshiva College 2
South Carolina, University of . . . 3	Utah State Agricultural Coll. . 3	Youngstown College 1
South Dakota School of Mines and Technology 3	Utah, University of 6	Total 1,877
South Dakota, University of . . . 1	Valparaiso University 1	Number of American Colleges Represented . . 252
Southern California, Univ. of . . . 2	Vanderbilt University 2	Number of Foreign Colleges Represented (not listed) . . 121
Southern Methodist Univ. 4	Vermont, University of 6	Total 373
Spring Hill College 1	Villanova College 1	
Stanford University 15	Virginia Military Institute . . . 4	
State College of Washington . . . 5	Virginia Polytechnic Inst. . . . 5	
Stevens Inst. of Technology . . . 5	Virginia, University of 5	
Susquehanna University 1		
Swarthmore College 9		
Syracuse University 7		

TABLE II
REGULAR STUDENTS FROM COLLEGES CLASSIFIED BY COURSES

COURSE	No Previous Degree			Graduates of Other Colleges						Graduates of M. I. T. Taking Graduate Work	
	Entered			Sept. 1950		Previous Years		Total	S. B. Degree 1950	Other Graduates	Total
	Sept. 1950	Pre-vious Years	Total	Sept. 1950		Previous Years					
				Under-grad.	Grad.	Under-grad.	Grad.				
Aeronautical Engineering XVI	11	31	42	5	30	—	26	61	12	6	18
Architecture IV-A	8	25	33	10	17	15	2	44	—	1	1
Biology VII, VII-A	2	4	6	—	13	1	11	25	5	3	8
Building Engineering and Construction XVII	8	15	23	2	4	3	5	14	1	1	2
Business and Engineering Administration XV	10	27	37	9	26	7	8	50	—	3	3
Chemical Engineering X, X-A, X-B	12	28	40	3	49	3	63	118	30	9	39
Chemistry V	5	9	14	1	41	—	92	134	4	10	14
City Planning IV-B	—	1	1	—	14	—	9	23	—	1	1
Civil Engineering I	23	27	50	3	25	3	18	49	4	3	7
Economics and Engineering XIV	—	6	6	—	19	2	22	43	4	7	11
Electrical Engineering VI, VI-A	43	78	121	12	67	12	117	208	63	22	85
Food Technology XX, XX-A	1	—	1	2	4	—	6	12	1	2	3
General Engineering IX-B	—	7	7	—	—	2	—	2	—	—	—
General Science IX-A	2	1	3	—	—	—	—	—	—	—	—
Geology XII	2	5	7	—	10	—	16	26	3	7	10
Mathematics XVIII	5	3	8	—	10	—	37	47	3	7	10
Mechanical Engineering II	34	67	101	7	34	10	39	90	19	18	37
Metallurgy III	5	12	17	1	31	2	58	92	7	10	17
Meteorology XIX	4	2	6	—	4	1	11	16	3	4	7
Naval Architecture and Marine Eng. XIII, XIII-C	5	14	19	4	5	2	68	87	1	3	4
Naval Construction and Engineering XIII-A	—	—	—	2	46	—	91	143	—	28	50
Physics VIII	15	24	39	—	—	4	—	—	22	—	—
Sanitary Engineering XI	—	—	—	—	8	—	10	18	3	1	4
Total	195	386	581	61	476	67	711	1,315	185	150	335

ADMINISTRATIVE OFFICERS

TABLE 12. NUMBER OF DEGREES AWARDED IN OCTOBER 1950, JANUARY 1951, AND JUNE 1951

Name of Course	S.B.			B.Arch. and B.C.P.			S.M.			M.Arch. and M.C.P.			Adv. Eng.			Ph.D.			Sc.D.			Total				
	Oct.	Jan.	June	Oct.	Jan.	June	Oct.	Jan.	June	Oct.	Jan.	June	Oct.	Jan.	June	Oct.	Jan.	June	Oct.	Jan.	June	Oct.	Jan.	June		
	Aeronautical Engineering	2	—	45	—	—	—	2	—	37	—	—	—	—	—	3	—	—	—	—	—	—	7	3	87	
Architecture	—	—	—	3	5	19	—	—	—	11	2	—	—	—	—	—	—	—	—	—	—	14	7	20		
Biology	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—		
Building Eng. and Constr.	—	—	32	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	—	—		
Business and Eng. Admin.	3	10	107	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	35		
Ceramics	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	131	
Chemical Engineering	7	2	81	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	111	
Chemical Engineering Practice	—	—	26	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	47	
Chemistry	5	2	20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	34	
City Planning	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4
Civil Engineering	3	1	51	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	9	
Economics and Engineering	1	2	21	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	68	
Electrical Engineering	29	15	113	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	22	
Food Technology	1	—	9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	169	
General Engineering	9	4	20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	9	
Geology	—	—	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20	
Industrial Economics	—	—	18	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	
Marine Engineering	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	26	
Marine Transportation	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7	
Mathematics	—	—	8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	
Mechanical Engineering	4	13	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	
Metalurgy	9	9	120	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	24	
Meteorology	3	1	38	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	158	
Naval Architecture	—	—	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	55	
Naval Arch. and Marine Eng.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	11	
Physics	—	—	14	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	
Physical Biology	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	47	
Sanitary Biology	4	4	44	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	
Sanitary Engineering	5	1	10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	14	
Textile Technology	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10	
Without Course Classification	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	9	
Total	89	55	802	6	5	21	125	82	245	12	5	8	2	53	28	19	43	18	19	39	287	187	1,211			

REGISTRAR

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

Class (Calendar Year)	Aeronautical Eng.	Architectural Eng.†	Architecture	Biology or Natural Hist. (Inc. VII-A)	Bldg. Eng. & Constr.	Business and Eng. Admin.	Chemical Eng.	Chemical Eng. X-B. Practical	Chemistry	Civil Engineering	Economics and Engineering	Electrical Eng. (Inc. VI-A)	Electrochemical Engineering*	Food Technology	General Eng.	General Science or General Course	Geology	Mathematics	Mechanical Eng. (Inc. II-A)	Metalurgy**	Meteorology	Military Eng.	Mining Eng. and Metallurgy	Naval Arch.	Physics	Sanitary Eng.	Total	Total by Decades
1896										9						1											14	
1897									1	2						2											5	6
1898									1	4						2											10	14
1899									2	8						2											17	5
1871									3	3						1											12	17
1872									7	10						2											26	12
1873									1	10						4											18	17
1874									1	10						7											28	26
1875									5	12						8											43	18
1876									3	12						6											32	28
1877									3	8						2											19	32
1878									3	6						2											23	19
1879									1	3						1											8	23
1880									6	3						2											28	8
1881									8	3						5											24	226
1882									3	2						1											19	28
1883									3	3						7											36	19
1884									12	5						6											28	36
1885									4	4						7											59	28
1886									7	9						23											59	59
1887									9	10						17											58	59
1888									10	11						25											77	58
1889									8	14						24											75	77
1890									13	28						28											103	75
1891									11	18						26											103	103
1892									7	22						26											133	103
1893									8	25						30											129	133
1894									11	21						31											138	129
1895									14	25						34											146	138
1896									17	26						48											191	146
1897									20	25						33											179	191
1898									25	32						33											199	179
1899									22	30						32											176	199
1900									19	32						23											185	176
									11	32						21											185	185
																34											1,579	1,579

(Continued on page 72)

* Prior to 1909 this Course was designated as Option 3 (Electrochemistry) of Course VIII.

† Prior to 1923 degrees were awarded in Architecture.

** Prior to 1938 included in Mining Engineering and Metallurgy.

ADMINISTRATIVE OFFICERS

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

Class	(Calendar Year)	Aeronautical Eng.	Architectural Eng.†	Architecture	Biology or Natural Hist. (Inc. VII-A)	Bldg. Eng. & Constr.	Business and Eng. Admn.	Chemical Eng.	Chemical Eng. Practice X-B	Chemistry	Civil Engineering	Economics and Engineering	Electrical Eng. (Inc. VI-A)	Electrochemical Engineering*	Food Technology	General Eng.	General Science or General Course	Geology	Mathematics	Mechanical Eng. (Inc. II-A)	Metallurgy**	Meteorology	Military Eng.	Mining Eng. and Metallurgy	Naval Arch. and Marine Eng.	Physics	Sanitary Eng.	Total	Total by Decades
1906	1			21	1			14		17	37		25	—			6	1		39					18	16	1	4	200
1907	5			18	5			9		14	24		35	—			3	3		46					14	14	3	7	192
1908	1			15	1			10		13	26		39	1			1	1		37					27	12	3	4	190
1909	3			24	3			7		15	34		34	8			5	1		45					32	17	5	2	232
1910	12			12	3			13		23	46		31	3			3	1		54					26	24	5	2	244
1911	22			22	2			10		21	47		37	3			—	—		69					38	19	4	5	278
1912	21			21	1			14		10	37		32	5			—	2		52					22	10	3	208	
1913	19			19	4			15		16	48		38	2			—	—		62					19	5	2	230	
1914	18			18	5			13		12	51		42	3			2	—		41					30	5	3	232	
1915	10			10	1			19		10	57		36	3			2	—		57					24	11	12	251	
1916	21			21	4			31		12	46		49	5			2	—		49					17	6	1	15	232
1917	26			26	2			30		12	58		52	3			—	—		47					21	3	2	14	261
1918	19			19	6			37		9	60		51	8			—	—		50					20	4	1	15	269
1919	30			30	3			32		23	49		42	10			4	—		65					17	8	1	19	304
1920	37			37	5			33		11	45		56	14			3	—		69					5	7	3	12	289
1921	27			27	10			43		13	49		45	10			2	—		84					5	9†	3	18	321
1922	28			28	7			40		10	45		50	11			5	2		63					14	9†	1	17	345
1923	16			16	9			28		8	45		50	6			4	1		75					10	4	3	5	324
1924	19			19	2			48		6	52		50	6			3	1		66					7	7	4	6	300
1925	11			11	3			70		9	98		30	9			4	—		55					13	12	2	2	318
1926	32			32	8			126		15	65		75	15			1	3		128					24	18	1	3	505
1927	13			13	6			115		13	69		109	25			2	8		56					27	16	8	7	637
1928	6			6	15			82		8	64		78	16			2	3		106					23	13	9	3	608
1929	15			15	6			94		57	57		125	17			4	2		82					19	11	3	1	557
1930	24			24	5			95		45	76		108	14			3	2		76					20	14	1	2	561
1931	9			9	2			89		39	6		121	8			2	4		72					1	9	4	3	514
1932	19			19	6			73		13	59		114	11			2	3		67					12	3	3	5	471
1933	25			25	26			69		37	11		84	10			1	2		64					11	5	4	6	483
1934	15			15	44			39		12	11		76	8			1	2		48					6	6	11	4	459

(Continued on page 73)

* Prior to 1909 this Course was designated as Option 3 (Electrochemistry) of Course VIII.

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

‡ Prior to 1923 degrees were awarded in Architecture.

** Prior to 1938 included in Mining Engineering and Metallurgy.

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

Class (Calendar Year)	Aeronautical Eng.	Architectural Eng.	Architecture	Biology or Natural Hist. (Inc. VII-A)	Bldg. Eng. & Constr.	Business and Eng. Adm.	Chemical Eng.	Chemical Eng. Practice X-B	Chemistry	Civil Engineering	Economics and Engineering	Electrical Eng. (Inc. VI-A)	Electrochemical Engineering	Food Technology	General Eng.	General Science or General Course	Geology	Mathematics	Mechanical Eng. (Inc. II-A)	Metallurgy**	Meteorology	Military Eng.	Mining Eng. and Metallurgy	Naval Arch. and Marine Eng.	Physics	Sanitary Eng.	Total	Total by Decades
1931	39	10	18	16	15	83	32	10	12	49	—	83	9	—	22	5	3	4	70	—	—	—	12	13	7	2	496	
1932	27	16	5	15	18	70	38	7	15	38	—	74	4	—	29	3	2	3	68	—	—	4	21	16	21	4	505	
1933	27	9	13	9	13	56	47	8	18	47	—	86	8	—	16	3	2	7	86	—	—	—	14	13	14	2	471	
1934	26	10	—	16	13	78	48	6	15	35	—	82	7	—	8	9	1	8	50	—	—	—	26	25	28	5	496	
1935	27	8	—	18	8	74	43	5	15	18	—	57	8	—	19	4	1	3	45	—	—	—	14	14	19	1	401	
1936	27	3	—	13	12	63	31	20	16	23	—	68	5	—	25	6	2	8	47	—	—	—	10	18	11	2	410	
1937	30	3	—	9	4	61	34	9	13	15	—	67	5	—	20	4	—	4	46	—	—	—	19	19	17	1	380	
1938	25	3	—	11	4	56	51	6	14	22	—	62	4	—	28	6	1	2	50	10	—	5	23	14	2	399		
1939	30	2	—	6	7	56	53	12	25	23	—	67	7	—	19	13	4	4	72	20	—	9	8	17	1	453		
1940	29	—	—	12	9	59	59	12	23	14	—	73	2	—	36	20	6	7	68	22	—	7	24	22	—	1	504	4,515
1941	36	—	—	6	7	59	54	8	28	22	—	79	—	—	23	5	8	6	90	29	—	—	18	23	—	—	501	
1942	39	—	—	17	3	61	60	8	34	16	—	66	—	—	20	11	5	4	98	34	—	—	29	25	1	—	531	
1943	38	—	—	10	5	49	49	14	21	14	—	83	—	—	18	11	2	6	80	24	—	—	33	14	1	—	472	
1944	57	—	—	4	3	28	41	20	12	18	—	47	—	—	14	4	1	2	78	8	—	—	37	20	2	—	396	
1945	22	—	—	1	1	22	36	—	5	9	—	45	—	—	6	1	—	5	70	3	—	—	13	16	—	—	255	
1946	84	—	—	—	5	33	59	—	9	13	—	91	—	—	12	2	1	4	93	7	—	—	29	12	—	—	249	
1947	84	—	—	4	9	154	114	—	23	45	—	189	—	—	6	3	—	7	170	20	—	—	30	35	—	—	479	
1948	94	—	—	13	29	225	163	—	35	31	10	262	—	—	3	8	1	12	186	16	—	—	12	60	—	—	933	
1949	51	—	—	3	23	157	72	12	28	49	16	176	—	—	12	33	7	3	114	17	—	—	16	40	—	—	1,173	
1950	51	—	—	16	29	121	92	33	37	55	35	180	—	—	13	39	6	11	185	36	—	—	17	61	—	—	859	
1951	45	—	—	11	32	117	83	26	22	52	23	128	—	—	9	24	6	13	133	38	—	—	22	48	—	—	1,047	6,626
Total	926	172	865	386	277	2,681	2,414	310	1,086	2,610	84	4,289	301	44	708	279	125	152	4,342	284	63	5	880	774	648	264	24,969	

** Prior to 1938 included in Mining Engineering and Metallurgy.
§ Includes only January and June degrees.

TABLE 14
DEGREES OF MASTER OF SCIENCE AWARDED

Class (Calendar Year)	Aeronautics | Engineering	Architecture	Biol. & P. H. (Inc. VII-A)	Bldg. & Eng. Constr. XVII	Business and Eng. Admin.	Ceramics	Chemical Engineering	Chem. Eng. Practice X A	Chemistry	Civil Engineering	Economics and Engineering or Natural Science	Electrical Eng. (Inc. VI-A)	Food Technology	Geology	Marine Engineering	Mathematics	Mech. Eng. (Inc. II-A)	Metallurgy	Meteorology	Naval Architecture	Naval Construction & Eng.	Petroleum Engineering	Physics	Sanitary Engineering	Without Course Classification	Total	
1886									1																	1	
1887									1																		1
1888																											
1889																											
1890																											
1891																											
1892																											
1893		1																									1
1894										1																	1
1895		1								1													1				3
1896		2								1																	3
1897		2					1																1				4
1898		1					2										1						1				5
1899		1	1						1														1				3
1900																											
1901		2															2										4
1902		3							3								2										8
1903		5														1								1			7
1904		4							1			2				1						3					12
1905		9														1						8		1			18
1906		3							1												2	3					9
1907		6					1														2	8					15
1908		1							1			3									7	7					12
1909		6					1		1	2		1		1							3	3		1			17
1910		6	1						1	2		1		1							7	7					19
1911		5	2						2	2		4				2					3						20
1912		4	2						3	3		2									4			2			20
1913		4	1				7		1	1		1		1		2					2						19
1914		3	2				3		5	3		2		1		1					2			3			25
1915		1	4				2		2	1		10				4					1	2					27
1916		5	7	1			1		3	5		6				4					2	2		1			35
1917		4	3				1		1	3		5				1					9		1	2			30
1918		5	1	1			1		1	1		2				2										1	15
1919		2							3	4		4				1	1										15
1920			1				3		2	4		7		3		1	5				19		1		4	50	
1921		3					29		6	2		4		2		10						20					17
1922		5					6	32	4	5		37		2	2	4						10					18
1923	10						3	34	1	5		45		2		15	1			4	21		3			26	
1924		4					6	41	1	5		34		1		8	1				12		5			28	
1925		5					1	3	35	3		35				10	2						2	1			21
1926		6					5	20	2	2		60		3		6	1				12						25
1927		9	1				2	26	4	6		54		6		1	13				6		1				32
1928		9					5	14	2	8		63				2	13				9		1				43
1929		5					2	3	21	4		79		4		2	16				6		2	1			45
1930		3					1	7	22	5		51		1		2	5	3			1		1	1			53

(Continued on page 75)

TABLE 14—Continued
DEGREES OF MASTER OF SCIENCE AWARDED

Class (Calendar Year)	Aeronautical Engineering	Architecture	Biol. & P. H. (Inc. VII-A)	Bldg. & Eng. Constr. XVII	Business and Eng. Admin.	Ceramics	Chemical Engineering	Chem. Eng. Practice X-A	Chemistry	Civil Engineering	Economics and Engineering or Natural Science	Electrical Eng. (Inc. VI-A)	Food Technology	Geology	Marine Engineering	Mathematics	Mech. Eng. (Inc. II-A)	Metallurgy	Meteorology	Naval Architecture	Naval Construction & Eng.†	Petroleum Engineering	Physics	Sanitary Engineering	Without Course Classification	Total	
1931	4	2			5	15	34	5	12			57		2		5	10	4	4		8		2		20	189	
1932	5	5			9	25	33	8	17			56		2		3	16	1	4		7		6		40	237	
1933	10	1			5	14	26	7	12			46				1	18	2		1	13		4	2	20	182	
1934	7	5			5	16	19	11	9			46		3		3	20	5	1		11		3	1	21	186	
1935	3	1			2	16	14	4	13			55				3	16	6			10		7	2	21	173	
1936	5				4	2	7	30	3	19		22		2		2	14			4	1	7	1	5		23	151
1937	12	1			5	1	12	29	8	17	7	35				1	15	4		1	8	1	2	1	23	186	
1938	13				8	11	28	1	29	2	58					1	24	1	4		7	1	3		30	221	
1939	8	3			8	20	34	1	31	3	45			2		1	21	6	6		8		5	2	28	232	
1940	9	1			9	16	37	3	20		54		4		5	22	7	8	18	10	2	3	2	37	267		
1941	16	1			12	15	42	3	10	3	35		3	1	2	25	7	18	14	22		4	1	25	259		
1942	9	2			16	1	12	23	2	5	1	24		2	15	1	24	8	11		9			1	7	173	
1943	21	1				15	36	3	9		30			2	7		26	5	14		18		2	1	4	194	
1944	22				1	1	3	7	2	9		13				12	5	11	1	55			3	5	150		
1945	9	3			1	12		3	5		25				2	11	7	6		23			2	3	9	121	
1946	47	1			4	29	2	5	24		45		2		5	47	4	5	3	46		2	4	9	284		
1947	67	5			18	65	32	12	47	1	63	5	5	3	9	64	13	8	4			10	13	12	456		
1948	40	4	9	19	1	31	39	13	30	5	92			4	5	63	11	12		33			5	9	13	438	
1949	44	6	5	29		36	41	7	26	3	109	5	1	2	10	58	15	8	3			11	9	19	447		
1950	32	2	7	22		57	19	3	29	3	110	2	2		11	58	17	6	3			14	9	20	426		
*1951	39	3	3	24	1	36	27	6	15	2	72		4	3	9	36	14	6	3			7	8	9	327		
Total	498	84	60	24	210	7	555	797	177	473	30	1,604	12	63	35	90	731	150	140	59	478	5	120	84	708	7,194	
Total of degrees in discontinued courses, Architectural Engineering, Electrochemical Engineering, Fuel and Gas Engineering, General Science, Mining Engineering, Naval Construction (Foreign Students), and Railroad Operation (see 1940-41 Report)																								126			
Grand Total																								7,320			

*Includes only January and June degrees.
† Beginning 1949 see Naval Engineer, Table 17.

TABLE 15

DEGREES AWARDED IN ARCHITECTURE AND CITY PLANNING

Class (Calendar Year)	Bachelor in Architecture	†Bachelor in City Planning	Master in Architecture	Master in City Planning
1921	—	—	3	—
1922	—	—	2	—
1923	—	—	7	—
1924	—	—	8	—
1925	—	—	5	—
1926	—	—	9	—
1927	—	—	7	—
1928	—	—	6	—
1929	—	—	9	—
1930	—	—	7	—
1931	—	—	9	—
1932	11	—	5	—
1933	24	—	7	—
1934	27	—	—	—
1935	17	4	11	—
1936	14	4	4	2
1937	9	2	11	3
1938	19	1	3	3
1939	14	1	10	3
1940	11	2	21	7
1941	17	2	6	1
1942	15	1	4	4
1943	10	—	3	6
1944	8	—	2	3
1945	5	—	—	7
1946	7	—	2	8
1947	9	1	20	15
1948	11	3	14	13
1949	24	2	10	12
1950	20	4	17	13
*1951	24	2	3	10
Total	296	29	225	110

* Includes only January 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		Total
	Prior to 1948	1948*	
1923	—	2	2
1926	—	1	1
1927	—	2	2
1929	—	1	1
1930	—	5	5
1931	—	4	4
1933	—	7	7
1934	—	4	4
1935	—	4	4
1937	—	6	6
1938	—	2	2
1939	—	6	6
1940	—	6	6
1941	3	6	9
1942	11	1	12
1943	10	10	20
1944	7	5	12
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 ADVANCED ENGINEERING AWARDED

Class (Calendar Year)	Aeronautical Engineer	Chemical Engineer	Electrical Engineer	Mechanical Engineer	Metallurgical Engineer	Meteorologist	Naval Architect	Naval Engineer	Total
1949	—	—	2	—	—	1	—	37	40
1950	2	—	10	8	2	—	—	27	49
*1951	3	1	6	10	1	—	1	33	55
Total	5	1	18	18	3	1	1	97	144

* Includes only January and June degrees.

TABLE 18
DEGREES OF DOCTOR OF PHILOSOPHY AWARDED

Class (Calendar Year)	Biology	Chemistry	Electrical Engineering	Food Technology	Geology	Industrial Economics	Mathe- matics	Physics	Group Psychol- ogy	Total
1907	—	3	—	—	—	—	—	—	—	3
1908	—	3	—	—	—	—	—	—	—	3
1909	—	—	—	—	—	—	—	—	—	—
1910	—	1	—	—	1	—	—	—	—	2
1911	1	—	—	—	—	—	—	—	—	1
1912	—	3	—	—	3	—	—	—	—	6
1913	—	1	—	—	—	—	—	—	—	1
1914	—	2	—	—	—	—	—	—	—	2
1915	—	2	—	—	—	—	—	—	—	2
1916	—	1	—	—	1	—	—	1	—	3
1917	—	3	—	—	1	—	—	—	—	4
1918	—	3	—	—	1	—	—	—	—	4
1919	—	—	—	—	—	—	—	1	—	1
1920	—	4	—	—	1	—	—	—	—	5
1921	1	3	—	—	—	—	—	3	—	7
1922	—	4	—	—	1	—	—	—	—	5
1923	—	5	—	—	1	—	—	—	—	6
1924	2	10	—	—	—	—	—	2	—	14
1925	—	11	—	—	—	—	—	—	—	11
1926	—	2	—	—	2	—	—	—	—	4
1927	2	6	—	—	1	—	1	1	—	11
1928	1	5	—	—	1	—	1	—	—	8
1929	4	8	—	—	2	—	1	—	—	15
1930	—	5	—	—	2	—	3	—	—	10
1931	—	9	—	—	—	—	1	—	—	10
1932	1	12	—	—	—	—	1	2	—	16
1933	2	10	—	—	3	—	3	—	—	18
1934	2	10	—	—	2	—	2	1	—	17
1935	4	15	—	—	2	—	3	7	—	31
1936	—	15	—	—	—	—	3	12	—	30
1937	2	11	—	—	4	—	1	10	—	28
1938	2	12	—	—	2	—	4	7	—	27
1939	1	33	—	—	4	—	3	4	—	45
1940	3	19	—	—	5	—	4	5	—	36
1941	1	18	—	—	1	—	3	5	—	28
1942	1	19	—	—	5	—	1	8	—	34
1943	2	8	—	—	2	—	3	8	—	23
1944	2	12	—	—	—	1	—	9	—	24
1945	1	6	—	—	—	—	1	1	—	9
1946	2	5	—	1	—	4	4	1	—	17
1947	3	14	1	1	—	3	4	17	—	43
1948	3	27	—	—	5	1	8	34	5	83
1949	2	40	—	2	4	3	5	36	3	95
1950	4	31	—	—	3	7	6	40	—	91

(Continued on page 80)

ADMINISTRATIVE OFFICERS

TABLE 18—(Continued)
DEGREES OF DOCTOR OF PHILOSOPHY AWARDED

Class (Calendar Year)	Biology	Chemistry	Electrical Engineering	Food Technology	Geology	Industrial Economics	Mathe- matics	Physics	Group Psychol- ogy	Total
*1951	2	21	—	—	8	7	4	20	—	62
Total	51	432	1	4	68	26	70	235	8	895

* Includes only January and June degrees.

TABLE 19. DEGREES OF DOCTOR OF SCIENCE AWARDED

Class (Calendar Year)	Aero. Eng.	Ceramics	Chem. Eng.	Chemistry	Civil Eng.	Elec. Eng.	Electrochem. Eng.	Food Technology	Geology	Mathematics	Mech. Eng.	Metalurgy	Meteorology	Min. Eng.	Naval Arch.	Petroleum Eng.	Physics	San. Eng.	Total
1911						1													1
1912																			
1913																			
1914						1													1
1915						1													1
1916	1					1													1
1917						1													1
1918																			
1919									1										
1920	1													1					3
1921																			
1922	1			1		1													3
1923	1							1									2		5
1924			2			1		1									1		6
1925	1		3									3							7
1926			1	1		1	1			1	1	2							8
1927						1											1		6
1928	1		5		1	2									1				10
1929			3			6				1	3	1							10
1930			9												1				20
1931			3	2		3													9
1932			5		1	2					2	1					2		14
1933			10			3				1		6		1					24
1934			3	1		2	1				3	1							14
1935	2	1	2			4				2	2							1	24
1936	1	1	12			1										1			14
1937	1		9	1		6					2					1			24
1938		1	12			7													23
1939		1	10			1		1			2								38
1940	2	2	12		3	1					2	4	3						26
1941	1	1	15		3	3				3	3	8	3					1	29
1942	1	2	14		2					1	1	5	1					1	41
1943		2	10			1						5	1						26
1944	2		4			1			2		1	4							20
1945		1	7		2	1					1	3	1						15
1946	1		11		3	4					2	11	2						23
1947	2	1	10		2			2											17
1948	3	1	10		3	3					4	9	9						46
1949	2	5	21		6	8					7	15	4						71
1950	6	3	12	1	5	13		1			14	11	4					2	70

(Continued on page 82)

TABLE 19. DEGREES OF DOCTOR OF SCIENCE AWARDED—(Continued)

Class (Cal- endar Year)	Aero. Eng.	Ceramics	Chem. Eng.	Chem- istry	Civil Eng.	Elec. Eng.	Electro- chem. Eng.	Food Tech- nology	Geology	Mathe- matics	Mech. Eng.	Metal- lurgy	Meteor- ology	Min. Eng.	Naval Arch.	Petro- leum Eng.	Physics	San. Eng.	Total
*1951	3	2	9	—	5	8	—	—	—	—	10	14	2	—	1	—	2	2	58
Total	32	25	224	11	42	87	2	3	12	5	62	123	33	5	2	1	39	7	715

* Includes only January and June degrees.

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

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

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

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

TABLE 22
SUMMARY OF DEGREES AWARDED (1868-1950)

Bachelor of Science	24,969
Bachelor in Architecture	296
Bachelor in City Planning	29
Master of Science	7,320
Master in Architecture	225
Master in City Planning	110
Master in Public Health (Discontinued after 1944)	103
Advanced Engineering	144
Doctor of Philosophy	895
Doctor of Science	715
Doctor of Public Health (Discontinued after 1944)	9
Doctor of Engineering (Discontinued after 1918)	4
Grand Total	34,819

J. C. MacKINNON.

DIRECTOR OF ADMISSIONS

This report, following the precedent of other years, covers the twelve-month period ending with the opening of the new academic year in September, 1951, which date marks the natural termination of the Admissions Office year.

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

*First Year Classes**

	<i>September 1950</i>	<i>September 1951</i>
Total Applications.....	2,527	2,413
Admissions Granted.....	1,204	1,214
Actual Registration.....	780	735
Registration as Per Cent of Admissions.....	64.8	60.5
Number of Secondary Schools Represented...	492	478

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

College Transfers

	<i>September 1950</i>	<i>September 1951</i>
Total Applications.....	940	663
Preliminary Applications Not Followed Up..	308	205
Admissions Granted.....	322	215
Actual Registration.....	248	179
Combined Plan of Study.....	53	43
Registration as Per Cent of Admissions.....	77.0	83.5

The quality of applicants showed a perceptible improvement over last year, which enabled us to accept a freshman class of comparable size despite a moderate decrease in the number of applications. This would seem to indicate that our extended program of school visits, now entering its third year, is having some effect. In 1950-1951, a total of 396 secondary schools and four of the Combined Plan colleges were visited in person. These visits were made by five members of the Admissions Office staff and by Mr. Robert A. Plachta, who spent three weeks on the road on loan from the Department of Electrical Engineering. Eight of these visits were scheduled for the dates on which college conferences were held at the schools. An additional 33 invitations were received for college conferences which could not be included without disrupting

our systematic school visiting program. Several such conferences were, however, covered by Honorary Secretaries in their own areas. As in previous years, our program of school visits is directed primarily at the long-range objective of increasing our acquaintance in, and improving our relations with, secondary schools, rather than merely at the short-run objective of recruiting freshmen for the following September, although the latter purpose has also been served.

The Admissions Office has continued the large scale distribution of promotional literature with the aid of stencil lists aggregating over 16,000 names of key people in schools and youth agencies. These lists have all been verified during the past year. Distribution has also been made through the science teachers' packets of the National Science Teachers' Association, both in the original mailing of packets and as a result of requests for additional copies sent in by teachers. These lists are in process of constant revision, and additions are made from many sources. The following schedule gives the present composition by principal categories:

Mathematics teachers	2,100
High school guidance officers	5,255
Science and Mathematics teachers	275
Science teachers	1,544
National Vocational Guidance Association	916
YMCA and Hi-Y lists	1,749
English teachers	130
Basic school list	<u>4,634</u>
	16,503

For a number of years, systematic reports have been sent to Honorary Secretaries on the status of applicants whom they have interviewed. One set of reports goes out about September 1, and gives the status with respect to admission. A second report, on those who actually entered, is sent following the end of the first term of the freshman year, and gives the term marks, as well as a brief personal comment from the Dean of Freshmen. Beginning last year, similar reports are being sent to each school from which we have drawn students. Reports of this kind are much appreciated by both alumni and schools. The use of mechanized records will greatly facilitate tasks of this kind, which impose a formidable clerical burden when performed by hand.

As in previous years, the members of the Committee on Admissions have participated in the reviewing of individual applications. This provides assistance in a time-consuming job and brings the committee into some direct contact with the work of the office; the latter is an important consideration for this committee, whose task is primarily one of policy-making.

The office continues to make systematic use of the statistical predictions worked out over the past few years by Professor George P. Wadsworth and Dr. Joseph G. Bryan, which have proved extremely valuable. This work is now entering a new phase with the construction of a "mathematical model" which is now in process of verification against data for the last two entering classes. Hitherto, the approach has been a more conventional, statistical one with the assumption of linearity in all functions. The new approach using a model involves the determination of a series of functions by a process of logical analysis, and the evaluation of parameters from the data. The use of a product function permits a cut-off point to be established for each component. It is hoped that the accuracy of prediction can be significantly improved by this means.

Significant experimental studies are being made by Dr. John V. Gilmore, clinical psychologist of the Medical Department, on non-intellectual factors which have a bearing on college success. The Admissions Office is co-operating in this work which has attracted a great deal of interest on the part of the Educational Testing Service and its affiliate, the College Entrance Examination Board. There is reason to believe that college admission procedures have reached the stage of diminishing returns in the refinement of purely academic and intellectual criteria for admission. A large proportion of academic failures are traceable to emotional or motivational factors rather than to lack of intellectual ability, and techniques of projective psychological testing and diagnosis give promise of shedding much light on these problems. A large scale experimental run to validate a series of such tests is scheduled for this fall at M. I. T. and Wellesley College in a joint project under Dr. Gilmore's direction, for the support of which the College Entrance Examination Board is being asked to make a grant. All freshmen at each institution will be diagnosed by psycho-

logical means, and the results compared with actual performance during the ensuing academic year. This development continues the policy initiated several years ago of bringing to bear on our admissions problems, through co-operative effort, the best thought available in related fields such as mathematical statistics, psychology, and psychiatry.

The Office has likewise collaborated in plans for a large-scale alumni body to be known as the Alumni Educational Council, to supplement and augment the work long carried on by the Honorary Secretaries. A more aggressive admissions policy, aimed at securing a higher caliber of applicants, needs widespread co-operation from alumni in many centers. A proposed plan of organization has been presented to the Alumni Council, the Honorary Secretaries, and the officers of alumni clubs. The establishment of this organization will be a major Institute effort under the direction of the Secretary of the Institute, Professor Walter H. Gale. Mr. Arthur L. Bryant, Assistant Director of Admissions, will devote his time to the organizational field work under the direction of Professor Gale beginning in October, 1951.

Because of this change and the resignation of Mr. Franklin R. Kellogg, two new members have been added to the staff of the Admissions Office: Mr. Richard W. Willard, who was graduated from the course in Mathematics in 1951, and Mr. Bruce F. Kingsbury, a 1944 graduate in General Science, who came to us following industrial experience and two years of science teaching at Milton Academy. Both will be active in our school visiting program.

B. ALDEN THRESHER

DIRECTOR OF LIBRARIES

The fiscal year 1950-1951 provided a highly useful yardstick for the measurement of the over-all effectiveness of the M. I. T. Library system. Occupancy of the Charles Hayden Memorial Library last year, with the advent of extraordinary new library facilities, tended to overshadow other necessary basic changes and improvements all along the line. The year, in fact, resembled a shakedown cruise for a new ship. Equip-

ment, procedures, and personnel mechanisms were tested under full operating pressure. The results have been interesting. Without question the year has been the best and most productive in the history of the library.

From all sources there were officially added to the library 15,623 volumes during the year. Under analysis this total shows a slight increase in purchase, a decrease of about one-third in gifts received direct from publishers and authors, an increase of about 17 per cent through binding, an increase of 9 theses, and 10 per cent in serials. To arrive at a net total, discards amounting to 3 per cent were deducted. As of June 30, the official total of volumes held in the Institute Library is 465,639. Interestingly enough, though we purchased only a few more books than last year, price increases in the book market are strongly reflected in current expenditures for books, periodicals, and bindery. Quite probably the increased cost of books has adversely affected our receipt of gifts.

Diligent work by the Catalogue Department added 7,916 new titles in 21 foreign languages, not including editions or added numbers in a series. Volumes were recatalogued and a total of 49,056 catalogue cards were typewritten or otherwise reproduced. Near the end of the year, a series of experiments in the use of lithographic equipment to reproduce catalogue cards culminated in a procedural change which is expected to increase the flow and quality of catalogue cards while decreasing labor costs incident to their production. All new titles except those received in the closing weeks of the fiscal year are ready for use, and the balance will be completed during the summer.

It is about as easy to measure the use of a library accurately as it is to refine uranium ore; that is to say that the results can be had at a cost that under ordinary circumstances is prohibitive. The most satisfactory compromise, the circulation statistics, is still useful. Our one- and two-week circulation reached a new high of 130,000, and overnight circulation added 81,500. Room use, though possibly the most important of all, must be arbitrarily excluded, for we have no adequate method of ascertaining the facts. The following tabulation shows one- and two-week circulation arranged by major library subdivision.

1. Central	29,605
2. English & History	28,300
3. Eastman	14,312
4. Dewey	13,767
5. Rotch	9,750
6. Eng. & Naval Arch.	9,133
7. Vail	8,426
8. Lindgren	5,995
9. Biology	4,904
10. Aeronautics	4,192
11. Music (books)	1,641
Total	130,025

Percentage-wise, faculty and staff use accounted for 23.2; graduate students, 24.7; undergraduate students, 32.1; alumni, 1.3; D.I.C., 5.0; employees, 3.2; and a miscellany of other categories, 10.5.

Users of the library obtain much information for themselves either from books on the open shelves or through the Circulation Desk and card catalogue; difficult, advanced, or non-routine inquiries usually find their way to the Reference Desk, for it is the function of the Reference Department, among other things, to assist the users of the library to solve special problems. Considerable judgment is often required to distinguish between a staff member in need of immediate specialized assistance and a student who is trying a short cut from the paths of normal study. The former must be assisted in every way while the latter must be carefully instructed in methodology, shown the sources, and urged to work out his own salvation. Reference questions are received in three ways: in person at the Reference Desk (of these more than 2,500), by correspondence (6,350 letters), and by telephone (7,200 calls). Requests for material not in the M. I. T. Libraries totaled 800 items, of which only 95 could not be obtained. Origin of the requests were: staff and faculty 63 per cent, research associates 23 per cent, graduate and undergraduate students 12 per cent, D.I.C. 2 per cent. Materials sent on inter-library loan reached the all time high of 5,075 items, an increase of 1,728 items over the past year. The inter-library loan situation is becoming critical. The Faculty Committee on the Library rightly feels that the place for M. I. T.'s books is on the M. I. T. campus, yet if we expect to borrow we must loan. Restrictions are now

in effect on categories of material which may not be sent on inter-library loan, and two further alternatives are under serious consideration. The first is a fee sufficient to cover the full cost of inter-library loan service to be paid by the borrower, and the second, substitution of micro-duplication. The use of microfilm greatly increased during the year; the largest category, material in the M. I. T. Library microfilmed for others, multiplied by a factor of six in dollar value. The increasing prevalence of outside telephonic requests for reference information has become a matter of concern. Other facets of reference activity will appear in the course of this report.

Aeronautics Library. Last year a room was added to the Aeronautics Library, and this year the physical facilities were augmented by the transfer of needed stack equipment available as a result of the several moves. The entire library was rearranged to place the reference collection of bound aeronautical periodicals and several thousand technical reports in the new stack and to provide additional tables and seating. Through the generosity of the Department, an asphalt tile floor was laid. Circulation decreased slightly, a matter of some 2 per cent, although it is still well above the total for 1948-1949. A greater emphasis on the use of aeronautics books at the expense of periodicals and reports was noted during the year.

Biology-Food Technology Library. The youngest branch library of the system experienced fewer growing pains this year than formerly, and it would appear that many of the problems connected with its original establishment have been partially or completely solved. With the availability of additional space for stack and readers in the dome of Building 10, the collections could be reorganized and rearranged. It is not surprising, therefore, to note a growing use of all types of library material. A periodical catalogue for current holdings has been completed, and the main card catalogue advanced. Substantial additions were made to the collections of books and periodicals. As the Dorrance Laboratory continues to take shape, the prospect of a new home for the Biology branch library dominates much library thinking and planning.

Dewey Library. The Dewey Library, which includes the Industrial Relations collection, shared the popularity of a new

library, although recorded circulation figures were slightly below those reported for the preceding year. The great increase of open shelf material no doubt contributed to the apparent decline of circulation, for the library was much used and greatly enjoyed. The collections were increased by 1,440 volumes not including duplicates, bound periodicals, and similar material. If the educational structure of the Institute had continued on the same basis, the Dewey Library would be considered in excellent condition. The generous gift of the Alfred P. Sloan Foundation, Inc. establishing a new School of Industrial Management, the acquisition of the former Lever Building and remodeling to house the fifth school and its library alter the prospects for the future. Plans to house the Dewey Library in the Sloan Building were well advanced at the end of the year, and presumably Dewey will be but a transient guest in the Charles Hayden Memorial Library building.

Eastman Library. The Institute world with a generous seasoning of alumni, outside industrial users, visitors (many from foreign countries) has beaten a well-marked path to the door of the Eastman Library. Congestion mentioned in previous reports has in no way diminished, and facilities, particularly reader space, remain the same. Established initially as a graduate library primarily intended for the use of the Departments of Chemistry, Mathematics, and Physics, Eastman has become in essence a science reference library with outside demands increasing almost on a geometric ratio. The serious problem of uncontrolled out-of-hours access to the library has apparently been solved by co-operative action of the Faculty Committee on the Library, the three Departments, and the Dean of Science. Indicative of changing emphasis in use is the fact that in 1934, when 667 users were registered, more than half were from the Departments of Chemistry, Mathematics, and Physics. This year, of the 2,583 registered users, less than one-third were from these three Departments. Eastman needs and must have more space. Coincidentally, its schedule of open hours should be increased. Heavy use and crowded conditions cause difficulty in maintaining the collections. Despite these handicaps, efforts were made with partial success at least to improve the holdings and the condition of the collections.

Engineering and Naval Architecture Library. The removal of Dewey to Hayden from quarters shared with the Engineering and Naval Architecture Library left almost an embarrassment of space. From a status of extreme congestion, ample stack and reading areas became immediately available. As decompression of the collections proceeded, several deficiencies were found — among them the absence of customary and expensive general reference tools that had been a part of the Dewey Library. The most used items were supplied by the end of the year as the library settled into virtually new quarters. Use increased by a factor of about 2 per cent, and the intensified library interest observed elsewhere in the system by outside laboratories, government offices, manufacturing concerns, and sponsored research projects was particularly noteworthy. An inventory of the collections revealed a surprising number of missing books which are being sought in all likely and some unlikely locations. Many will doubtless have to be replaced by purchase. Physically, the library despite efforts made during the year is not in first-class condition. Building changes and alterations deserve immediate attention.

English and History Library. A busy library with a high percentage of reserved books and overnight circulation, even in a new and greatly extended location, presents an interesting picture. As a part of the humanities, general education, and recreational reading facilities, the English and History Library manifested unusual activity. The curve of demand is steadily mounting and no leveling off is yet perceptible. Details of operation are being studied in an attempt to evolve a more satisfactory organization. As with the Dewey Library, inauguration of the School of Industrial Management may profoundly change the character of the English and History Library; it may disappear as an entity and become a segment of an entirely new branch library. Recreational reading at M. I. T. has always offered particular problems which we have not yet fully solved. The Tubby Rogers collection as a contribution to recreational reading and general education is taking shape but of itself will not be the final answer.

Lindgren Library. The shopworn appearance of the Lindgren Library mentioned last year has been completely eliminated by renovation and relighting. It is a tribute to the

Office of Buildings and Power that the entire project took only two weeks in the middle of the term with no serious loss of service. The librarian, installed in a borrowed office across the hall, carried on with a bookcase full of reference books and reserve material. Circulation decreased approximately 10 per cent, yet the library remained as busy as ever with room use under the improved conditions apparently taking the place of withdrawal. The library remains crowded, and it is difficult to see how much additional material can be added; even the topmost shelves are now full. Certain general maps were withdrawn from the Theodore Schwarz Map Room for transfer to the Boston Stein Club Map Room in the Charles Hayden Memorial Library, but space for the library to meet its requirements is essential.

Rotch Library. With deep regret the resignation on March 15 of the Rotch Librarian, Miss Margaret H. Beale, to become head of the Fine Arts Department of the Detroit Public Library must be reported. We are fortunate in securing as her successor Miss Caroline Shillaber, who came to us from the Library of the Departments of Landscape Architecture and Regional Planning at Harvard. The administrative change came in the midst of organizational readjustments in the collections which will continue through the coming year. Recataloguing, regrouping, and a careful analysis of holdings is a large forward step in the improvement of the library. Substantial additions to the collections in pertinent fields were paralleled by increased circulation and use.

Vail Library. The Vail Library, the largest of the Institute branch libraries, comprises two distinct types of material. It is at once an active working library for electrical engineering and related fields and an historical library based on the Theodore N. Vail collections. With the move of the Central Library to Hayden, Vail inherited, along with Biology and Food Technology, the large domed reading room and a sufficiency of adjacent stacks. The space has not been remodeled, not from a lack of interest or desire but from a failure of planning and budget to coincide. Departmental needs and plans generally must be reflected in the ultimate entity of Vail. The question of splitting the library by divorcing current day to day and the historical collections, as opposed to the continuation of Vail

under its present concept was finally resolved in favor of the latter. Despite difficulties and uncertainties, the use of the Vail continued on a scale fully comparable with previous years. Some 4,000 items were added while circulation continued at par. Reorganization of the collections is proceeding slowly. The specialized reference facilities are presently inadequate. Lack of personnel constitutes a problem despite effective student assistance. The nation-wide shortage of adequately trained professional librarians for the fields of science and engineering is a real and critical factor.

Music Library. Visitors are frequently amazed to find at M. I. T. a Music Library that in concept and reality is unexcelled in any educational institution in this country. It is a tangible demonstration of the interdependence of science and the humanities, and its contributions to student body, faculty and staff could only be described in extravagant terms. A studio type turntable, amplifier, and high fidelity speaker were installed this year, and the results have been extremely gratifying. Music for enjoyment and recreation is played every day from eleven until five, and the room has become a Mecca. It will be possible next year to extend the range of listeners through the facilities of radio station WMIT from three until five each day. The large music room and the individual listening rooms were well filled at all times including an experimental schedule of Saturday and Sunday hours. The use pattern manifested some interesting changes. Whereas during the past year course work and recreational listening occupied an equal position, this year recreational listening increased to a ratio of three to one. Special concerts of "live music" were enjoyed to the extreme capacity of the area. The Lauletaan Society, a student group with membership drawn not only from M. I. T. but from Harvard, Radcliffe, Boston University, and other adjacent colleges met in the Music Library at approximately monthly intervals under the sponsorship of Professor Theodore Wood, Jr., for evenings of folk music. Record circulation (within the Music Library) increased approximately 150 per cent over the preceding year to achieve the amazing total of 35,492; a parallel increase for books and scores totaled 50 per cent. It would be hard to find a single library facility that has been more intensively used and enjoyed during the year.

Boston Stein Club Map Room. On October 24, 1950, members of the Boston Stein Club and their wives attended a preview of the Boston Stein Club Map Room which was opened for general use on November 1. This Map Room is an exceptionally fine addition to the library. It contains, among other things, the complete depository set of Army Map Service Maps, general U. S. Hydrographic Office charts, Geodetic Survey maps, and other topographic maps, road maps, atlases, and other cartographic material. A number of interesting historical globes from the collection of Mr. Harry H. Young, '91, were added during the year. The Map Library has also been used for exhibits and seminars and in connection with meetings. A brief guide to the Map Library prepared by Miss Eleanor Bartlett, Special Collections Librarian, has been completed and given limited distribution. The use of the Map Library has fully justified the effort that attended its organization and installation.

Two other new areas, the Library Lounge and the Projection Room, have been in continuous demand for meetings of all types including national and international associations, faculty, and other groups, informal teas, formal Institute luncheons, and a great variety of other occasions. The Projection Room has served to augment classroom instruction and on occasion for small meetings, previews, and similar purposes. The use has been so great that it has become necessary to schedule these areas well in advance through a booking system in the Office of the Director of Libraries.

The two principal library committees are the Visiting Committee and the Faculty Committee on the Library. Midway during the year the Visiting Committee held a one-day meeting in the library. After touring Central and the branch libraries, the Committee reviewed the changes in organization brought about by the several moves. Opening hours, staff salaries, and operational matters received brief attention, but emphasis was placed on long-term considerations including theses, preprints, the micro techniques, sponsored research, document rooms, and the program of the Friends of the M. I. T. Library. The important fact that M. I. T.'s library problems are not completely solved for all time recurred frequently in the course of the discussion.

Under the chairmanship of Professor Ernest H. Huntress, the Executive Board of the Faculty Committee on the Library held regularly scheduled meetings at approximately monthly intervals during the fall and spring terms. Invaluable assistance was rendered by the Committee, and most important of all, near the end of the year the appointment by President Killian of Dr. Keyes D. Metcalf, Director of Libraries, Harvard University, to survey the M. I. T. Library system for the Faculty Committee on the Library was announced. Dr. Metcalf will begin the survey during the summer and complete it by early fall in time to be most useful in planning the direction that the Institute's library effort should take.

Beginning with a meeting in New York on September 20 of the Executive Board of the Friends of the M. I. T. Library, an intensified and rewarding program was inaugurated for the year. Announcement of the acquisition of several original manuscripts of recent books by Technology authors was made, and progress toward the provision of adequate air-conditioned housing in the Charles Hayden Memorial Library for these and rare books was reported. There have been notable additions to the cartographic holdings including an early Hakluyt and a series of terrestrial globes. A prize essay contest was held in conjunction with an exhibit of recreational reading books from the Peter Pauper Press presented by Peter and Edna Beilenson. The interest and participation by the Friends in the production of the M. I. T. Library Annuals continued. The chairman of the Friends, Mr. Ralph Walker, and the Director of Libraries met in Boston with members of the Club of Odd Volumes in March to debate the merits of libraries and edifices to house them. The result, a booklet, "Books in Libraries — Architect versus Librarian, Two Rounds to a Decision," will be ready for distribution in the early fall.

Any discussion of the Friends of the Library brings up the matter of gifts to the library, or perhaps it should be the other way about. At any rate, organizations and individuals through gifts of books and collections continued to enrich the library. It is a perennial regret that limited space in this report does not allow opportunity to list all gifts received. Illustrative of categories in which gifts customarily fall are the receipt from the Atomic Energy Commission of a depository file of non-

classified reports; the gift by Mr. John R. Macomber of *The Book of Kells*, termed one of the finest examples of modern facsimile reproduction; the entire professional library of our late colleague, Professor John R. Loofbourow, presented by his son, John W. Loofbourow; the gift by Mr. Buckminster Fuller of manuscripts, personal papers, clippings, drawings and his Chronofile. Access to this extensive personal collection will be restricted by the terms of gift. Miss Helen F. Tucker, '33, established a fund in the amount of \$500 in memory of her father, the late Charles W. Tucker, '96. Additions to the previous gifts from the libraries of Professor Samuel C. Prescott (Emeritus) and Professor B. Alden Thresher were greatly appreciated. Mention has already been made of the receipt of original manuscripts of books by M. I. T. authors and of numerous gifts of single items and collections by publishers, manufacturers, and others. To all who have participated in the building of the collections during the year the thanks of the library and of the Institute are extended.

Library publications have kept pace with the growth of other services. Two *Library Annuals* (1949 and 1950) appeared during the year, thereby bringing this activity up to date. The first concerned the planning and construction of the Charles Hayden Memorial Library. Its second part, revised and rewritten by Miss Margaret P. Hazen, comprised the *Library Handbook for Students*, which was reprinted for general distribution. A professional periodical characterized the *Handbook* in these words: "One of the best library manuals L. J. has seen for some time" (*Library Journal*, Vol. 76, p. 1211). The second *Annual* was the printed record of the dedication of the Charles Hayden Memorial Library compiled and edited from the transcribed proceedings. In addition, the usual accessions lists, special bibliographies, and reviews were prepared and distributed in the Central and branch libraries. The usual four-page leaflet, "Introduction to Institute Libraries," for use with registration material sent to new students and the "List of Periodicals . . . 1949-50 . . . by Members of the Staff" for inclusion in the President's Report with reprints for library exchange were prepared. Of particular interest was an attractive booklet, "Your Guide to the Dewey Library," by Miss Barbara Klingenhagen, Dewey Librarian.

It is a privilege to conduct visitors through the M. I. T. Libraries, particularly through our new building; and the year provided ample opportunity for the exercise of this privilege with visitors singly, in groups, in delegations, and en masse from all parts of the United States and over 30 foreign countries. At times indeed the library assumed a definitely cosmopolitan air. The library was host to a great many conferences and meetings, among them a group of visiting documentalists from 16 countries in Europe under the sponsorship of the Department of State and the Organization for European Economic Cooperation, a remedial reading conference, the Library Commission of Cuba, the New England College Librarians (a two-day meeting), the Medical Library Association, and others.

If space permitted, some of the special exhibits and continuing projects, as for example, the organization of a reading library in physics intended for use by students whose primary interests are in other fields, an exhibit of science fiction books by the M. I. T. Science Fiction Society, reading lists on the history of engineering, and the like could be detailed. Perhaps the best summary of a profitable year in the new library is the reality of the fact that realization is infinitely more satisfactory than anticipation.

VERNON D. TATE

DIVISION OF BUSINESS ADMINISTRATION

The last year has been marked by more new construction at the Institute than at any other time since the original buildings were erected 35 years ago.

The Van de Graaff 12 MEV Generator was completed at a cost to the Institute of \$279,000; the equipment was provided by the Office of Naval Research at a cost of \$325,000. This adds another major scientific instrument of importance to both teaching and research programs. The Hydrodynamics Laboratory was completed and occupied during the year; this provides much needed facilities for the Departments of Civil Engineering and Naval Architecture. In large part for investment purposes, the Whittemore Building on Albany Street was purchased; considerably less than half of the building has been occupied by the D.I.C. projects housed primarily in the Hood Building.

The Metals Processing Building, made possible through funds provided by Alfred P. Sloan, Jr., will add 60,000 square feet to the academic plant when it is completed this fall. The Biology and Food Technology Building, housing the John T. Dorrance laboratories, will provide another 105,000 square feet of laboratory space; this imposing structure will cost more than \$2,500,000, of which the Campbell Soup Company has contributed \$1,000,000. The acquisition of Lever House, through the gift of Alfred P. Sloan, Jr., will provide 90,000 square feet to house the new School of Industrial Management, the Department of Economics, and the long-sought Faculty Club. Finally, the remodeling of Burton House, formerly the Riverside Apartments, was completed, adding 600 to the Institute's dormitory capacity.

Many other smaller, but no less important, construction projects were undertaken, such as the Transonic Wind Tunnel, the Combustion Facility, an addition to the high-voltage X-Ray clinic, and the remodeling of the Moore House which will be the residence for the Dean of Students.

In all, the Institute has spent or committed \$8,000,000 during the year for the construction of new facilities or the major remodeling of newly acquired property.

To meet the needs of the greatly expanded construction activities, a construction section has been set up in the Department of Buildings and Power. The plant expansion has made necessary the replacement of two of the Institute's four boilers in the power plant, increasing the capacity by 100,000 pounds of steam per hour. A new east loop steam main will supplement existing lines by 60,000 pounds per hour.

The gradual growth of the educational activities, together with the urgent needs of D.I.C. projects during the last year, has created a difficult space problem. The addition of the new facilities will go far toward permitting a healthy growth of the Institute's activities, but the total requests for additional space from the several departments clearly indicates the need for a careful study of not only the requests but the present space allocations. For the year ahead, during which the new buildings will be occupied, additional space can be provided only at the expense of some other activity.

Increasing costs, coupled with a desire to induce more

students to live on campus, led to an intensive study of all services provided in the dormitories. Some services, such as towels and soap, were eliminated; others, such as the telephone service, have been modified or reorganized in order to maintain the current rent schedule for 1951-1952. Each service was examined in the light of its contribution to the educational value of campus living. The Faculty Resident program, which has been started on the initiative of the Dean of Students, is an example of the kind of undertaking which will add substantially to the effectiveness of dormitory living in comparison to some of the services which have heretofore been a part of the dormitory program.

For the last year, a student staff has been responsible for the maintenance and operation of one section of Burton House. The program, undertaken on an experimental basis, proved to be successful in every respect. The student staff program will be extended during the coming year to the rest of Burton House. Much of the success of the student staff program is due to the imaginative planning and understanding supervision of William H. Carlisle, Jr., who has been Assistant Manager of Walker Memorial Dining Service for many years. Effective January 1, 1951, Mr. Carlisle became Manager of Student Personnel, assuming responsibility for all student employment at the Institute, on the retirement of Mr. Pennell Aborn of the Technology Christian Association.

In further extending the student employment program, Mr. Carlisle will co-ordinate his activities with a committee on student employment headed by Dean Thomas P. Pitré, Director of Student Aid. In addition to Dean Pitré and Mr. Carlisle, other members of the committee are Mr. R. Colin Maclaurin, Personnel Officer, and Mr. Charles O. Jackson, Assistant Student Placement Officer.

On an experimental basis, one unit of Burton House accommodating 240 students, has been set up as a co-operative dormitory. Each resident will be expected to clean his own room, and the general service areas will be maintained by paid student staff. The rent for the co-operative section has been set at \$120 per term for 1951-1952, which is attractive in comparison with other dormitory rents and the rents charged by rooming houses in Boston and Cambridge.

Since the opening of Baker House two years ago, students living in the house have had commons style meals. The opportunities to provide better meals in both quality and quantity and at a lower price, under the commons plan, led to the decision to extend the program to Walker Memorial in the fall. All freshman residents in the dormitories will be required to have commons meals; upperclassmen may join in the plan on a voluntary basis. If there is student demand, commons meals will be available in the Graduate House. The Institute will continue to serve a la carte meals for students and staff. The price of commons meals has been increased to \$10.75 per week for 15 meals.

A Snack Bar, such as those that have proved to be so popular at Walker and the Graduate House, will be provided at Burton House. Not intended as a substitute for a full dining room which should eventually be available to the 600 occupants of Burton House, the Snack Bar will, nevertheless, fill a real need.

In order to attain better co-ordination, the Director of Dining and Housing has assumed supervisory responsibility for the operations of the Men's Student House and the Women's Dormitory on Bay State Road. Each of these units has been operating at capacity, with waiting lists, which demonstrates the desirability of seeking funds to supplement the co-operative type living unit. The Co-operative Dormitory in Burton House will satisfy the need for men's quarters, but serious consideration should be given to providing additional facilities for women in Cambridge.

R. Colin Maclaurin, Personnel Officer, reports that by the end of December, contracts were signed with the unions representing both laboratory and maintenance employees, agreeing to reduce the scheduled work week from 44 to 40 hours and to maintain the previous weekly pay. Thus, the employees received a substantial increase in hourly rate, and the Institute was still able to operate within its budget. Some services were modified; the reduction in hours was in general achieved by eliminating Saturday work. Aside from the wage and hour issue, the only important changes in the contracts were: (a) a new expiration date, namely June 30 of each year to coincide with the fiscal year, and (b) a change in the seniority clause

for laboratory employees to provide that new employees hired after January 1, 1951, would not have Institute wide seniority in cases of layoff.

Normally, the salaries of office employees are reviewed July 1 of each year, but this year there was an additional review effective January 1, 1951. The policy and procedure for handling this review was worked out by the newly established committee on office policy which is made up of representatives from the Administrative offices, the Academic departments, and the D.I.C.

Since the first of the year, the Institute has been expanding gradually. Instead of hiring 30 or 40 people per month, we are now hiring at the rate of 100 per month. This has put additional strain on the Personnel Office and has necessitated an increase in the number of its personnel.

The following statistics show the number of employees as of June 30, 1951, and the annual turnover rates:

	<i>Office</i>	<i>Laboratory</i>	<i>Building and Power</i>	<i>Dining Service</i>	<i>Dormitory Operation</i>	<i>Totals</i>
Number of Employees	772	929	306	91	72	2,170
Annual Turnover	45%	21%	9%	40%	19%	30%

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

ROBERT M. KIMBALL

DIVISION OF INDUSTRIAL COOPERATION

The dollar volume of Division research increased, largely because of the accelerated defense program. Because the present volume was large, no new programs were undertaken without the most careful examination of their importance and of the Institute's being uniquely equipped to carry out the work.

The interdepartmental laboratories are making individual reports, and the academic departments are reporting on the Division research which they accomplished.

Fiscal Report for the Year Ending June 30, 1951

<i>Dollar Volume</i>	<i>Fiscal Years</i>	
	<i>1950-1951</i>	<i>1949-1950</i>
General Government	\$14,554,000	\$12,445,000*
Industrial	466,000	414,000
<i>Total</i>	\$15,020,000	\$12,859,000

* Includes \$391,000 for new construction

<i>Active Projects</i>	<i>Number on July 1, 1950</i>	<i>Additions</i>	<i>Expirations</i>	<i>Number on July 1, 1951</i>
General Government	175	76	42	209
Industrial	62	12	11	63
<i>Total</i>	237	88	53	272

<i>Personnel</i>	<i>As of June 30, 1951</i>	<i>As of June 30, 1950</i>	<i>As of June 30, 1949</i>
D.I.C. Staff	788	500	535
D.I.C. Non-staff	1,170	900	879
M. I. T. Staff	550	483	469
<i>Total</i>	2,508	1,883	1,883

NATHANIEL McL. SAGE

ADVISER TO FOREIGN STUDENTS

In the academic year 1950-1951, 470 foreign students were enrolled at the Institute; of these 258 were undergraduate and 212 graduate students. They were citizens of 59 different countries. They constituted slightly over 9 nine per cent of the Institute's total student body. Again, as in recent years, the Institute had, for its size, the most cosmopolitan student body of any institution of higher learning in the United States. The annual census of foreign students, published by the Institute of International Education, gives a table of the first 25 institutions in number of foreign students enrolled. The following excerpt from that table gives the first 10 institutions in percentage of foreign students enrolled to total students enrolled:

<i>Institution</i>	<i>Foreign Students</i>	<i>Total Enrollment</i>	<i>Percentage Foreign Students To Total</i>	<i>Rank, Number of Foreign Students</i>
1. M. I. T.....	470	5,149	9.13	7
2. Harvard.....	635	10,801	5.88	5
3. Howard.....	219	4,082	5.37	22
4. Columbia.....	1,414	27,636	5.12	1
5. Chicago.....	351	7,890	4.45	11
6. Michigan.....	803	18,912	4.25	4
7. Stanford.....	277	7,717	3.59	18
8. Washington (Seattle)	509	14,590	3.49	6
9. Cornell.....	347	10,115	3.43	12
10. Louisiana State.....	284	8,307	3.42	17

The Institute's foreign students came from the following areas: Latin-America, 89 students; British Commonwealth and Empire, 127; Northern Europe, 46; Western Europe, 44; Central and Southern Europe, 44; Near East, 28; Far East, 92. The countries sending the largest delegations were: Canada, 80; China, 34; India, 34; Norway, 27; Cuba, 17; England, 17; Greece, 16; France, 15; Colombia, 14; and Israel, 13.

It is interesting that students of Chinese citizenship continue to form one of our largest national groups. Most of these are men who are continuing in graduate studies begun some time ago, or those who have completed their undergraduate studies at some other American institution and have entered here for their post-graduate degrees. A few apply each year from Hongkong or Formosa. None in recent years has come from the mainland. It is anticipated that in the near future the numbers of our Chinese students will rapidly diminish.

For admission in September, 1951, 978 foreign students made informal application, and 317 filed completed applications. Of these, 196 were accepted for admission. Because of dollar shortages around the world and possibly because post-war enthusiasm for education in the United States has slackened somewhat, applications from abroad have fallen off steadily in the last few years. For example, incomplete applications for the last three years were: 1,981, 1,490, and 978; and completed applications filed were: 681, 600, and 317. The effect of the dollar shortage has been offset by the increased scholarship help which governments and private sources have

been giving. Admissions for the past three years have been: 163, 208, and 196. Standards of admission have not changed; a large number of able and ambitious students continue to find some way to reach their goals in spite of formidable obstacles.

The Foreign Student Summer Project, begun in 1948, is in its fourth successful year. This program initiated and completely managed by undergraduate students, brought, in the summer of 1951, 80 young men and women from 30 countries for a program of study and research at the Institute. This is supplemented by a carefully arranged program of plant visits in the Boston area, hospitality in American homes, a series of forums on various aspects of our culture, planned visits to New York and Washington, and a two-week Mid-West tour of industrial plants under the sponsorship of, and because of the generosity of, the National Association of Manufacturers. The student chairman of FSSP, 1951, is Allan Elston, a 1951 graduate of Course XV-A. Assisting the student committee is a Faculty Advisory Committee, consisting of Professors Paul M. Chalmers, Walter H. Gale, and Glenn C. Williams.

The Displaced Persons Committee of the National Students Association has continued to do excellent work. This committee has sponsored D.P.'s abroad who qualified for admission to M. I. T., has brought them to this country, and raised the funds for their maintenance for one year. The social fraternities at the Institute have been very generous in helping these D.P.'s with offers of free room, and in some instances, board. The Institute has agreed to waive tuition fees for one year for each man to help him get his start in this country. Most of these students are continuing in their courses at M. I. T.; after their first year, they are on their own and help themselves with jobs, loans, and earned scholarships in the usual American tradition. Seventeen such students have been brought to the Institute by the D.P. Committee. This next academic year will see the end of this program.

It has been a matter of increasing difficulty for foreign students to secure dollars in this country. Many students are willing and able to help themselves. For most of them, the concept of "working their way" through school is a new one, but many of them become quickly Americanized in this respect; and most of the usual campus jobs have a good share of foreign

men among incumbents. The amount of gainful employment a student may undertake is, however, severely restricted by law. Most of our students are admitted to this country with a 4(e) student visa on their passports. Under the provisions of this visa, a student must petition the Immigration and Naturalization Service for permission for a job, and such permission may be granted only if the student is in need and the job does not interfere with his being a full-time student.

For the undergraduate student these provisions permit him to fit into the normal pattern; namely, to work on a campus job of some kind about 10 to 15 hours per week. For the graduate student, however, the problem is more severe. Many of our graduate students now supplement both their income and their educational experiences by working half-time as teaching fellows or research assistants. At the Institute, at least, this has been the accepted pattern for a large proportion of our graduate students. While permission for such jobs can be obtained in some instances, it is severely restrictive and often alters the educational plans an exceptionally good student would normally make. Also, it is almost impossible to offer such jobs to students at the time of their admission, as we would sometimes like to do.

This situation has been considerably ameliorated, at least for our graduate students, by the introduction of a new type of visa, popularly known as the Smith-Mundt or Exchange-Visitor's visa. In 1948, the Congress passed a bill intended to make scholarships available to foreign students in this country. Practically no money has been appropriated by Congress to implement this purpose. One gain, however, was a section of the bill that provided for a new immigration regulation permitting aliens to come to this country for a specific educational purpose, without the former restrictions as to gainful employment. This affects four categories of persons coming to the Institute: (1) graduate students who have been offered part-time jobs at the same time they were granted admissions; (2) those on the instructing staff; (3) research workers, who may be offered full-time jobs for a year in our laboratories; and (4) Guests of the Institute, who are members of sister institutions offered our facilities on a no-fee, no-remuneration basis.

For the academic year 1951-1952, 18 foreign graduate students have been issued Exchange-Visitor visas which will permit them to accept the part-time jobs we have offered them — jobs which in most instances are their only means of pursuing their education in this country. Of these, five students are coming from the United Kingdom as the result of a co-operative effort of the English-speaking Union and the Institute.

Eleven colleagues from abroad were granted status as Guests in 1950-1951, and in 1951-52, eight will be at the Institute.

In 1950-1951, nine men from foreign countries were employed as research workers in our various laboratories under the Exchange-Visitor's visa. For 1951-1952, full-time jobs have been offered to 29. Most of these are scholars with advanced degrees, distinguished in their specialties, who will make a decided contribution to the research carried on at the Institute. They are an invaluable asset to our laboratories, particularly as they come at a time when skilled workers are in short supply.

For the next year, nine students from the Institute have been granted Fulbright scholarships for a year's study abroad. Their selection was made initially by a screening committee at the Institute under the chairmanship of Professor David A. Dudley, Assistant Director of Admissions.

A Foreign Study Committee, under the Chairmanship of Professor Norman J. Padelford, has been active in arranging for summer employment abroad for Institute students in industry and research laboratories. A small fund has helped to provide transportation as a scholarship award. Five students were sent to Sweden in the summer of 1950; and in 1951, seven students went to England, France, Sweden, and the Netherlands.

The chief preoccupations of the Adviser's Office are admissions and counseling. The latter task is time-consuming and varied. There is a heavy load of handling legal problems, chiefly concerning immigration regulations. Many of these are routine, many are involved. In addition, there are several foreign students who, because of their strangeness, need special attention to their academic and personal problems.

Professor Paul M. Chalmers has been for the last two years

a member of an Advisory Committee to the Department of State on Emergency Aid to Chinese Students, and for 1951-1952, was re-elected President of the National Association of Foreign Student Advisers.

PAUL M. CHALMERS

PLACEMENT OFFICER

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

Student Placement. During the period July 1950 to June 1951, a total of 287 companies conducted personal interviews at the Institute, and 471 more announced openings by correspondence inviting interested and qualified students to contact them directly. Many companies showed interest in students in all three classes, September 1950, February 1951, and June 1951; therefore, some repetition in the number of companies is included in the above figures.

Salary offerings are currently running about \$25 a month over those of last year, men with the Bachelor's degree being offered from \$285 to \$350, men with the Master's degree from \$350 up, and Doctors from \$425 up.

During the past year the demand for men has been high in all fields of science and engineering. The accelerated defense program created unforeseen openings coinciding with a nationwide drop in technical graduates, and industry found itself with a serious manpower shortage. Our graduating students averaged about three offers each with many offers being made at the time of the interview.

At the time of graduation, 81 per cent of the June class was placed. As of September 1, this figure had risen to 97.4 per cent. The class had 245 commissioned officers, of whom 71 were members of the regular Armed Forces. On September 1, our records showed that 202 of the 1,177 graduated in June were in the Armed Forces.

Almost without exception, company representatives emphasized that they would request deferment for every new technical employee. It was also stated that, should deferment be refused, such employees would be placed on military leave, with provi-

sions that their jobs would be waiting upon their return from active duty.

Classes Graduated During 1950-1951

	<i>Individuals</i>	<i>Number Placed</i>	<i>Per Cent Placed</i>
<i>As of Graduation Day</i>			
Bachelors.....	931	686	74
Masters.....	476	375	79
Engineering Degree.....	64	54	84
Doctors.....	166	137	82
Total.....	1,637	1,252	77
<i>As of September 1, 1951</i>			
Bachelors.....	931	891	96
Masters.....	476	473	99
Engineering Degree.....	64	64	100
Doctors.....	166	163	98
Total.....	1,637	1,591	97
<i>Members of the June Class in the Armed Services on September 1</i>			
	<i>Total in Class</i>	<i>In Armed Services</i>	<i>Per Cent</i>
Bachelors.....	790	122	15
Masters.....	252	42	17
Engineering Degree.....	53	34	64
Doctors.....	82	4	5
Total.....	1,177	202	17

Alumni Placement. This year's placement figures speak for themselves so clearly that comment may be superfluous, but it is interesting that in spite of the enormous amount of advertising which has gone on in the press concerning the shortage of engineers and scientists, fewer men than usual have registered with this office. Since the men who register here are usually employed and looking for something better, it had seemed reasonable to expect that more than the average number would have registered in a year like this in order to take advantage of the vast number of opportunities available. There are a good many reasons why they have not; most important is that pay for engineers has increased substantially during the past twelve months. In addition, most companies are paying bonuses, or giving cost-of-living allowances, or working a six-

day week and paying the engineer for the sixth day. As companies expand again, opportunities for promotion are presenting themselves more frequently. A great many of the positions which have been cited in the newspapers and magazines are obviously tied up with what the men call "straight war work" and do not seem to offer the permanence they desire. Men at all likely to be drafted are finding it unwise to move because it is difficult for a company to hold a man from military service if he is new in the organization. Also, the extremely aggressive recruiting policies of many major companies have made it possible for engineers to investigate job possibilities in different types of industries in various parts of the country simply by answering newspaper advertisements.

The most startling shift of interest among engineers and scientists is their greatly increased interest in working for the government. Formerly, even in years when industrial positions have been a little hard to come by, it has been unusual to have more than one out of ten applicants willing to talk about the possibilities of working for Civil Service. This year, it is fair to estimate that 50 per cent of the men interested in making a change are not only willing but eager to talk about government opportunities, and that at a time when private industry is hiring more heavily than ever before.

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

	<i>July, 1950-June, 1951</i>	<i>July, 1949-June, 1950</i>
Number of Jobs	3,643	2,304
Men Who Went on Available List	843	1,065
Men Who Came Off Available List	592	553
Placements	186	169

NATHANIEL McL. SAGE

INDUSTRIAL LIAISON OFFICE

The past year has been characterized principally by an intensification of all the various activities carried out as part of the Industrial Liaison Program. Less effort has had to be directed toward establishing basic policies and methods of procedure, a fact which has made possible our concentration

on meeting the specific liaison needs of the companies and the Institute within the conceptual framework already erected.

An expansion in the number of participating corporations from 29 to 52 has taken place. Within the group the various industries are represented in roughly the same proportion as occurs in the nation generally. The viewpoints, problems, and interests of these companies can now be taken as reasonably characteristic of that segment of the national industry being served through education and research by schools of technology. Within the Program, the breakdown into industries is currently as follows: aviation, 4 per cent; chemicals, 19 per cent; electronics, 16 per cent; food, 8 per cent; manufacturing and others, 25 per cent; metals, 9 per cent; and petroleum, 19 per cent.

Conferences sponsored exclusively for the participating companies have continued to prove our most efficient method of exchanging research information. Ten such meetings were held during the year on topics ranging from "Properties and Reactions of Hydrogen Peroxide" to "Use of Large Computing Machines in Industry." The average attendance at these meetings was 40, and most of the companies attended the majority of the conferences. When one considers the diversity of subjects discussed, the latter fact is regarded as indicative of the ever-broadening scope of industrial research interest. Clearly, the conference system can always be made more effective to the degree that a genuine *exchange* of ideas and information rather than a one-way flow is brought about. We plan to experiment with the techniques of such meetings during the coming year in the hope of enhancing their value to all participants.

Another of our major objectives has become that of assisting company liaison officers in the dissemination within their own organizations of information about the Institute's researches and the opportunities for co-operative effort within the Industrial Liaison Program. To this end, a descriptive bulletin, listing typical services the Industrial Liaison Office can render, is being prepared for internal use by each company. A Directory of Institute Researches is being compiled for use in a similar manner. In addition, our office staff hopes to visit more company laboratories in the future to acquire a firsthand

acquaintance with company research personnel and technical programs as well as to apprise each company of pertinent Institute research developments.

A patent policy was evolved during the year which offers each of the companies a non-exclusive license on patents taken out on behalf of the Institute in fields eligible for support under the terms of the agreement with the company. The policy provides for the use of company grants as a credit against royalty payments which may become due.

The number of opportunities recognized for out-of-the-ordinary interchange of benefits between individual companies and the Institute is showing a marked increase. This is resulting largely from the greater familiarity being acquired by the staff of this office with company situations, and on the part of faculty and company staff with our readiness and desire to serve them. It has been gratifying to have faculty members and company representatives turn increasingly to us for the various kinds of help we are especially organized to provide.

William R. Weems, Technical Industrial Liaison Officer, went on leave of absence midyear to serve with the Institute's air defense project, but he is returning to responsibilities in this office in the summer. Dr. David I. Sinizer, formerly Assistant Professor of Mechanical Engineering, served with the office as a Technical Industrial Liaison Officer during the latter half of the year only. W. Leslie Allison was appointed as a Technical Industrial Liaison Officer at the close of the year.

ROBERT V. BARTZ

MEDICAL DIRECTOR

The health of the Institute staff and student body has continued on a high level during the past year. Following the pattern of the past five years, contagious disease has been at a minimum, and further progress has been made in reducing the incidence of pulmonary tuberculosis. Three cases of active infection were found in the student body and three other cases among the employees and staff. The Commonwealth of Massachusetts has recently enacted a law requiring a chest film every three years of each person connected with an educational institution who might have any contact with students.

Under this law 4,372 chest X-rays were carried out during April, May, and June, 1951. The presence of the three unsuspected active cases was thus revealed.

Under the student health insurance plan, the number of problems concerned with the financing of individual illness or injury has been very small. During the past year 68 per cent of all students were insured under the plan described in last year's report.

The number of visits to the various services were:

Surgery	9,221
Medicine	9,939
Psychiatry and Neurology	2,576
Otolaryngology	1,164
Ophthalmology	1,174
Dermatology	1,144
Dental	4,524
Emergency Clinic	2,421
Physical Examinations	3,340
Occupational Medicine	459
Radiology	14,236

50,198

The total number of patients admitted to the Infirmary was 714. Of this number 79 per cent were students and the remainder were employees or staff members. The following table gives the over-all picture of clinic visits and patient-days in the Infirmary for the past five years.

	<i>Total Clinic Visits</i>	<i>Patient-Days in Infirmary</i>
1946-1947	43,488	3,517
1947-1948	43,572	3,792
1948-1949	46,341	3,406
1949-1950	47,718	3,143
1950-1951	50,198	2,827

The department suffered a heavy loss in the death of one of its senior physicians, Dr. Edward Martin, in April, 1951. He had served the department as clinic physician and visiting physician in the Infirmary for nine years.

Much of the direction of the work of the Medical Department this year was done by the Associate Director, Dr. John W. Chamberlain, and to him special thanks are due for performing this extra service in his usual skillful, considerate manner.

The Dental Service has now completed ten years of service to the Institute. During the past year 1,423 dental examinations, including X-rays, were made on entering students. Of this number, 40 per cent were observed to have some dental caries by gross visual examination, and caries in an additional 20 per cent were found by the X-ray examination. This high figure of 60 per cent of all entering students with some tooth decay emphasizes the need for the diagnostic and educational services which this clinic renders. Students are referred to dentists in the community or at their homes for remedial work.

The Clinical Pathology Service continued at about the usual level of activity with a total of 11,206 procedures, which included 877 blood counts for the Occupational Medical Service and 464 special tests of considerable complexity.

The Psychiatric Service has continued to be very active. It is gratifying to note that prejudices against psychiatry are much less in the Institute community than is usually the case in other institutions. This has made it possible for a student to refer himself to the clinic without fear of social pressure from others.

Full staff meetings have been held every other Wednesday throughout the year, and these have aided greatly in building up greater familiarity of the staff with the academic problems of the Institute.

In addition to the treatment of individual social problems which have interfered with the social and scholastic adjustment of staff and students, various research projects are being carried forward. At the beginning of the year, the entire Freshman Class was approached for volunteers to participate in an experiment of a kind of preventive group psychotherapy. More volunteers were available than could be used, and we were able to set up an experimental and control group all of whom had a series of psychological tests to establish a base line. The members of these two groups will be followed throughout their careers at the Institute, and similar groups will be studied for several years until a statistically valid number of groups have been studied. At the end of that time, it is hoped that we shall be able to tell whether such group integrative activity is useful to the student in increasing the efficiency of his adjustment to Institute life. This project

forms a part of the larger program of attempting to delineate and verbalize the contributions that psychiatry can make to the relationship between emotions and learning.

One senior resident in the late years of his psychiatric training in a local hospital contributed a portion of his time to the clinic during the past year. It is hoped that more relationships of this kind can be worked out with young psychiatrists in the community. The increasing interest in the academic world in psychoanalytical theory and practice, psychology, sociology, anthropology, and ethnology points to an increasing demand for psychiatrists with training in the treatment of emotional disorders encountered in a college community. In fact, the need for training centers such as this one could be is very urgent judging from the large number of requests from other institutions for psychiatrists to aid in their student health programs.

The total number of persons seen during the year was 310, of whom 258 were students. The total number of interviews was 2,492. The Psychological Service of the Dean's Office saw 200 students, of whom 67 per cent participated in diagnostic and testing procedures.

During the period from July 1, 1950 to July 1, 1951, physician members of the staff of the Occupational Medical Service performed 459 medical examinations. This figure represents examinations made before placement in potentially hazardous jobs, checkups during such toxic exposure either routinely or to evaluate abnormal laboratory findings, and on termination of certain workers' employment. In the fall of 1950, Dr. John Stoeckle of the Resident Medical Staff of the Massachusetts General Hospital joined the Medical Department for three months between residencies. Dr. Stoeckle performed routine medical examinations on workers exposed to toxic materials and accompanied members of the technical staff on field studies. This experience proved to be of great advantage to the department in receiving the new ideas of a recent medical graduate and it served to acquaint Dr. Stoeckle with the principles of preventive medicine as seen in student health and occupational medical practice. As a result of this mutually helpful experience, an arrangement has been worked out with Dean Dwight O'Hara of the Tufts Medical School to have

fourth-year medical students serve as clinical clerks for short periods in the Occupational Medical Service.

The staff made 470 field trips during 1950-1951. Some of these were made in order to analyze the working environment for the quantity of material present — toxic, chemical, radioactive, or harmful dust. Other field trips were made to suggest correct controls of hazards by engineering devices or protective equipment. Many field trips were made jointly by members of the service and the other Institute safety officers, especially when accidents, fire hazards, and waste disposal problems were involved.

In the latter part of 1950, Dr. Harriet L. Hardy was invited to read a paper before the Royal Society of Medicine in England on the problem of disease in American industries using beryllium compounds. In conjunction with this lecture, Dr. Hardy spent six weeks in Europe visiting hospitals, medical schools, and industries at the invitation of colleagues working in occupational medicine in Wales, Scotland, England, Sweden, Holland, and Belgium.

During 1951 adequate facilities for the work of the Occupational Medical Service were completed. The facilities are located on the second floor of the Homberg Infirmary in space previously used for the care of patients in epidemic periods. One room has been converted into an occupational hygiene laboratory in which analytical procedures for the detection of toxic substances in air and biological materials are carried out. New methods for the analysis of radioactive materials which have entered the body by inhalation have been developed. For example, a method for determining amounts of radioactive strontium in urine is being devised by Dr. Ivan D. Frantz, the Radiological Medical Officer.

A fume chamber is a part of this laboratory. It is used for calibration of instruments and basic studies such as threshold levels of smell of toxic gases. Equipment for fluorometric analysis of beryllium is in use by Miss Janet Walkley, the Occupational Hygiene Chemist in the laboratory, since certain projects continue to use this toxic material.

Adjacent to the Occupational Hygiene Laboratory is a Counting Room for radioactive analysis of air, water, and biological samples by Mr. Samuel Levin, the Radiological

Safety Officer, and his staff. Because work elsewhere in the Institute has increased the radiation background, it has become necessary to move the counting equipment from Building 20 to the Occupational Medical Service facilities in the Homberg Infirmary. The Radiological Safety Group of the Occupational Medical Service continues to maintain its laboratory in Building 20 for the supervision of the film badge service, physical surveying, and maintenance and calibration of radiation detection instruments.

The physicians of the Occupational Medical Service, Dr. Harriet L. Hardy, Dr. Albert O. Seeler, and Dr. Ivan D. Frantz now share two offices equipped for seeing patients and performing preplacement and routine medical examinations. These offices each occupy what was a single patient room and are adjacent to a two-bed ward now occupied by the Occupational Medical Service secretary with space for the files and reprint and textbook collection so essential in this type of work.

The Occupational Hygiene Engineer, Mr. Frederick J. Viles, Jr., and the Radiological Safety Officer, Mr. Samuel Levin, share a large office across from the Occupational Hygiene Laboratory with sufficient space for the weekly Occupational Medical Service staff meetings and the frequent conferences held with members of other departments.

Teaching of occupational hygiene has been done on a small scale in the Department of Sanitary Engineering and in Electrical Engineering. Professor Rolf Eliassen has requested a term course for credit in Occupational Hygiene and plans are well advanced to accomplish this with help from the faculty of the Department of Industrial Hygiene of the Harvard School of Public Health.

The year 1950-1951 has been important since the technical staff now has proper equipment and space in which to carry out its analytical services. All staff members of the Occupational Medical Service now have office space together, thus greatly adding to the efficiency of their work through mutual exchange of ideas and data. Proximity to the rest of the Medical Department adds to the effectiveness of diagnosis and handling of all types of occupational illness.

DANA L. FARNSWORTH, M.D.

EXECUTIVE VICE-PRESIDENT OF THE ALUMNI ASSOCIATION

Initial public announcement that the Institute's Committee on Financing Development had surpassed its \$20,000,000 goal was made appropriately at the Alumni Association's Midwinter Meeting on February 1 — appropriately so because the 716 individuals composing the Development Committee included 677 alumni, chosen principally on the basis of capacity previously demonstrated in managing the affairs of the Alumni Council and the M. I. T. Clubs or as Honorary Secretaries of the Institute.

Many more than these 677 alumni also participated actively in the campaign as members of sub-committees, exerting untold influence in securing support from corporate and foundation sources, and in encouraging benefactions to the Institute by non-alumni donors; and 9,752 alumni personally contributed \$5,045,425 to the Development Fund.

On January 27, the Saturday before the Midwinter Meeting, our first Alumni Regional Conference was held under the auspices of the M. I. T. Club of Chicago, at the Museum of Science and Industry. During morning and afternoon sessions, four members of the Institute Faculty dealt, verbally and by means of specially prepared demonstration apparatus brought from Cambridge, with various aspects of the topic "New Frontiers in Science"; and the day's program concluded with a dinner at which three other Cambridge personalities were among the speakers. An attendance of alumni and friends of M. I. T. numbering nearly 300 included officers and past officers of M. I. T. Clubs in Milwaukee, St. Louis, Cleveland, and Philadelphia as well as five distinguished past presidents of the M. I. T. Club of Chicago.

Throughout the day it became increasingly apparent that such an experimental one-day conference, designed to interest an audience of intelligent laymen at an alumni center distant from Cambridge, was a popular move. Hence, a similar conference is being scheduled during 1951-1952 at Los Angeles under the auspices of the M. I. T. Club of Southern California.

In a sentimental sense, as well as on other counts, it was fitting that our first Regional Conference take place in Chicago, because that M. I. T. Club, organized in 1887 as the "North-

western Association of the M. I. T.," stands senior on our present roster of 87 M. I. T. Clubs. With the establishment of those in Belgium and Puerto Rico during 1950-1951, we now have 67 M. I. T. Clubs in the continental United States, 10 elsewhere in the Americas, and 10 in the other hemisphere.

H. E. LOBDELL

SCHOOL OF ENGINEERING

AERONAUTICAL ENGINEERING

The demand from industry, government laboratories, and research institutions for graduating students again far exceeded the number available. Two or three times as many students could have been placed. Particular need was shown for graduate students trained in advanced techniques. Failing to secure recruits, some personnel officers from industry turned to junior staff members and D.I.C. research personnel. This raises the old problem of holding and attracting teachers but reflects a healthy situation.

Nevertheless, the paradox continues of a diminishing undergraduate enrollment in spite of a manifest shortage of engineers. The number of freshmen selected for Course XVI in June 1951 was the lowest in six years and included all who applied.

The salaries offered our graduates were higher than in previous years. The average for the professional degree men was \$500 per month. Graduates with the Master's degree were offered between \$340 and \$600, depending on age and previous military experience. The average for Bachelors was \$305 per month.

Of 37 graduates with the Master's degree, 17 were student officers who returned to active duty, 11 entered industry, 2 government laboratories, and 7 remained at M. I. T.

The 42 Bachelors were distributed as follows: 8 to active military duty, 4 to government laboratories, 21 to industry, 1 foreign, with 8 remaining at M. I. T. Five seniors of the Honors Group who would normally receive the Bachelor's degree will continue for a fifth year of graduate study.

Co-operative Course. The past year was the third in which this Co-operative Course was offered. Twenty-four of the junior class of 42 elected to spend six months in industry before the beginning of their senior year.

The co-operators who employ our students as engineering assistants are: United Aircraft Corporation, Chance Vought Aircraft, Glenn L. Martin Company, Republic Aviation Corpo-

ration, Langley Aeronautical Laboratory (National Advisory Committee for Aeronautics), and Ames Aeronautical Laboratory (N.A.C.A.). Salaries ranged from \$215 to \$235 per month, which are very satisfactory to the students in view of the excellent training involved. The co-operators have found our students not only useful but highly promising for future employment after graduation.

Honors Course. The group following the five-year Honors Course for the Bachelor's and Master's degrees consisted of seven seniors and nine graduate students under the immediate guidance of Professor Charles S. Draper. The group, in accordance with the tradition established by their predecessors, dine together monthly with a guest selected by them as likely to illuminate discussion of some topic of interest.

Reports from former Honors Course graduates indicated that they are fitting well into industrial organizations and doing exceptionally well. This might be expected from students selected for outstanding professional promise, and it will remain unknowable to what extent their special course helped them. Their own view is that it did.

Graduate School. With intense activity in the aircraft industry, the demand for aeronautical engineers with graduate degrees has increased. At the same time, the excellent opportunities for employment offered by industry to men with Bachelor's degrees and the call for men from the armed services tend to reduce the number entering Graduate School. For 1951-1952 there will be a somewhat decreased enrollment of civilian students, but the armed services show continued desire to improve the technical competence of their officers and will detail 25 officers next year for special work in the fields of automatic controls and armament, power plants, and airplane design.

During the year five doctorates were awarded, of which three were in Instrumentation. There are now eight candidates for the Doctor of Science degree. Three degrees of Aeronautical Engineer were awarded.

New courses of advanced content were offered: Aerodynamics — Thermal Effects by Morton Finston, and Methods of Analysis in Control Systems by Dr. J. Halcombe Laning, Jr. Both proved of considerable interest. For 1951-1952 a new

course in Control Systems Components will be offered by Professor Robert K. Mueller.

Continued financial assistance to graduate students was afforded by fellowships sponsored by Aviation Week, Douglas Aircraft Company, Goodyear Tire & Rubber Company, Sperry Gyroscope Company, and the Richard C. du Pont Memorial Fund. In addition, it has been possible in many instances to give graduate students part-time employment on sponsored research projects in the Department's laboratories.

Aeronautical Mechanics. With the departure last year of Professor Manfred Rauscher to join the faculty of the Swiss Institute of Technology, his courses in aeronautical mechanics were assumed by Professors Holt Ashley and Robert L. Halfman. In addition, they jointly offered a new senior elective to introduce intending graduate students to the mathematical and mechanical properties of linear systems, servomechanisms, and the flow of compressible fluid. This topic proved to be of so much interest in the fall term that it was repeated in the spring.

Aeroelasticity and Structures. Professor Joseph S. Newell has supervised a research project (National Advisory Committee for Aeronautics) to determine the distribution of stress in rubber models of riveted joints typical of metal aircraft construction. Results indicate a significant discrepancy between the currently approved design calculations and the findings of the model tests, which should help toward a better understanding of fatigue failure of such joints.

Professor Raymond L. Bisplinghoff, assisted by Professors H. Guyford Stever, Holt Ashley, Robert L. Halfman, and James W. Mar, has supervised an extensive program of government-sponsored research projects involving a force of some 75 people. Laboratory, shop, office, and computing space was occupied in Buildings 33 and 22. With the razing of the latter building, a substantial portion of this activity will move to Building 35.

Twelve research projects were actively worked on, resulting in eleven confidential reports to the sponsors: the Bureau of Aeronautics of the Navy, the Office of Naval Research, the Air Force, the Ordnance Department of the Army, and the Bureau of Ordnance of the Navy. These reports dealt with theoretical and experimental studies of problems of airplane structures,

wing flutter, effects of impact and gusts, aileron effectiveness, battle damage, effect of twist and deflection of wings, weight and strength studies of special wing constructions.

Nine professional papers dealing with unclassified work were a valuable by-product of the sponsored research. Throughout the year, the effort was continued to make this sponsored research aid our academic program and our students. It is believed that this effort is bearing fruit. The content of our courses in Structures and in Aeroelasticity reflect research findings, and these courses are taught by the active project supervisors.

Eleven theses resulted from the participation of graduate students in sponsored research in this field.

In addition to the supply to industry of students with advanced training, three of our experienced D.I.C. staff members entered industry at high-level positions. The sponsored research program is now in fact, as well as in intent, providing a unique opportunity for advanced training for graduates who join the D.I.C. staff. The demand by prospective employers for specialists in aeroelasticity has been greatly stimulated by the inclusion of supersonic airplanes and missiles in the defense program.

The sponsored research program in aeroelasticity and structures constitutes a major effort of the Department. This effort has already achieved several conspicuous successes, which must be credited to the faculty supervisors and to Mr. Lawrence E. Beckley of the D.I.C. staff who has acted as manager of all projects.

Helicopters. Professor Rene H. Miller's two elective helicopter courses have been combined because, in general, students do not have sufficient time for two terms. The need for qualified helicopter engineers is acute, and students desiring to enter the helicopter industry have had a wide choice of offers.

Registration for the special course on Automatic Stabilization of Helicopters offered in the summer of 1951 is higher than expected, with an enrollment of 43 men from the Navy, Air Force, and industry.

The investigation of helicopter blade loadings by means of a wind tunnel model was continued under the sponsorship of the National Advisory Committee for Aeronautics. Work

under a previous contract was reported as an N.A.C.A. Technical Note. Parallel analytical studies have been conducted, as graduate theses, in order to provide a theoretical background for this experimental work.

Research on helicopter stability and control was presented at the International Helicopter Congress in Paris by Professor Miller.

Wright Brothers Wind Tunnel. The academic year started out with little testing work in sight, but this condition quickly reversed itself with the expanded Air Force and Naval Aviation development programs. At the close of the year, the tunnel was scheduled for four months ahead.

The tunnel is managed by Professor Joseph Bicknell with an operating staff of five. Last year, industrial testing took up about one-half of the tunnel time, permitting evaluations to be made for Project Meteor, for the Civil Engineering Department's study of suspension bridges, and for an Aeronautical Engineer degree thesis.

Transonic Wind Tunnel. The Wright Brothers Wind Tunnel group was authorized to proceed with the design and construction of an additional facility for aerodynamic testing near the velocity of sound — the transonic range. Using the main wind tunnel as a pressure vessel, which can be pumped up rapidly, there is to be a blowdown nozzle exhausting to the atmosphere through an acoustically-treated stack. The transonic wind tunnel proper, the nozzle, will be housed in a building containing necessary instrumentation, the dryer, and controls. The test section will be about three square feet, the size of the Naval Supersonic Tunnel, and should operate at velocities between 0.8 and 1.3 times that of sound in air at sea level. Contracts for construction have been let for completion before 1952.

The Wright Brothers Wind Tunnel was built in 1938 and was then of an advanced design. In the meantime, many similar wind tunnels have become available. Many aerodynamic data from wind tunnel testing have been published, and design methods exist which eliminate much of the need for wind tunnel testing except for unusual configurations.

The advent of jet propulsion has pushed airplane speeds up toward and even through sonic velocity. New and unpre-

dicted aerodynamic phenomena are encountered for which subsonic wind tunnels are not useful. The provision of this transonic addition to the Wright Brothers tunnel has attracted the attention of industry, and requests for testing time have already been received. The Office of Air Research, United States Air Force, has contracted for an investigation of aerodynamic, aeroelastic and stability problems in the transonic speed range, making use of the new facility.

On completion of this facility, students in this Department will have available four installations giving a complete range of testing velocities, i.e., subsonic, transonic, supersonic, and hypersonic, as well as a shock tube for the study of shock waves in air.

Hypersonic Wind Tunnel. Work was completed by Professor H. Guyford Stever on the investigation of condensation of the principal components of air in a hypersonic wind tunnel, and a report has been submitted to the National Advisory Committee for Aeronautics which sponsored the research. Professor Stever will present his findings for discussion at the Conference on Heat Transfer in London, September 1951. The results indicate that air condenses at slightly supersaturated conditions and seriously changes the flow characteristics, making necessary preheating for condensation-free flow at hypersonic velocities (above a Mach number of 5). The small facility was erected in the Gas Turbine Laboratory using existing compressed air equipment with a blowdown nozzle.

Shock Tube. The design has been completed and fabrication is well advanced. The shock tube will be 100 feet long with a cross-section 2 feet by 8 inches. The test chamber will be equipped with optically flat windows, and an interferometer will be used to delineate flow patterns. Funds were furnished by the Air Force in connection with a research project.

Naval Supersonic Laboratory. This facility was dedicated in December, 1949, and Professor John R. Markham was appointed Director. By the beginning of the past academic year, the supersonic wind tunnel was instrumented and calibrated, and a laboratory staff of about 100 built up. As Project Meteor advanced from the research to the design and development stage, Professor Robert C. Seamans, Jr. was designated Chief Engineer. About one-half of the staff of the laboratory

was assigned to him as a missile design group. The remainder of the staff is engaged in aerodynamic analysis and wind tunnel operation.

The Bureau of Ordnance, U. S. Navy, has first call on the tunnel for about half time. Other research programs were undertaken for the Office of Air Research, Bureau of Aeronautics, and the Boeing Airplane Company. It is believed that the staff and workload are stabilized for the next year.

The operating machinery of the wind tunnel and its measuring equipment have proved satisfactory. During the year, two additional nozzle blocks were procured and calibrated for Mach numbers 1.7 and 2.5, and additional nozzles are under construction for Mach numbers 1.5 and 3.0. Several strain gage instruments were constructed to measure rolling moments and hinge moments on models. A 60-tube 10-foot manometer for pressure distribution measurements was acquired.

Classified reports on sponsored research were made at frequent intervals, together with four unclassified reports for publication and one student thesis.

To minimize power charges, the tunnel was usually run between four p.m. and midnight. The acoustic treatment appears to have effectively suppressed external noise, and there have been no complaints from our neighbors.

Gas Turbine Laboratory. This laboratory, staffed jointly with the Department of Mechanical Engineering, is administered by the latter Department which will report on it. Professor Edward S. Taylor of this Department has continued as Director. The Conference on Aircraft Gas Turbines, held June 18 to 20 as part of the 1951 Summer Session, was attended by 123 guests from industry, the armed services, and other educational institutions.

Ten graduate students of this Department completed their thesis research in the Gas Turbine Laboratory under the supervision of Professors Taylor and Stever.

Instrumentation. Teaching has continued at substantially the same level as in the past three years, while research has been accelerated under the pressure of the critical world situation.

All operations have been under the general direction of

Professor Charles S. Draper with Professor Walter McKay in charge of unclassified work and Dr. Walter Wrigley in charge of classified activities. Unclassified teaching is principally done in Building 33; classified teaching and sponsored research occupy the Hood Building, part of the Whittemore Building, a part of Fort Heath and the Flight Facility at Bedford Airport.

Instruction in Instrumentation and Control has been given principally by Professors Charles S. Draper, Walter McKay, Robert C. Seamans, Jr., James E. Forbes, Dominic Amara, and Sidney Lees of this Department, and Dr. J. Halcombe Laning, Jr., of the D.I.C. staff. The number of different students enrolled in the various instrumentation courses was 76, of whom 23 were Air Force and Navy officers specializing in fire control. Out of this number, 26 students completed 15 theses, of which 3 were for the Doctor of Science degree in Instrumentation and the remaining 12 were for the Master's degree.

Eleven projects for the Air Force and the Navy were in progress and several were accelerated to meet the current threat to peace. All projects were in the field of precision fire control and air navigational equipment with particular emphasis on the development of new gyroscopic devices and the organization of complete systems. Several projects reached the production stage during the year. Progress on four systems is sufficiently advanced so that these systems are expected to be demonstrated during the coming year.

During the year the laboratory expanded considerably. Additional space was occupied in the Whittemore Building, and an annex was constructed for housing a high-precision Swiss jig borer. At Bedford, a hangar lean-to has been added. Both a jet and a small single-engine airplane have been acquired for laboratory use in addition to a Navy plane for Project Meteor.

Professors Dominic Amara, Sidney Lees, Yee J. Liu and Robert K. Mueller had part-time assignments in the Instrumentation Laboratory. Professor Seamans was relieved of supervision of a major project to assume general responsibility for Project Meteor as Chief Engineer. Research Assistants William B. Bryant, Kenneth Fertig, Ralph W. Gretter, David M. Keay, Benedict O. Olson, Norman E. Sears, Jr., and Robert

A. Summers were also members of the Instrumentation Group. The Laboratory staff has been expanded to meet the needs of the accelerated program. Currently there are 140 staff members, 270 non-staff members, and 53 engineers and draftsmen from the firm of Jackson and Moreland.

The year's work of the Laboratory has been recorded and distributed in approximately 70 classified reports. An aspect of some unclassified work of the laboratory was presented at the annual meeting of the Institute of Navigation in June, 1950, by Dr. Wrigley in a paper entitled "Fundamentals of Certain Navigational Equipment." Research Associate Yao-Tzu Li continued his research on optimizing control systems.

Dr. Charles S. Draper was awarded the Exceptional Civilian Service Award by the Secretary of the Air Force in recognition of distinguished service in development of fire control components and systems. Appropriate ceremonies were held in Room 10-250.

Outside Activities. The faculty of this Department continued to make their professional judgment and skill available to the government, professional societies, and industry. Among the more important and time-consuming services were the following:

Professor Holt Ashley: Organized Reserve, U. S. Air Force, Office of Deputy Chief of Staff for Research and Development; Leader of M. I. T. Squadron of Air Explorer Scouts (Boy Scouts).

Professor Raymond L. Bisplinghoff: National Advisory Committee for Aeronautics, Committee on Vibration and Flutter (chairman), Committee on Aircraft Construction; Armed Forces Special Weapons Project, consultant; American Society of Mechanical Engineers, reviewer for Applied Mechanics Review; Brooklyn Polytechnical Institute, guest lecturer.

Professor Charles S. Draper: Air Forces, Science Advisory Board; Department of Defense, Ordnance Committee of the Research and Development Board; consultant to Navy and to Air Forces.

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

Professor Jerome C. Hunsaker: National Advisory Com-

mittee for Aeronautics (chairman); Naval Ordnance Laboratory, Advisory Board; Smithsonian Institution, Board of Regents; Guggenheim Medal Board.

Professor John R. Markham: National Advisory Committee for Aeronautics, Committee on High-Speed Aerodynamics; Air Forces, Science Advisory Board, Advisory Board for Arnold Engineering Development Center; Institute of the Aeronautical Sciences, Aerodynamics Committee.

Professor Joseph S. Newell: American Society of Civil Engineers, Committee on Light Alloys, Column Research Council.

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

Professor Robert C. Seamans, Jr.: National Advisory Committee for Aeronautics, Committee on Stability and Control.

Professor H. Guyford Stever: Air Forces, Science Advisory Board, Guided Missiles Panel, Air Defense Systems Engineering Committee; Department of Defense, Guided Missiles Evaluation Committee of the Research and Development Board.

Professor Edward S. Taylor: National Advisory Committee for Aeronautics, Power Plants Committee (vice-chairman).

J. C. HUNSAKER

AIR SCIENCE DEPARTMENT

The immediate effect of the Korean situation on the Department of Air Science and Tactics was the authorization to enroll qualified seniors for a two-term Advanced Air Force ROTC Course in place of the usual four-term course. This authorization was later increased to include qualified juniors for a three-term course and seniors for a one-term course. In June, 118, rather than the original 32, graduates were commissioned in the United States Air Force Reserve. Major General James P. Hodges, Commanding General, First Air Force, presented the new officers with their commissions.

Because of differences between the Army ROTC and the Air Force ROTC curricula, instruction for the freshman was

separated to a large extent at the start of the spring term. This change anticipated the complete separation of instruction which will occur at the beginning of the 1951-1952 academic year.

In June, the Faculty approved the inclusion of a new training option, General Technical, for Advanced Course students. This option will be offered in addition to the Communications Option which is currently being taught. The two options will enable Advanced Course students to select the training which more closely corresponds to their academic course. It is anticipated that greater student interest will be gained by the addition of the new training course and that they will be better prepared, when called to active military service, to perform their assigned duties.

A tabulation of the Air Force ROTC enrollment is given below:

<i>Freshmen</i>	<i>Sophomores</i>	<i>Juniors</i>	<i>Seniors</i>
236	123	124	130

One hundred and ninety-nine members of the Class of 1954 were selected for deferment from Selective Service. Almost without exception, all other cadets have signed the agreement which defers them from induction as long as they remain in the Air Force ROTC and thereafter as long as they retain their Air Force Reserve commissions.

Officers assigned during the year were Major Joseph F. Gricius, Captain Clifford D. Coble, Captain Floyd Traynham, and Captain John F. Clearo. Officers leaving the detachment were Major Lyman R. Blake, Captain Dante V. Morel, and Warrant Officer Lucyan Lada. Because of the increased enrollment and changes in the curriculum, the personnel strength for the Air Force detachment has been increased to seven officers and eight airmen.

THOMAS U. LINEHAM, JR.

BUILDING ENGINEERING AND CONSTRUCTION

Revisions of Curriculum. The revised curriculum prepared by a staff committee was approved by the Faculty and goes into effect with the Class of 1954. It provides elective hours in the senior year so that students may continue their study of the Humanities, may elect additional professional technical

or business courses, or they may choose to avail themselves of the opportunity to work co-operatively with students in the Department of Architecture. These changes meet the requirements of the Faculty for the Humanities and the recommendations of our Visiting Committee for closer liaison with Architecture. The new curriculum retains the essential structure of the old but provides a rearranged sequence and minor revisions of individual course content.

Graduate Study. Professor Howard Simpson has completed his basic work for the doctorate in the field of structural analysis and presently is working on his thesis. Herman C. Fischer, Research Associate, and Thomas A. Hood, Instructor, were awarded their Masters' degrees; Robert G. Cheatham, Research Assistant, continued his studies for the doctorate in the field of plastics; Frederick J. McGarry, Research Assistant, continued his work for the doctorate in the Department of Mechanical Engineering; Joseph F. Cheatham, Research Assistant, started his work for the doctorate in the field of structural analysis; Werner H. Gumpertz, Instructor, continued his studies for the doctorate in economics and social science.

Staff Changes. Professor Howard R. Staley resigned at the end of the first term to accept a position with the government, and his duties were assumed by Werner H. Gumpertz and Thomas A. Hood; Professor Demitrios A. Polychrone, Thomas A. Hood, Steven Yurenka, Research Associate, Ray W. Shade, Research Assistant, left the staff at the close of the second term to take positions in industry.

Placement. Professor Staley supervised placement assistance during the fall term, and Thomas A. Hood took over these duties during the spring term. All graduates who did not enter the armed services or who were not continuing their studies were placed before graduation. The policy of direct contact assistance was continued with success.

Professional Staff Activities. Professor Albert G. H. Dietz continued his activities in the American Society for Testing Materials as Chairman of Committee C-19 and as a member of the Administrative Committee on Papers and Publications. He was again Chairman of the Committee on Plastics Education of the Society of the Plastics Industry. He became a member of the Committee of Rheology of the American Institute of Physics

and a member of the Committee for Structural Defense of the Commonwealth of Massachusetts. Professor James A. Murray carried on his activities in the American Society for Testing Materials on Committees C-7 and C-12. Professor Howard Simpson was recently made a member of the Committee on Prestressed Reinforced Concrete of the American Concrete Institute and acted as Associate Chairman for the First U. S. Conference on Prestressed Concrete held during August. Professor Walter C. Voss continued as Chairman of Committee C-7, Chairman of the Administrative Committee on Research, and worked on Committee C-12 and the New England Council of the American Society for Testing Materials. He continued as Chairman of the Building Code Committee of the American Institute of Architects; as a member of the Division of Industrial Research and Development and the Building Research Advisory Board of the National Research Council; and as consultant to the New York State Code Commission. He is a member of a Work Committee for the Massachusetts Special Commission on the Structure of the State Government. Werner H. Gumpertz acted as consultant to this Commission.

Talks and Papers. Professor Dietz spoke on "Solar Heating of Houses" to a joint meeting of the American Society of Heating and Ventilating Engineers and the Engineers Society of Milwaukee on October 29, 1950. He spoke again on the same subject to the Connecticut Chapter of the American Society of Heating and Ventilating Engineers at Bridgeport in December, 1950. He delivered a paper on the "Effect of Orientation on the Mechanical Properties of Polystyrene," which was written jointly with Robert G. Cheatham, to the annual meeting of the American Society of Mechanical Engineers in Toronto in June. Professor Voss acted as Chairman of the Research Session of the National Lime Association Convention at Hot Springs, Virginia, in May, 1951, and as Chairman of a "Symposium on the Development of Building Codes on a Statewide Level" at the Second Annual School of the Eastern States Building Officials Federation at New York City in February, 1951. He gave a paper on "Course Sequence and Its Educational Implications" at the annual meeting of the American Society for Engineering Education at Lansing, Michigan, in June, 1951.

Grants-in-Aid. Grants-in-aid from the National Lime Association, the Manufacturing Chemists Association (formerly the Plastic Materials Manufacturers Association), and Revere Copper and Brass, Incorporated, were again available.

The National Lime Association research program continued under the direction of Professor James A. Murray with the assistance of Herman C. Fischer and Ray W. Shade. Studies of the calcination of commercial limestones and of the basic chemical transformations in white coat plasters were continued. A start was made on the solution of the technical problems involved in the property of plasticity, as it effects cementitious materials.

The Manufacturing Chemists Association research program under the direction of Professor Albert G. H. Dietz with the assistance of Steven Yurenka, Frederick J. McGarry, and Robert G. Cheatham continued with studies on the effect of orientation of molecules by elongation upon the mechanical properties of polystyrene. The work on the measurement of the modulus of elasticity of thermosetting plastics while cured under heat and pressure was continued.

The Revere Copper and Brass, Incorporated, research program under the direction of Professor Walter C. Voss, assisted by Albert J. O'Neill, Instructor, Professor Demitrios A. Polychrone, and Joseph F. Cheatham, continued with a study of the structural behavior of circular gutter sections and the planning of the program to determine the stress-strain relationships which exist in concrete when tubing is used in radiantly-heated concrete slabs was started.

Division of Industrial Cooperation. Under the direction of Professor Albert G. H. Dietz and with the assistance of Robert G. Cheatham, the two projects sponsored by Army Ordnance, one on adhesives and the other on the behavior of solid rocket propellants, were continued.

Solar Energy. The recording of additional data on the small solar house was continued during the year. These continue to reinforce the conclusion that solar heat can be used successfully in this area.

WALTER C. VOSS

CHEMICAL ENGINEERING

The academic work of the Department has continued at approximately the same level as in the preceding year. There is some decrease in the student enrollment in the undergraduate school, but during the past year this reduction was largely in the sophomore and junior years which do not involve much instruction on the part of the Chemical Engineering staff. The smaller classes will begin to work into the senior year during 1951-1952, and we shall have fewer sections in some subjects than during the past few years. The graduate enrollment continues at a high level, being approximately one-fourth larger than in the prewar years.

Since the start of war in Korea, there has been a marked upswing in the demand for technically trained people, and at the present time we are far from able to supply all the chemical engineers that industry wants. During the postwar era, there has been a shift in the employment of our chemical engineers with the chemical companies taking a higher, and the petroleum companies a lower, proportion of our men. These two groups still take a large proportion of the graduates.

The School of Chemical Engineering Practice is now operating on a regular schedule which includes participation of both graduates and undergraduate students. Because of the large senior classes, facilities were used almost entirely by undergraduates during the spring term, and graduate demand for Practice School work during this period has been shifted to the Oak Ridge Engineering Practice School.

Work at the Oak Ridge Engineering Practice School continued to expand during the year with a total of 18 graduate students participating. This group included four mechanical engineers, and the remainder were chemical engineers. This Practice School is now an established part of operations at Oak Ridge, and contributions from the student work have become increasingly significant. Qualified students from other universities may participate in the work of the Oak Ridge Engineering Practice School, and one student from the University of Illinois has taken the program as a part of the work for his Master's degree. Two graduate engineers from the University of Michigan started work this June.

During the past year, the undergraduate curriculum in Chemical Engineering has been modified to allow the student more freedom in electives during his junior and senior years. The additional time was obtained by dropping the language requirement, although a student can take foreign languages as his elective.

The Department had an instructive session with the Visiting Committee, and the individual views expressed by the members of the Committee on the attitude the staff should take towards outside commitments during the present emergency were particularly helpful.

The Institute is establishing a program of study in nuclear engineering which, together with the Oak Ridge Practice School and other projects at the Institute, should give it a strong integrated program in this field. Initially the educational program in the field will be administered by the Department of Chemical Engineering; and Dr. Manson Benedict, who has been appointed Professor of Nuclear Engineering, will devote full time to this work. Subjects are to be offered in February of 1952, and the development of an integrated curriculum is planned.

The research activities of the Department continue at a high level. Work on mass transfer involved a large number of the students and the staff. These mass transfer problems covered many phases such as the study of simultaneous heat and mass transfer across aerodynamic boundaries in order to find the interaction between the two transfer processes. The problem of simultaneous mass transfer and chemical reaction in the absorption of gases and liquids is under investigation as well as a number of thesis studies on the fundamental mechanism of transfer in gases and liquids and between phases.

The Department is aiding in the supervision of research on soil solidification for the Corps of Engineers. This project has been developing for several years and is now taking on sizable proportions and appears likely to expand.

In the colloidal chemistry field, work is in progress on the effect of molecular weight distribution of the molecules on the elasticity of plastics. Such investigations are important in the development of new synthetic rubbers and plastics. Studies

are also in progress on the colloidal properties of compounds containing large quantities of silicon.

The work of the Fuels Research Laboratory is very active. This program involves various phases of combustion such as atomization, vaporization, and mixing; flame stabilization in high velocity streams including studies of homogeneous gas-air mixtures and liquid fuel sprays; combustion in vortex systems; micro-rocket studies; and coal gasification including studies of mechanism of reaction of thin layers of carbon with carbon dioxide and steam. The work of the Fuels Research group has grown to such an extent that a new combustion laboratory is to be built which will provide improved facilities. The new laboratory will be built as an additional floor on one wing of the Sloan Automotive Laboratory.

Heat transfer investigations were actively continued with particular emphasis on unusual conditions where adequate data are lacking. Emphasis is placed on measuring the variations in the local heat-transfer coefficients in order to obtain a fundamental insight into the processes involved. Recent investigations have included: heat transfer involving local boiling while the main bulk of the fluid is below the boiling point; heat transfer to steam at high pressures; heat transfer to boiling water up to the critical pressure; and measurements of the thermal conductivity of molten metals at high temperatures. Heat transfer under supersonic flow conditions is being investigated under a joint project with the Mechanical Engineering Department.

A number of the staff supervised investigations in various aspects of applied industrial chemistry. These cover a wide range of topics such as the synthesis and investigation of hydrogen polysulphides, particularly hydrogen disulphide; the effect upon reaction rates of ultrasonic and microwave radiation; the interconversion of various optical and geometric isomers, such as glutamic acid and cresols; the preparation of hydrogen peroxide by the use of barium and calcium peroxide; the use of metal oxides as oxygen carriers for the oxidation of hydrogen, coke, sulphur vapor, and iron sulphide; polymerization of olefins, and the reaction of olefins with alcohols.

Methods for estimating and correlating physical data are a continuing study which involve such fields as P-V-T relations

of gases and other thermodynamic quantities which can be derived from such data; interphase equilibria involving solubilities and vapor-liquid equilibria; and the prediction of chemical reaction equilibria for gases where basic thermodynamic data are not available.

A program on methods of preparing, and characteristics of, hydrogen peroxide is under way with the financial support of the U. S. Navy. These studies involve investigations of the explosive characteristics of hydrogen peroxide including measurements of the ignition limits, the initiation characteristics of explosions, and the effect of various diluents on the explosive characteristic. It has been shown that the rate of decomposition of hydrogen peroxide vapor on an active catalyst surface is controlled by the rate of mass transfer, and the results agree closely with those predicted from correlations of heat and mass transfer rates.

The program on mechanics of fluidized powder operations has continued. This program involves studies of the operating conditions, entrainment, heat and mass transfer, and gas and solid massing in fluidized beds.

During the past year, Professor Warren K. Lewis received an honorary Doctor of Science degree from Harvard University, and Professor Edwin R. Gilliland received the Professional Progress Award in Chemical Engineering presented by the American Institute of Chemical Engineers.

E. R. GILLILAND

CIVIL AND SANITARY ENGINEERING

During the past year the total enrollment of students in the Department has remained at last year's high level, as summarized in the following table:

<i>Date</i>	<i>1st Year Civil</i>	<i>2d Year Civil</i>	<i>3d Year Civil</i>	<i>4th Year Civil</i>	<i>Graduate Civil</i>	<i>Graduate Sanitary</i>	<i>Total Department</i>
September 19, 1949.	56	49	61	57	54	21	298
October 23, 1950.	56	56	58	57	50	22	299

This enrollment now constitutes 5.78 per cent of the total Institute enrollment, as compared to 5.40 per cent a year ago.

The Department Seminar Program was continued with six meetings each term which were addressed by leaders in

Civil and Sanitary Engineering. This program was co-ordinated by a committee headed by Professor Myle J. Holley, Jr.

The Student Chapter of the American Society of Civil Engineers, for which Professor John M. Biggs is faculty adviser, was awarded a certificate for meritorious conduct of its affairs.

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

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

Structural Division. The research program being conducted by this division includes a project under the direction of Dr. Robert J. Hansen for the Office, Chief of Engineers of the Department of Defense, on the behavior of structural elements under impulsive loads; a project supervised by Professor Myle J. Holley, Jr., for the Office of Naval Research on the development of techniques for the measurement of static and dynamic stresses in cementitious materials; a project supervised by Professor John M. Biggs for the Corps of Engineers on the action and failure of bridges under high velocity surge winds; a project for the Corps of Engineers, involving the conduct of certain portions of Operation Greenhouse in the Marshall Islands, during which four staff members, including Dr. Hansen, spent extended periods at the site; and a special classified project for the Corps of Engineers. Under Dr. Charles H. Norris, the project for the Welding Research Council on the elastic stability of welded struts and flexural members has continued.

Dr. John B. Wilbur was elected President of the Boston Society of Civil Engineers in March. Throughout the year he served as Chief Engineer for the Design of the Boston Central Artery and as consultant to the Armed Forces Special Weapons Project and to the Corps of Engineers, for whom he visited the Marshall Islands in connection with Operation Greenhouse.

Dr. Norris was promoted to the grade of full Professor. He served as consultant to both the Corps of Engineers and the Armed Forces Special Weapons Project. In October he presented a paper to the American Welding Society.

Professor Eugene Mirabelli served as a member of the Brace Research Committee at the Massachusetts General Hospital, accepted appointment on the Building Code Committee for the City of Cambridge, and was consultant on the design of a Navy airplane hangar.

Professor Holley was co-ordinator for the First United States Conference on Prestressed Concrete. In this endeavor, this Department was joined by the Departments of Building Engineering and Construction and of Architecture. The Conference was co-sponsored by the American Society of Civil Engineers, the American Concrete Institute, the American Institute of Architects, the Associated General Contractors of America, the American Railway Engineering Association, and the Portland Cement Association. This three-day conference, held at the Institute in August, 1951, was extraordinarily successful, and is believed to have been a milestone of importance in the development of construction in this country.

Dr. Hansen continued his consulting activities for the Air Force, the Directorate of Intelligence, the Armed Forces Special Weapons Project, and the Sandia Corporation. He accepted appointment on the Structural Protection and Fire Service Committees of the Governor's Defense Council, as well as on subcommittees of the Column Research Council and the Engineering Mechanics Division of the American Society of Civil Engineers.

Dr. John S. Archer was promoted to the grade of Assistant Professor.

Hydraulics Division. In June the new Hydrodynamics Laboratory was dedicated; the dedication being combined with a three-day symposium on the Role of Hydrodynamics in Modern Technology. There were 312 participants including 75 from the Institute. Arranged by Dr. Arthur T. Ippen, this program was a fitting ceremony for the official opening of this splendid new laboratory that provides the Institute with a setting capable of meeting the needs of a great center of hydrodynamics on the east coast.

Research conducted by this division includes the following under the direction of Dr. Ippen: a project, supervised by Dr. Donald R. F. Harleman, for the United States Air Forces on the hydraulic analogy to supersonic flow; a project, super-

vised by Dr. James W. Daily, for the Office of Naval Research, investigating fluid friction and cavitation phenomena in unsteady motion; a project for the Office of Naval Research on an experimental investigation of a solitary wave; a project for the United States Public Health Service, on securing greater efficiency in the solution of oxygen from the air supplied in the activated sludge process for sewage and industrial waste treatment; and a project, supervised by Dr. Henry M. Paynter, for the Research Corporation on transient stability of non-linear systems using electronic analog computation methods.

Dr. Ippen organized a symposium on Electronic Analog Computers for the American Society of Civil Engineers, gave two lectures at a symposium on Fluid Mechanics and Aerodynamics at the University of Michigan, gave three of the John R. Freeman Lectures in Applied Hydraulics for the Boston Society of Civil Engineers, and participated in the Gravity Waves Symposium of the Bureau of Standards. He wrote six technical publications and served on seven technical committees including the Executive Committee of the newly formed Engineering Mechanics Division of the American Society of Civil Engineers.

Professor Allan T. Gifford gave a series of lectures for the Water Works School of the New England Water Works Association.

James W. Daily participated in the John R. Freeman Lectures, was a member of three technical committees, and research secretary of the Hydraulics Division of the American Society of Mechanical Engineers. He also became a member of the Office of Naval Research Advisory Committee for Hydrodynamics.

In addition to supervising the research project for the Army Air Forces, Dr. Donald R. F. Harleman wrote two technical papers and participated in the Gravity Wave Symposium of the Bureau of Standards.

Dr. Henry M. Paynter was promoted to the rank of Assistant Professor.

During the spring, Dr. Karl R. Kennison, who recently received the New England Award for outstanding engineering services, joined the staff as special lecturer and conducted the Hydrodynamics Seminar as a series of lectures on hydraulic structures.

Sanitary Division. The Sedgwick Laboratories of Sanitary Science have been working at full capacity for the past year. The research project for the Atomic Energy Commission has been expanded to include two phases of the sanitary engineering aspects of radioactivity. The first phase, under the direction of Dr. Rolf Eliassen, has been under investigation for two years and has been concerned with the removal of radioisotopes from water supplies by various treatment processes. The second phase, under Dr. Clair N. Sawyer, includes a study of the effects of radioisotopes on the biochemical stabilization of organic matter in polluted streams. Dr. Sawyer's two research grants from the National Institute of Health have been continued, one on the study of the nutritional characteristics of aerobic fermentation processes, and the other on the development of the biochemical oxygen demand test for sewages and industrial wastes. Dr. Murray P. Horwood also has two research grants from the National Institute of Health. The one on the study of the mechanism of the destruction of bacteria by ultrasonic vibrations has been continued for a second year. A new project has been initiated in the biology and biochemistry of the activated sludge process.

Dr. Eliassen participated in four engineering conferences and was active in professional societies; he was elected a member of the Executive Committee of the Sanitary Engineering Division of the American Society of Civil Engineers. He has also served as consultant to the Surgeon General of the United States Public Health Service and the Metropolitan District Commission.

Dr. Horwood was awarded a World Health Organization Fellowship to study teaching, research, and practice in environmental sanitation in Europe during the summer of 1951.

Professor William E. Stanley was elected Chairman of the Sanitary Section of the Boston Society of Civil Engineers in March.

In addition to supervising an extensive research program, Dr. Sawyer has been active in the work of professional societies.

During the year a special seminar was devoted to the field of industrial hygiene. The seminar was under the direction of Dr. Harriet Hardy, Assistant Director of the Medical Department, and included various specialists in the field of occupa-

tional medicine and industrial hygiene. With increasing demand on the part of industrial concerns for sanitary engineers with broad education in the many facets of environmental sanitation, it has become necessary to include Industrial Hygiene in the curriculum.

Soil Mechanics Division. The Soil Solidification Research Project, sponsored by the Engineer Research and Development Board of the Army Engineers and aimed toward the development of a chemical method of bonding soil particles together to make a surface satisfactory for the support of military vehicles, has continued during the year; and further significant progress has been made. This project is guided by a committee of which Dr. Harold C. Weber of the Department of Chemical Engineering is Chairman. Dr. T. William Lambe is Supervisor. Further research by this division included a project under Professor Donald W. Taylor for the Corps of Engineers, on laboratory tests with triaxial compression and direct shear equipment. A new project, under Professor Taylor, for the Armed Forces Special Weapons Project and dealing with the effect of dynamic loads on soils, has been initiated.

Professor Taylor has continued as Secretary of the International Society for Soil Mechanics and Foundation Engineering and as Chairman of the Committee on Subsoils for Boston, for the Boston Society of Civil Engineers. In October Professor Taylor attended a one-week conference in Paris for the formation of a union of international engineering organizations. He has also been consultant for the Office, Chief of Engineers, and for the Waterways Experiment Station.

Dr. Lambe published a textbook, "Soil Testing for Engineers," as well as two papers dealing with soil solidification.

Dr. Harl P. Aldrich, Jr., was promoted to the grade of Assistant Professor.

Transportation and Surveying Division. In September, with Professor Alexander J. Bone as co-ordinator, this Department, together with the Department of Aeronautical Engineering and with the Port of New York Authority, the Civil Aeronautics Administration, and the Massachusetts Aeronautics Commission as co-sponsors, conducted a three-day conference on Ground Facilities for Air Transportation. The

conference was attended by 180 engineers, administrators, and planners concerned with airports. The proceedings of the conference have been published and distributed widely throughout the United States and many foreign countries.

Professor John B. Babcock continued his outstanding work as Placement Adviser for the Department. The number of positions available for both Civil and Sanitary Engineering graduates has been the largest for many years and has far exceeded the number of graduates available; the placement problem has been primarily that of serving potential employers as effectively as possible to maintain these contacts for future years. The program for summer placement has likewise been most effective. As of June, all students in this Department desiring work in engineering or construction for the summer had positions.

During the year a co-operative research project in the field of Highway Engineering was set up between the Institute and the Massachusetts Department of Public Works. Work on this project, which is under the direction of Professor Bone, has just been initiated.

For the first time since the war, it was possible to operate the Summer Surveying Camp at East Machias, Maine, during a single session of seven weeks. The camp, with Professor Herman J. Shea as Director and Professor Allan T. Gifford as Executive Officer, had an enrollment of 89 students and enjoyed a successful season.

Professor Shea served as Chairman of the Surveying and Mapping Section of the Boston Society of Civil Engineers.

JOHN B. WILBUR

ELECTRICAL ENGINEERING

The past year has been one of increasing departmental responsibilities occasioned by the accelerating defense effort and the relevance of electrical technology to this effort. In spite of the decrease in student enrollment in Electrical Engineering to 900 this year from 996 in the fall of 1949, the department is under- rather than over-staffed because of the demands made on our faculty by the many sponsored research projects and by the government and other outside agencies.

To assure adequate consideration of over-all policy in a large, widely varied, and rapidly changing departmental activity, Dr. Gordon S. Brown was appointed to the new administrative post of Associate Head of the Department. Experience during this year confirms the soundness of this action.

To provide appropriate emphasis on educational program in a period of heavy demands on staff, and in line with the broad Institute faculty thinking on education, a department Committee on Educational Policy was initiated with Professor Gordon S. Brown as chairman. This committee is charged with continuing responsibility for the nature and quality of our academic program at both the undergraduate and graduate levels. This program includes not only educational objectives and their expression in subject and curriculum content, but also those elements within the department's control that influence the professional growth and development of our students.

Two recent deaths touch the department and its alumni deeply, those of Edward L. Moreland on June 17, 1951, and Dugald C. Jackson on July 1, 1951. Both were former heads of the department and for many years partners in the consulting firm of Jackson and Moreland, Engineers.

Professor Jackson was an engineering educator of world renown. He was head of this department from 1907 to retirement in 1935. Among his specific contributions at M. I. T. were the establishment of the Co-operative Course VI-A under the direct leadership of Professor William H. Timbie, with features marking it as a new and important milestone in the area of co-operative education carried through the graduate level. In addition, Professor Jackson led in the development of graduate study and research in the department. He originated an Honors Group program of study whereby high-standing students were relieved of formal class responsibilities and encouraged to develop breadth as well as depth in their education by wide reading and study under the guidance of counselors. Professor Jackson arranged yearly a series of colloquia wherein noted engineers visited the Institute and discussed with our students the manner in which they solved current engineering problems. He was a prominent contributor to engineering and engineering education nationally and internationally.

Dr. Moreland was head of the department from Professor Jackson's retirement in 1935 until he was appointed Dean of Engineering in 1938. Prominent as a practicing engineer, he brought to the department notable wisdom and insight— influences continuing throughout his years as Dean of Engineering and Executive Vice-President.

The Co-operative Course, under Professor Eugene W. Boehne, reports increased demand for men with graduate training and practical experience. A dozen prominent firms are now seeking to join the VI-A co-operative training program, and only lack of available students prevented additions of new companies this year. A total of 145 men are training with eight industrial companies.

In March, Mr. Harry A. Kuljian, '19, made a gift to the Institute of two annual prize scholarships worth \$500 each. Mr. Kuljian set up these scholarships because he is anxious that engineers be as able in their relations with people as they are with technical matters. Candidates for the scholarship are to have shown unusual professional promise; winners must take two additional electives in the humanities and social studies during their senior year. This year one of the two scholarships was awarded to Mr. Herbert M. Teager, and honorable mention went to Mr. John T. Fitch, both of whom were Juniors in the department.

Professor Thomas F. Jones, Jr., who was given responsibility for the Electrical Measurements Laboratory upon the resignation of Professor Richard Taylor, is conducting a comprehensive search for new teaching materials and techniques for work in applied measurements. An element of choice in selecting laboratory exercises is being given the students, with the thought that they will do stimulated work with those applications of particular interest to them.

The Corporation Visiting Committee, under the Chairmanship of Dr. Vannevar Bush, at its meeting this year found the Department to be in sound condition and making excellent progress despite difficult circumstances. It was enthusiastic about the senior elective "Case Studies in Engineering Practice," which was taught this year by Mr. Richard Kriebel of the Polaroid Corporation, and recommended extension in scope of this type of subject and in the number of students partici-

pating. The Committee stressed the importance of undergraduate teaching and felt that the Institute must give recognition for good teaching and provide real opportunity for satisfying careers for primarily undergraduate teachers.

The Dugald Caleb Jackson Room, whose dedication was mentioned in last year's report, has been in continuous use during its first year for departmental and Institute functions, thus clearly demonstrating the value of such a gracious facility.

For more than 25 years the Department has been increasingly active in the development and application of large-scale computing machinery. This activity has been accompanied by the growth of a teaching program based upon machine research in the Center of Analysis and in the Digital Computer Division of the Servomechanisms Laboratory. During the past year the individual subjects were organized and regrouped in order to offer, in co-operation with other departments, a graduate program in the field of Automatic Computation and Numerical Analysis.

Mr. Alistair E. Ritchie, of the Bell Telephone Laboratories, served as a Lecturer during the first term and presented a new subject of instruction in the design of control equipment using components of the relay or off-on type found in automatic telephone systems. Emphasis was placed on the general applicability of the techniques and equipment, to the solution of control problems in a wide variety of engineering situations.

Promotions, resignations, and additions to the staff during the year were as follows: William H. Radford was promoted to the grade of full Professor; Donald P. Campbell and Robert M. Fano were made Associate Professors; and Jordan J. Baruch, Elery F. Buckley, James M. Ham, F. Ralph Kotter, Ronald E. Scott, and Albert B. Van Rennes were promoted to Assistant Professors. Professor Ivan A. Getting was granted a year's leave of absence to be a Special Consultant to the Army Air Force in Washington. Professor Joseph C. R. Licklidge transferred to the Department of Economics, but will continue his interdepartmental functions in the areas where human psychology and physiology intermingle with electrical engineering in the basic problems of communications. Dr. Walter A. Rosenblith was appointed Associate Professor of Communications Biophysics, to teach and conduct research in this broadly

construed field of communications. Dr. Osman K. Mawardi was appointed Assistant Professor to teach and work with Professor Leo L. Beranek's group in the Acoustics Laboratory.

In anticipation of continued and growing interest in the theory and practice of feedback control systems, the academic staff of the Servomechanisms Teaching Laboratory planned, during the spring of 1950, a general expansion and renovation for both classroom and laboratory course content. Their aim has been to upgrade the graduate theory subjects, add facility for process control research to the existing laboratory equipment, and encourage comprehensive and elevated graduate theses in the new area.

In December, a conference entitled, "Seminar on Modern Process Control Techniques," was presented as part of the Industrial Liaison Office service to the members of industry who have supported the M. I. T. Development Program. Approximately 60 industrial people, representing a wide cross section of American production, and about 25 M. I. T. faculty and research staff members attended. There have been frequent follow-up requests by many industries which were represented at this conference for information, assistance in locating manpower, and in a few instances, for special enrollment of their men in the department's subjects of instruction.

Under personal notes and accomplishments may be mentioned the following: Professor Gordon S. Brown was elected Chairman of the Faculty. Professor Brown also was chosen to be the inaugural speaker of the technical delegates at the Conference on Automatic Control held in England. Professor Donald P. Campbell received the annual Eta Kappa Nu award as the "Outstanding Young Electrical Engineer of 1950," the first time a member of the M. I. T. staff has won this important distinction, although four of the Department staff have previously received Honorable Mention. Professor Harold L. Hazen was named Chairman of the Engineering Education Mission to Japan, requested by the Supreme Commander Allied Powers (Japan), under the auspices of the American Society of Engineering Education (professional responsibility) and the Unitarian Service Committee (administrative responsibility under Army contract). He flew to Japan with his fifteen-man group for the months of July and August. Professor Hazen also was

appointed Chairman of the Region II Committee for Undergraduate Engineering Curricula of the Engineers Council for Professional Development. Professor Robert M. Fano served as Chairman of the Institute of Radio Engineers symposium on education entitled "Matching Schools and Industry." Professor Leo L. Beranek supervised the engineering design of the largest acoustic muffler in the world for the National Advisory Committee on Aeronautics in Cleveland, Ohio. Professor Truman S. Gray served as Chairman of the Subcommittee on Organization of the American Institute of Electrical Engineers Committee on Instruments and Measurements. Professor Harold E. Edgerton was appointed a Consultant for the Terminal Ballistics Laboratory at Aberdeen Proving Ground, Maryland. He also participated in the atomic bomb tests at Eniwetok this past spring. Professor Arthur R. von Hippel served during the past year as Chairman of the Solid States Physics Division of the American Physical Society.

Again this year the department had visitors from the United States and from various foreign countries. The following were appointed Guests of the Department of Electrical Engineering: Professor Harold W. Bibber, from Union College; Dr. Johannes C. R. Heydenrych, of South Africa; Mr. Christopher F. Knapp, of England; Dr. Renato Malvano, of Italy; Mr. Thomas F. Porter, of England; and Dr. Lucio M. Vallese, from Duquesne University.

Staff members of the department continue to play important roles in the large number of sponsored research projects. Some of the highlight research activities, in addition to the interdepartmental Acoustics Laboratory, the Laboratory of Nuclear Science and Engineering, the Research Laboratory of Electronics, and the Dynamic Analysis and Control Laboratory, which are reported separately, are as follows:

The Stroboscopic Laboratory, under Professor Harold E. Edgerton, continues to develop new methods for producing and measuring flashing lights, thus advancing the science in this widely used art. During the past year Dr. Edgerton and his associates have developed a magneto-optic shutter for photographing self-luminous objects at speeds from 2 to 20 microseconds. Perfection of practical models of this shutter is one

goal of this laboratory, while another is the development of equipment for generating increasingly short flashes of light.

The Electronic Nuclear Instrumentation Group, under Professor Truman S. Gray, has been engaged in research on instrumentation needed by the Nuclear Shielding Group in the Department of Physics and in developing new instruments useful in other nuclear work. During the past year, proton-resonance magnet-control equipment for the Van de Graaff generator in Building 46 has been completed. This equipment utilizes the phenomenon of proton resonance for measurement and control of the field strength in a large analyzing magnet. A precision of one part in 20,000 is obtained. Since the magnetic field is a reference quantity for the accelerating-voltage control system, particle energies can be adjusted and maintained to an approximately equal precision. Only recently has proton resonance been recognized as an indispensable tool for measurement and control of magnetic fields. Through its use, the problem of error measurement in magnetic-field regulation is reduced to one of frequency measurement for which extremely precise methods are available.

The Laboratory for Insulation Research, under the direction of Professor Arthur von Hippel, has added to its fundamental research on the dielectric properties of matter by initiating a program of applied dielectric research. The objective of this additional task is not the perfection of devices but investigations as to the applicability of the new insight gained in the fundamental research effort. Work has begun on the shaping of the hysteresis loops of ferroelectrics and ferromagnetic semiconductors, on field emission into solid dielectrics, and on an improved method of storage of electric energy. A summer course of ten days on the "Theory and Applications of Dielectric Materials" is contemplated for 1952.

The Servomechanisms Laboratory, under Professor Gordon S. Brown, has been occupied during the past year with a number of different projects. Under the sponsorship of the Air Forces Armament Laboratory of the Air Materiel Command, fundamental studies in Fire-Control Systems, characteristics of the magnetic-particle clutch, and characteristics of radar noise, have been continued. A 10-horsepower magnetic-particle clutch designed to test the suitability of such a device for an

aircraft turret drive is under construction. The design of this clutch is based on fundamental studies of clutch properties made during the past few years in the Servomechanisms Laboratory. Work has been essentially completed on the design and construction of a complete instrumentation system for determining the effectiveness of an air-borne fire-control system in the air. This equipment includes seven extremely high performance instrument servos and a special binary coding device. An engineering study directed toward the development and construction of special control valves for the Westinghouse Electric Corporation was completed, and a similar study for a different type of valve control mechanism has been undertaken under the sponsorship of the E. I. du Pont de Nemours Company. A fundamental study of process instrumentation and control techniques as applied to a distillation process is continuing. Construction and test of a working pilot model of a system applicable to machine tools for controlling the position of cutter elements by means of digital information on a punched tape is a major activity nearing completion. It is expected that demonstrations of the principles involved utilizing a standard contour milling machine will begin very shortly.

The Electronic Digital Computer Laboratory, under Mr. Jay W. Forrester, has been operating the Whirlwind Computer for M. I. T., the Office of Naval Research, and the Air Force, while expanding facilities for broader scientific and military problems. Industrial and academic interest in Digital Computation is developing rapidly. The Laboratory has been participating in the Institute's Machine Computation and Numerical Analysis Program through graduate subjects, teaching laboratory practice on the computer, and employment of graduate student research assistants. The Office of Naval Research sponsors free computer time for engineering and academic research at and outside of M. I. T. Along with heavy defense research commitments, the Laboratory continues studying computer applications in petroleum industries and developing advanced digital computer components.

In conclusion, although research in the interdepartmental laboratories is reported separately, they play a vital part in the Electrical Engineering research and graduate teaching programs. Any over-all picture of this department's activities

must therefore include the relevant parts of the reports of these laboratories.

HAROLD L. HAZEN

GENERAL SCIENCE AND GENERAL ENGINEERING

Curricula in General Science and General Engineering have long been a part of the Institute program under Course IX. The general purpose of this course has been to allow students with special purposes other than those fitting within the framework of the major scientific and engineering departments to pattern curricula suitable to their needs. Thus a greater degree of freedom of choice under faculty guidance has been open to students.

Beginning in the fall term of 1951, a new option is being added to Course IX. The Institute has long felt that as a center of scientific and engineering education it has an obligation to the secondary schools which supply it with students to assist in developing adequate teachers of science and mathematics at the secondary level. The Institute, together with the Graduate School of Education of Harvard University, is inaugurating a joint five-year program of study for young men and women intending to enter teaching professions.

The curriculum leads to the degrees of Bachelor of Science in General Science, at M. I. T., and Master of Arts in Teaching, at Harvard, both degrees being awarded at the conclusion of the five-year period.

The undergraduate part of the curriculum is largely at M. I. T., although some of the Harvard courses begin as early as the third year. Thus, for the third, fourth, and fifth years, the student will be taking courses concurrently at both of these neighboring institutions and can draw on the educational resources of both.

During the first two years which are wholly at M. I. T., the student gains a solid foundation in mathematics, physics, chemistry, and biology. In the more advanced scientific part of the curriculum, he further emphasizes one of the major fields and, in addition, follows a flexible program adapted to his individual interests and chosen from among such diverse fields as genetics, embryology, conservation, geology, and economic geography.

The professional studies in the Harvard Graduate School of Education include Educational Psychology and Measurements, History of Education, and Philosophy of Education, as well as courses in the teaching of mathematics and science. In his fifth year, each student carries on supervised teaching in nearby high schools, under the direction of the Faculty of the School of Education.

An important element of flexibility is introduced through the fact that all of the first year work and much of that in the second year coincide with that taken by all M. I. T. undergraduates. Thus students undecided whether their ultimate interest will lie in teaching or in other aspects of science, engineering, or architecture can embark upon the program and reserve decision as to their final choice of field until they have had a year or more at M. I. T. Continuation in the later stages of the program will be limited to those who, in the opinion of both institutions, show promise of aptitude for a teaching career.

In undertaking this joint project, both institutions have been influenced by the key importance of secondary school teachers in our society. It is their hope that as a result of this step, more young people of outstanding ability will be attracted into the teaching profession. At present, the production of teachers of high caliber and adequate training falls far short of the demand, particularly in the various areas of science and mathematics. There is every indication that this situation will grow more acute in the next decade. The project is intended to help alleviate this shortage by increasing the number of able teachers who are qualified to an exceptional degree, both in the breadth of their outlook and in the excellence of their professional training.

JOHN T. RULE

GRAPHICS

During the year the Section of Graphics introduced a new course in Advanced Graphics. The course is devoted to graphical theory and the development of graphical methods of attack on physical problems. The staff feels that this is a significant step forward in developing a greater knowledge of

the power and insight of graphical methods. The course was taught by Mr. Steven A. Coons.

The Section has suffered an irreparable loss in the death of Associate Professor Earle F. Watts. Professor Watts had been teaching in the Section 26 years and was the guiding spirit in the development of the Section's work in pure graphics. Until his death he designed all the courses given by the Section. He was a constant inspiration to all the staff.

JOHN T. RULE

MECHANICAL ENGINEERING

General. The fundamental premises for the curriculum in Mechanical Engineering, which were worked out with the Visiting Committee last year and presented in last year's report, have now been put into concrete form; and the first modification of the curriculum in this direction has been put into effect during the year. This change involves a greatly expanded option system for the fourth year as well as elective time for an additional humanities subject. The proposed option arrangement involves eight groupings of professional electives covering the fields of Power, Air Conditioning and Refrigeration, Materials and Materials Processing, Design, Internal Combustion Engines, Production, Textiles, and Jet Propulsion. To make this arrangement possible, the subjects of Metals Processing (3.12), Strength of Materials (2.081), and Heat Engineering (2.43), formerly required of all students, have been changed to elective subjects, appearing only in the appropriate option.

The development of new and vital professional subjects has been particularly active in recent years in the Department of Mechanical Engineering. The new curriculum will give greater scope to the interest and enthusiasm of the students in these new subjects. Above all, the proposed change has the object of making the professional part of the curriculum, which will remain under constant appraisal, dynamic in character.

The Visiting Committee of the Department, under the chairmanship of Mr. Frederick S. Blackall, Jr., met on December 15, 1951, and discussed this proposal in considerable detail. The Committee gave its strong endorsement to the new curricu-

lum. At this time the Visiting Committee also discussed the next phase of the curriculum revision, which will involve modification of the second and third years. This proposes a reduction in Applied Mechanics and Fluid Mechanics, which will restore the balance between these subjects and Heat Engineering. These changes also stem from the fact that the Department now has available many professional subjects of high standards. Some of the instruction which in the past was conveyed directly through fundamental subjects of Applied Mechanics or Thermodynamics will in the future reach the students through the vehicle of applied professional subjects, to which it is hoped they will apply more interest and enthusiasm. It is a part of the principle that professional education is best conveyed in close conjunction with the creative work of the staff.

During the year Professor Egon Orowan has organized two new subjects in his specialty, the physical properties of solids. These courses have attracted a wide audience from several departments of the Institute. During the year Dr. Orowan's major research efforts have been directed towards the establishment of his laboratory and the installation of several new pieces of equipment. Effective July 1, 1951, Dr. Orowan was appointed Westinghouse Professor of Mechanical Engineering.

Several other major developments in the educational program will be discussed in greater detail in connection with the activities of the Divisions. The most noteworthy of them are the new developments in laboratory instruction under Professor William A. Wilson, a new venture in industrial design under Professor John E. Arnold, and the rapid development in the subject of metal cutting under Professor Milton C. Shaw.

The academic year just finished marks the graduation of the first group of students to participate in Course II-B, the new co-operation program under the direction of Professor William M. Murray. Interest among students and companies remains high. In spite of the smaller number of students in the junior year, the percentage enrolled in Course II-B has increased slightly, and we have been able to participate with the same number of companies and government agencies as last year. More companies are interested in taking part in the

program and would do so if a greater number of students were available. For the first time, we are now attracting students in the combined plan with other colleges to take part in the co-operative program.

The Placement Officer of the Department, Professor Arthur L. Townsend, reports that the senior class as a whole had more numerous interviews and job opportunities than ever before. As a result, there has developed on the part of the students an indifference to the formalities of the placement service which we must strive to correct in the future.

The enrollment of graduate students in Mechanical Engineering continues at a fairly high level, but a falling off in the number of applications is discernible. The number of graduate programs in Mechanical Engineering in the United States has increased rapidly in recent years, and we expect that the competition for outstanding students will become even keener in the future.

Under the leadership of a number of students and Professors John E. Arnold and Kenneth R. Wadleigh, the Senior Registration Officers, a very active student-faculty program was carried on which contributed much to the student-faculty relations within the Department.

The following major changes of personnel took place during the year. Professor George W. Swett retired after having served five years half-time. Professor Swett can look back upon 48 years of invaluable service to the Institute. This unusual service continued into the last five years, when his sympathetic advice and understanding have been of constant help to us in the rapid transition which has taken place during this period.

Professor William R. Hawthorne resigned to accept a chair (Hopkinson and Imperial Chemical Industries Professorship of Applied Thermodynamics) at Cambridge University. During his short association with the Institute, Professor Hawthorne has made a most noteworthy contribution not only to the Department but to the Institute as a whole. The Westinghouse Professorship of Mechanical Engineering, thus becoming vacant, has been filled by the appointment of Dr. Orowan, as noted above.

Professor John T. Burwell, Jr., resigned his position with

the Institute to join an industrial corporation on July 1, 1951. During his period at the Institute Professor Burwell carried on an outstanding program of research in lubrication and surface phenomenon of metals. This has had enthusiastic sponsorship from the Chrysler Corporation since 1939, during which period a great many outstanding results have been obtained.

Other resignations are as follows: Professors Pei-Moo Ku, George L. Nelson, and Charles O. Smith, and Mr. Fredman J. Walcott. The following are on leave for one year: Professor Robert H. Eustis, to Thermal Research and Engineering Corporation, Conshohocken, Pennsylvania, and Professor Nicholas Grossman, to the M. W. Kellogg Company, New York. During the year Professor David I. Sinizer left the department to join the staff of the Industrial Liaison Office.

New appointments for the academic year 1951-1952 include Arthur D. Brickman, formerly of Pennsylvania State College, Stanley Backer, Robert C. Dean, Jr., and Chien Tse Yang, as Assistant Professors.

Professor Joseph H. Keenan spent six months as a Fulbright lecturer at the University of Cambridge and at the Imperial College of Science and Technology during the year. In addition to a series of lectures at each of these institutions, he attended one of the Touchstone Conferences on Education at Imperial College. He was a delegate to the celebration of the fifth centenary of the University of Glasgow and also made several visits to industries in England and France. He was invited to give lectures at the Universities of Bristol, Nottingham, and Liverpool.

Professor Robert H. Macmillan of the University of Cambridge, England, spent the academic year here and participated as a full-time staff member in the instruction program of the Department. He also gave a special course on servomechanisms and completed the publication of a book on the subject, entitled *The Theory of Control*. His services to the Department were very effective and much appreciated. During the same period Professor Norman H. Dahl took Professor Macmillan's place at Cambridge University. This is the second exchange of this kind we have had with England. The results have been outstanding in stimulating the activities of both staff and students.

In February, 1951, Professor C. Richard Soderberg was awarded the honorary degree of Doctor of Technology by the Chalmers' Institute of Technology in Sweden, his Alma Mater. Professor Edward R. Schwarz was the recipient of the Harold DeWitt Smith medal presented by the American Society of Testing Materials Committee D-13 (Textiles). Professor Jacob P. Den Hartog has been awarded the Worcester Reed Warner Medal of the American Society of Mechanical Engineers to be presented at the annual meeting of the society in November. Professor Samuel C. Collins was awarded the J. P. Wetherill Medal of the Franklin Institute.

Professor Soderberg has continued to serve as Chairman of the Division of Engineering and Industrial Research of the National Research Council, as Chairman of the Panel on Fuels and Propulsion of the Scientific Advisory Board to the United States Air Force, and as a member of the Scientific Advisory Committee on Selective Service. He is also serving as a member of the Medals Committee of the American Society of Mechanical Engineers.

Applied Mechanics Division. Study of the curriculum has continued with a view to changes which may be put into effect next year, reducing the applied mechanics program by one term.

Professor Jacob P. Den Hartog completed a book, *Advanced Strength of Materials*, which is now in press and which will appear early in 1952. Professor Den Hartog was appointed a member of the Aviation Technical Advisory Board to the Army Ordnance Department in Washington.

Fluid Mechanics. The graduate program in fluid mechanics, over a period of three years, has been gradually reorganized, and now comprises a series of courses covering the latest professional developments in the field. Included in the curriculum are: (1) 2.49 Advanced Fluid Mechanics, covering basic principles and classical dynamics of inviscid and viscid fluids, with particular reference to problems of power and propulsion. (2) 2.491 Compressible Fluid Mechanics, covering the dynamics and thermodynamics of high-speed flows, both internal and external, and again with emphasis on problems of power and propulsion. (3) 2.492 Advanced Topics in Fluid Mechanics, for individual students especially interested in some topic of their own choosing. (4) 2.28 Fluid Machinery, covering from a

unified point of view a wide variety of fluid-handling machinery.

Machine Design Division. During the fall term a course, Product Design (2.734), was offered for the first time under the direction of Professor John E. Arnold. This course has materialized as a result of demand from industry and students for training in the field of industrial design. The course was a co-operative enterprise with representatives from the Departments of Architecture, Business and Engineering Administration, Building Engineering and Construction, and Metallurgy taking part under Professor Arnold's direction. A practicing industrial designer, Mr. Gordon Florian was engaged to work with the students one day per week. In addition, the following outside speakers participated: Henry Dreyfuss, Buckminster Fuller, Walter Baermann. This course was limited to approximately 20 students and was notably successful. This represents one more step forward in our program to encourage creative design work. Plans are under way to expand the program to a two-term sequence in the near future.

During the past year, Professor James B. Reswick has headed the Design Group, and Mr. J. Lowen Shearer has headed the Hydraulics Group in the Dynamic Analysis and Control Laboratory. In addition, Mr. Gerhard Reethof, who recently joined our staff from Sperry Gyroscope Company, has devoted a considerable portion of his time to the hydraulic research and development work in that laboratory.

The book, *Analysis of the Four Bar Linkage*, by John A. Hrones and George L. Nelson, was published by the Technology Press. This work will make the synthesis of important classes of mechanisms available to designing engineers.

From July 9 to July 20 a special two-week program in Hydraulic Power Control was offered with Messrs. Blackburn, Hrones, Lee, Reethof, and Shearer. This course drew 64 men from various companies all over the United States and was very well received.

Materials Division. Under the supervision of Professor Maurice E. Shank, improvements have been made in the development of new laboratory exercises in the Testing of Materials Laboratory subjects 2.37 and 2.371, in order to further strengthen a more fundamental approach to the study of the behavior of materials under stress. Lectures in these

subjects have been more closely integrated with laboratory exercises. Attempts are being made to introduce current developments in this field to keep the subject matter abreast of latest practice. Further improvements in the physical plant have been largely curtailed by budget considerations. The laboratory is badly in need of further modernization as mentioned in the report of last year.

The past year has been a very fruitful one in connection with various Division of Industrial Cooperation research projects under the direction of Professor Charles W. MacGregor. The research work for the Bureau of Ordnance, Navy Department, has produced valuable information concerning the general problem of the effects of strain rate, temperature, and constraint on the impact properties of metals leading to new Navy acceptance tests. This project is conducted in the High Speed Impact Laboratory and other facilities. The Brittle Fracture Laboratory has completed a project for the National Advisory Committee for Aeronautics on the effect of prior cycles of fatigue on the transition properties from ductile to brittle fracture of various aircraft metals. In addition, the effect of size and combined stresses on the brittle fracture properties of metals was determined, and a paper on this was presented by Professors MacGregor and Nicholas Grossman at the Low Temperature Symposium of the National Bureau of Standards. Two projects in the Creep and Plastic Flow Laboratory were completed during the current year. One of these, under the sponsorship of the Office of Naval Research, showed that creep curves would be predicted from short-time tension data with good results for the aluminum tested by use of the velocity-modified temperature concept. A paper on this subject is now in preparation by Professor MacGregor and Mr. David I. Sinizer. The other project, under the sponsorship of the National Advisory Committee for Aeronautics, presented the results of torsion creep-to-rupture experiments on a gas turbine alloy. This is the first time that successful torsion creep-to-rupture tests have ever been performed. Valuable results showing the effects of stress concentration and combined stresses on the creep-to-rupture properties were determined. This work is currently being published as a Technical Memorandum by the National Advisory Committee for

Aeronautics and will be presented in the form of a paper in the near future by Professor MacGregor and Fredman J. Walcott.

In addition, the Department research project on the Rolling of Metals under the auspices of the Special Research Committee on the Plastic Flow of Metals of the American Society of Mechanical Engineers has been nearly completed. The purpose of the project was to determine the effects of a large number of rolling variables on the distribution of stresses in the contact arc between the rolls. At least two papers on this will be prepared in the fall by Mr. Richard B. Palme and Professor Charles W. MacGregor. This project is unique in that it is the only one being conducted in this country on the subject. Other completed department research projects included the calculation of stress and strain distributions in rotating disks in the plastic range for both partial and complete yielding, at small and large strains, for disks of arbitrary profile and stress-strain curves. This was presented to the Department as a Doctor's thesis by Mr. Melvin Zaid.

Professor MacGregor served as a consultant to the Research and Development Board of the National Military Establishment, was appointed a member of the Ordnance Advisory Committee to the Chief of the Ordnance Research and Development Division of the Army, and served as a member of the Special Research Committee on the Plastic Flow of Metals of the American Society of Mechanical Engineers.

Professor John M. Lessells has continued editorial work for the *Journal of Applied Mechanics* involving co-operation this year with the National Applied Mechanics Congress held in Chicago in June, 1951. He served as Chairman of the American Society of Mechanical Engineers Subcommittee to consider steps to improve financial operations of the Applied Mechanics Reviews. Other Committee activities included Chairmanship of the Professional Division Committee of the American Society of Mechanical Engineers, member of the Dudley Metal Award Committee of the American Society of Testing Materials, and member of the Committee E-9 on Fatigue.

After a lapse of nine years, the industrial course in Applied Photoelasticity has been reinstated by Professor Murray in the summer program. The response has been most encouraging. The course was scheduled for the last two weeks in

August, and the number of applications received necessitated repeating the program during the first two weeks in September to take care of those seeking admission.

During the past year a program of modernization of the equipment in the Laboratory of Experimental Stress Analysis has been initiated. Polaroid photographic equipment, which provides finished prints in less than one minute, has been obtained, and the mechanical weighing system on the testing machine in the Photoelasticity Laboratory is being replaced by a sensitive strain gage device.

A new type of Lateral Extensometer has been under development in the Photoelasticity Laboratory. The first model has been completed and shows encouraging results.

Professors C. Richard Soderberg, Charles W. MacGregor, and William M. Murray have all contributed to the *Handbook of Experimental Stress Analysis*. This is now the largest available source of information on Experimental Stress Analysis and currently the outstanding book in its field.

Professor Murray has continued as Secretary-Treasurer of the Society for Experimental Stress Analysis and editor of its *Proceedings*.

Metal Cutting Laboratory. A new graduate subject, Metal Cutting Theory, was given for the first time this year by Professor Milton C. Shaw.

The fundamental study of the grinding operation sponsored by the Timken Roller Bearing Company has been continued. A new project concerned with a study of the internal grinding operation has been started within the past year. This project is sponsored by the Bryant Chucking Grinder Company of Springfield, Vermont, and is being conducted in both the Metal Cutting and Machine Tool Laboratories. Support for the basic study of the cutting of noncrystalline materials has been continued and extended by the United Shoe Machinery Company. A grant received from the Industrial Liaison Program has made possible the purchase of motion picture equipment with which to conduct a visual study of the cutting operation. A motion picture showing the manner in which metal is cut is now being prepared.

Mr. Nathan H. Cook, of the Metal Cutting Laboratory, has been awarded a nationally competitive Coffin Fellowship

for next year in order to study the cutting properties of non-crystalline materials.

A special two-week summer program in metal cutting was held with approximately 60 persons from various industrial companies attending. This program provided a valuable contact with industrial operations and proved to be quite broadening and inspiring to those of our staff who participated.

Preparations are continuing for the movement of our Machine Tool activities into their new quarters in the Alfred P. Sloan, Jr., Metals Processing Building. From present indications it would appear that the new building will be ready for occupancy about the end of this year.

Lubrication Laboratory. During the year 1950-1951, work in the Laboratory continued under Chrysler sponsorship on the study of the fundamentals of friction and wear. One phase of this work on determination of the empirical laws of wear has been brought to a successful conclusion, and the results were presented at a Discussion on Friction held by the Royal Society of London in April. These laws are somewhat analogous to Coulomb's laws of friction.

The most noteworthy development in the laboratory during the past year was the increase in the number of research projects from the single one for Chrysler to a total of five, sponsors in addition to Chrysler being the Draper Corporation, the Office of Naval Research, Kennecott Copper Company, and the Massachusetts Institute of Technology itself. As a result, the staff has grown to a total of eight. Three additional projects are currently under discussion.

From June 11 to 22, 1951, M. I. T. offered the first course in lubrication engineering to people from industry that has been given anywhere. It was also sponsored by the American Society of Lubrication Engineers and was attended by 64 people.

With the resignation of Professor Burwell as noted above, Professor Brandon G. Rightmire will take charge of the Laboratory; and it will be administratively in the Division of Machine Tools and Metal Cutting under Professor Milton C. Shaw.

Textile Technology Division. The research program of the Textile Division has been centered about a mathematical and

physical study of the structure of yarns — particularly involving the applications of differential geometry and of friction theory to the investigation of the placement and behavior of fibers. This is a field almost entirely neglected elsewhere, and one of interest and importance to the industry in general and to the participants in the liaison program in particular. Several important publications have appeared and have been circulated.

Thermodynamics Division. During the absence of Professor Joseph H. Keenan the instruction program in thermodynamics has been under the supervision of Professor Ascher H. Shapiro. Several discussions have been held with respect to the role that should be played by the kinetic theory of matter in the undergraduate instruction in thermodynamics.

Engine Laboratory. The basic senior Mechanical Engineering Laboratory subject, 2.68, under the supervision of Professor Wilson, has undergone substantial changes during the past academic year. It has been found possible to substitute a rationally sequenced series of exercise groups for the substantially independent and randomly ordered experiments. At the same time, the hour lectures have been directly correlated in time and subject matter with laboratory activity. Although much the same equipment is employed as previously, the emphasis has been taken off the specific machinery and placed on principles which the designs or applications of the machines illustrate. Thus, an experiment with a refrigeration machine becomes an illustration of the "Application of the First Law to Engineering Measurement."

This change in viewpoint has two useful corollaries. First, the relationship of the laboratory to the analytical courses is made more evident. Second, the apparatus used to illustrate a particular principle may be varied from term to term with a consequent avoidance of stereotyping.

The unifying theme adopted for the course is "Engineering Measurement." Each student group is assigned a final project involving a genuine measurement problem. These projects take several weeks at the end of the term and are "original" in character. So far as possible this originality is genuine; in any case, the answers are not known ahead of time to the staff members sponsoring the projects. These projects provide an experience in genuine investigation which is denied the under-

graduate unless he undertakes a thesis. Hence, their inclusion in a senior laboratory course is particularly appropriate.

Members of the faculty not normally associated with the laboratory have been drawn into its activities both as lecturers and as sponsors of final projects. A mechanism is being developed which will make it possible for them to displace the graduate assistants as typical laboratory instructors. This is of considerable importance if the laboratory is to become a means for providing mature experience in the application of theory to comparatively complex physical situations.

Very few complete reports are demanded, but assignments are made to illustrate the several functional elements of a report. The Department of English and History has provided very effective co-operation in the form of a series of lectures paralleling the final projects. The reports on these projects are complete and are weighted heavily in determining the final grade. This seems to have produced a receptive audience for the lecturers.

Physical development of the laboratory has been modest. Some equipment, long disused, has been removed; a few centers of activity have been moved to lighter and roomier areas. The most significant additions have been relatively small pieces of apparatus which can be put entirely at the students' disposal and which are designed to illustrate a principle most effectively.

Another minor but significant development has been the undertaking of investigations on a consulting basis. While these jobs have involved primarily a few staff members, they bring into the laboratory some "live" problems. It is expected that junior staff members and students will be drawn into any expansion of this kind of activity.

Refrigeration and Air Conditioning Laboratory. The Refrigeration and Air Conditioning Laboratories have become an increasingly important factor in the training of students, not only in Mechanical Engineering but in other fields. Laboratory work is now being given to Course XIII-C, Marine Transportation, in addition to the well-established courses required for students in Food Technology. The laboratory facilities for thesis work have been materially expanded, and the thesis load is constantly increasing. The expanded facilities have also resulted in increased service of the laboratories for specific aid to other departments.

During the past year, a start was made upon a research project concerning the heat transfer of condensing refrigerant inside horizontal tubes. This represents a problem of practical importance and the preliminary results have been most encouraging.

Heat Measurements Laboratory. Apparatus is now available for students for research to determine the total normal emissivity of ceramic materials up to 2700° F. New equipment has been installed for the rapid measurement of total normal emissivity of surfaces at room temperature. A three-year project sponsored by the Air Materiel Command has been completed. This included the determination of the total emissivity of a large number of surfaces from -300° F. to 2000° F. The solar reflectivity of a considerable number of materials and coatings were also determined.

A book on *Heat Insulation* was published during the past year by Professor Gordon B. Wilkes.

Heat Transfer Research. The research on heat transfer coefficients, recovery factors, and friction coefficients for supersonic flow of air in a tube, under the sponsorship of the Office of Naval Research, has been continued during the past year under the direction of Professors Joseph Kaye and Joseph H. Keenan. Three reports have been prepared; one will be presented at the Heat Transmission Conference in London, and the other two will be presented at the Annual Meeting of the American Society of Mechanical Engineers in November, 1951.

A new project on supersonic heat transfer on flat plates, under the sponsorship of the Office of Air Research, has been initiated under the supervision of Professor Kaye. This work will be both experimental and theoretical in nature and will entail co-operation between the Department of Mechanical Engineering and the Naval Supersonic Wind Tunnel, which is under the direction of Professor John R. Markham of the Department of Aeronautical Engineering.

During the past year, Professor Warren M. Rohsenow conducted an experimental program for the Office of Naval Research which involved the determination of heat transfer coefficient and pressure drop data for water flowing in an electrically heated tube. The purpose of the program was to obtain data at high pressures over a wide range of water veloci-

ties and water temperatures when local boiling occurred at the solid-liquid interface. The ranges of conditions studied were water velocities between .02 and 30 ft. per second, pressures between atmosphere and 2000 psia, liquid subcooling between 0 and 400° F. This phase of the work has been completed.

This program is continuing and will provide an experimental determination of the location of the burnout points, the condition at which boiling changes from nucleate type to film type. Experimental work is also in progress to determine fluid density from high speed motion pictures of the boiling process under the range of conditions stated above.

Work is also in progress under an Air Force contract to determine the accuracy and response rate of a device employing a thermodynamic method for determining the temperature of high temperature gas streams such as the exhaust of a jet engine.

Cryogenic Laboratory. The large helium refrigerator has been in active service for some months and is yielding valuable data on some of the mechanical properties of metals. It has been possible to cool heavy apparatus and hold it at any desired temperature between 12° K. and room temperature.

Work continues on cyclic refrigeration below 1° K.

The liquid nitrogen plant is now supplying substantially all of the liquid nitrogen used by the Institute. Approximately two tons per week is being produced.

Sloan Automotive Laboratory. Work is continuing for the Ethyl Corporation on the auto-ignition of fuels by rapid compression; the rapid compression machine and a special engine with compression ratio of 30:1 are being used.

It is now possible to take simultaneous schlieren and flame pictures of the combustion process at more than 10,000 frames per second and at the same time record the pressure changes in the charge.

The effect of inlet dynamics on engine air capacity is being studied for the Texas Company. A highly sensitive Li type pressure pickup is being used to determine the magnitude and phase of the pressure disturbances in the inlet system.

On a grant from the Coordinating Research Council, encouraging preliminary studies are being made of a method for measuring the speed of sound in the cylinder gas of a

detonating engine. By this means, it may be possible to determine the gas temperature associated with incipient knock. The present calculation of these and other cyclic temperatures is apt to be in error due to heat transfer and pre-flame reactions.

Professor William A. Leary, accompanied by members of the Industrial Liaison Group, visited the General Motors Laboratories in Detroit and the General Motors Institute at Flint, Michigan.

As a result, a group from General Motors Research Laboratories, including Drs. Withrow and Campbell, visited the Sloan Laboratory for a two-day combustion symposium; and a group from General Motors Institute came to exchange ideas on laboratory teaching methods.

Earlier in the year, Diesel Engine Manufacturers' Association sponsored a conference at Sloan Laboratory where our research work and laboratory techniques were explained by staff members and discussed by the group. This conference was attended by about 65 teachers and research men from all of the important colleges in New England as well as from more distant points. Great interest was expressed regarding the many unique features of our instructional engine test setups.

Nearly half of the Mechanical Engineering Department thesis students did their work in Sloan Laboratory this year. Investigation included the detonation speed reversal of diisobutylene, engine performance on liquefied petroleum gas, the effect of run-in on piston ring friction, the effect of size on engine friction, and the effect of engine speed on thermal efficiency.

Studies of flame propagation in a two-stroke engine with glass cylinder head were made by Mr. Cecil French, a foreign exchange student.

Important papers by members of the Sloan Automotive Staff for the past year include: "Auto Ignition by Rapid Compression," by James C. Livengood and William A. Leary — this paper was presented before the American Chemical Society at Cleveland; "Effect of Size on the Design and Performance of Internal Combustion Engines," by C. Fayette Taylor, published in the *Transactions* of the American Society of Mechanical Engineers, July, 1950; "Correlation and Presentation of Diesel Engine Performance," by C. Fayette Taylor, published

in the *Transactions* of the Society of Automotive Engineers, April, 1951.

Gas Turbine Laboratory. The following projects were underway in the Gas Turbine Laboratory during the year:

Low Speed Cascade. This project is supported jointly by the General Electric Company and the Westinghouse Electric Company. The objective has been the study of the problems involved in flow through a cascade of blades simulating the blades in an axial compressor. Comparison of theoretical (perfect fluid) and measured pressure distributions has been obtained.

The following report has been issued this year: "Low Speed Cascade Progress Report," No. 2006-5, by Truls W. Graff and Nguyen Van Le, June 10, 1951. The work is to be continued next year with the objective of studying the flow near the boundary walls.

Supersonic Vortex. This project is supported by a grant from the Air Research Division of the Garrett Company. The objective is a study of the flow in the diffuser of high speed centrifugal compressors.

The following reports by Francois Giraud have been issued: "Determination of the Solutions of Hydrodynamical Equations as an Initial Value Problem"; "Theoretical Investigation on the Transfer Phenomenon in Gaseous Substances"; "Theoretical and Experimental Investigations of Supersonic Free-Vortex Flow." This work is to be continued next year.

Secondary Flow in Bends. This project is supported by a contract with the Office of Naval Research. The objective is to study the effects of non-uniform upstream total pressure on the flow through a bend or a cascade. The following report has been issued: "Shear Flow in Bends," by Hans Eichenberger, March, 1951; the work is to be continued next year.

Boundary Layer in a Rotating Pipe. This project is supported by a contract with the NACA. The objective is to study a three-dimensional boundary layer problem similar to that which exists near the inner and outer walls of our axial compressor. The work is nearing completion and will be reported on during the summer.

Turbine Nozzle Cascade. These experiments have been

carried on as thesis work but with the support of the General Electric Company.

The objective of the program is to gain an insight into the nature of flow through a turbine nozzle cascade at variable Reynolds and Mach numbers. A number of excellent interferometer pictures of the flow have been obtained and compared with the directly measured pressure distribution as well as with pressure distributions derived from perfect fluid theory.

The following papers were written by members of the Laboratory Staff: "High Efficiency Supersonic Diffusers," by E. P. Neumann and F. Lustwerk, *Journal of the Aeronautical Sciences*, Volume 18, June, 1951; "The Influence of Boundary Layer on the 'Normal' Shock Configuration," by F. Lustwerk, Meteor Report No. 61, September, 1950; "An Investigation of Ejector Design by Analysis and Experiment," by J. H. Keenan, E. P. Neumann, and F. Lustwerk, *Journal of Applied Mechanics*, September, 1950.

Fifty-one graduate students and one undergraduate student completed their theses in the Gas Turbine Laboratory. Several members of the Departments of Aeronautical Engineering and Chemical Engineering co-operated as thesis advisers.

As a part of the program of the Summer Session, a conference on Aircraft Gas Turbines was held June 18-20. Attendance at the conference included 123 guests from industry and other educational institutions. Many favorable comments on the program have been received.

C. RICHARD SODERBERG

METALLURGY

The Department operated during the past year at a very high level from the standpoint of both research and education. A total of 76 degrees were granted: 38 Bachelor's, 15 Master's, 1 Metallurgical Engineer, and 22 Doctor's. Total enrollment in the three undergraduate classes was 111, and graduate enrollment reached an all-time high of 108. The research budget from industrial funds and Division of Industrial Cooperation contracts was over \$1,500,000.

The magnitude of both educational and research programs resulted in heavy teaching, research, and administrative loads

for all staff members. However, an effective balance has been maintained between research and teaching, such that all faculty members participate in both activities. The extent of our contributions to the technical literature is indicated by the fact that more than 50 papers representing original research of staff members were accepted for publication during the year. Students were aided in many ways by this extensive research program: (1) Both graduate and undergraduate theses were sponsored by the contracts. (2) The laboratories, most of which are now well-equipped as a result of the demands for research, were available also for teaching. (3) Financially, graduate students received a total of over \$125,000 in the form of salaries as research assistants; many of our graduate students would not be able to continue except for aid of this type. (4) An active research program in which new and dynamic ideas are constantly being evolved furnishes a stimulating background for advanced study.

The Department continues to receive excellent support from industry, particularly in the form of undergraduate and graduate scholarships and fellowships. Such awards to students during the year totalled \$23,435. Aid of this type is especially desirable since it enables us to attract excellent students who could not otherwise afford an M. I. T. education. Industry is also benefited because companies giving such support are usually looked upon as favorable places for employment.

During the year, the Department conducted several very successful conferences and symposia on subjects of particular interest to industry. These included high temperature ceramics, nodular cast iron, the metallurgy of steelmaking, corrosion, and surface reactions in flotation. The attendance at all sessions was excellent, and plans are being made for several similar conferences during the next year. The Metallurgy colloquia, which are held weekly during the school year, featured talks principally by outstanding foreign scientists.

JOHN CHIPMAN

METEOROLOGY

The total number of students in Meteorology was about 15 per cent greater than last year. Most of the increase was in the Graduate School, but there was also an upward trend

in the undergraduate enrollment. An even larger increase is anticipated for the coming year largely because the Air Force is planning to enroll a substantial group of officers. Employment opportunities greatly exceeded the number of graduates. In the past, most of our graduates found employment in the Weather Bureau or the airlines. The much greater diversity of the positions accepted by our recent graduates is striking.

This change in the type of employment available to our students, as well as advances in the meteorological field, led the staff of the Department to undertake a thorough review and revision of the undergraduate curriculum in meteorology. Although the existing curriculum provided a good professional background, it was designed primarily to train weather forecasters. It was decided that the curriculum should be liberalized to permit the student to adjust his program to conform to his individual objective without sacrifice to a sound professional background in meteorology. This was accomplished by providing five or six elective subjects which are intended to comprise an integrated program in a related field of study. Among the fields in which an effective elective program can be arranged are Instrumentation, Physics and Mathematics, Chemical Engineering, Hydrology, Business and Engineering Administration, and Economics. Students who wish to follow a career as weather forecasters may take essentially the old curriculum by a proper choice of electives. The new curriculum includes one meteorology subject in each term of the second year, whereas the old curriculum did not introduce meteorology until the third year. In spite of the important changes, only one meteorology subject was added and one dropped. Several other subjects were changed in detail, and a number of subjects previously required were made electives. All of these changes were approved by the Faculty in the spring, and the new curriculum will go into effect for all classes in the fall of 1951.

In May, the Department sponsored jointly with the Air Force Cambridge Research Laboratories a "Symposium on Atmospheric Turbulence and Diffusion." The principal investigators both from this country and abroad attended this four-day Symposium, and all participants felt that the meetings were exceedingly stimulating and worthwhile.

The Department was fortunate to serve as hosts to a

number of visiting scientists from all parts of the world. Two of them, Dr. C. H. B. Priestley, of Australia, and Dr. J. E. Fjeldstad, of Norway, each gave a series of lectures.

The extensive research program of the Department continued with unabated vigor. Most of the research is sponsored by Federal agencies, but some smaller investigations are supported by Departmental funds. All of the sponsored projects which were under way last year have been continued, and one new project was started. The breadth of the research effort permits all graduate students, who so desire, to play active roles as members of research teams. The research results provide a continual stimulus to the teaching program.

The Weather Radar Project, under the direction of Mr. Alan C. Bemis, is sponsored by the Signal Corps of the Army. Although the development of special instrumentation has continued, major emphasis has been placed on the exploitation of the unique type of meteorological data provided by radar. Radar provides a three-dimensional, nearly instantaneous, but continuous picture of the atmosphere as compared to the scattered spot observations of the conventional weather station network. Many important and hitherto unknown features of the processes of precipitation have been revealed by the radar and simultaneous flight observations. The observational program is supported by theoretical studies which are of fundamental value in themselves.

The Air Force sponsors a study of the general circulation of the atmosphere which is under the supervision of Professor Victor P. Starr. Through studies of the transport of energy and angular momentum, this group has now shown that the necessary exchange of energy between low and high latitudes is accomplished by means of quasi-horizontal circulations rather than by meridional cells as previously believed. This discovery, now supported by independent investigations, has led to a new approach to the mechanism of the general circulation of the atmosphere. An understanding of this mechanism is basic to improvements in weather forecasts for extended periods.

In a project sponsored by the Office of Naval Research, a group under the direction of Professor James M. Austin is studying the mechanism of the variations in atmospheric pressure which accompany the day-to-day weather changes.

An exhaustive study of all available data in combination with a theoretical approach has led to a greatly improved understanding of the interrelated changes in winds, temperature, and pressure. Some of this knowledge has already been applied to weather forecasting. Further studies are now under way which it is hoped will resolve some of the remaining questions.

In co-operation with the Weather Bureau, a research group under the direction of Professor Hurd C. Willett has continued to study the general circulation of the atmosphere of both hemispheres. There is increasing evidence that changes in the circulation, over periods ranging from a month to a century or more, are related to changes in the energy output of the sun. This relationship is indirect and probably involves the very high atmosphere where no data are available. Careful statistical treatment of the data at lower levels is the only present means of investigating this problem. Other studies of more immediate application to extended forecasting are also carried on, the results of which are applied by the Extended Forecasting Section of the Weather Bureau. Studies of the general circulation of the Southern Hemisphere are based on a series of daily weather maps which are prepared by another group under the direction of Professor Willett. This work is also supported by the Weather Bureau. The results comprise what is believed to be the first extensive series of weather maps for the entire Southern Hemisphere. This has permitted research on the general circulation patterns of that hemisphere and on the very important large-scale exchanges of energy and air between the Northern and Southern Hemispheres.

Research on the general circulation of the atmosphere of the Northern Hemisphere has shown that the necessary exchanges of energy and momentum between low and high latitudes are accomplished by means of quasi-horizontal circulations. It had been believed previously that the exchanges occurred in closed meridional cells in which vertical circulations were an essential feature. This discovery is of major importance to an understanding of the mechanism of the general circulation which, in turn, is essential to basic improvements in extending forecasting.

Research in the Department of Meteorology has demon-

strated that the processes which lead to the formation and intensification of cyclonic storms occur in the upper troposphere and lower stratosphere while those which lead to the motion of the storm are found in the lower troposphere. It was formerly thought that the processes of intensification and motion were identical. This discovery has already been applied to weather forecasting and will be of great value in a continuing study of the causes of weather changes.

Development of a recording device for very small rates of flow has made practical the use of an instrument developed earlier in the Department of Meteorology for the air-borne measurement of the liquid water content of clouds and rain.

Solution of a new problem in meteorology has been advanced by application of communications theory and use of the Whirlwind I digital computer as an autocorrelator. Analysis of radar echoes from rain and snow storms by these new techniques is helping to disclose the distribution of turbulent velocities within the storms.

At the Round Hill Field Station a research group, under the immediate direction of Dr. E. Wendell Hewson and sponsored by the Air Force, is studying turbulence and diffusion in the lower levels of the atmosphere. The work of this group has been concerned primarily with an experimental and theoretical study of the fluctuations of wind and temperature in time and space. These fluctuations are synonymous with turbulence, and a knowledge of them is basic for a physically sound theory of turbulence and diffusion. In order to measure the fluctuations, it has been necessary to design and construct new types of instrumentation.

A new project sponsored by the Air Force and under the direction of Professor Delbar P. Keily is engaged in the development of instrumentation for the measurement of cloud drop size distribution and liquid water content from aircraft. Knowledge of these parameters is essential to studies of cloud physics and aircraft icing. Present techniques are inherently unsatisfactory, and entirely new methods for such measurements are being explored.

Members of the staff continued to carry on important outside professional activities. Professor Henry G. Houghton served as Chairman, and Professor Hurd C. Willett as a

Deputy Member of a panel of the Research and Development Board. Professor Houghton served on the Council and as Chairman of three committees of the American Meteorological Society. Professor Thomas F. Malone devoted a considerable portion of his time to the editing of the "Compendium of Meteorology." This volume is being published by the American Meteorological Society and was planned by a committee which included Professors Willett and Houghton. Professor Houghton served on a subcommittee of the National Advisory Committee for Aeronautics. Professor Houghton testified before the Joint Hearings of the United States Senate on Weather Control legislation. At the annual meeting of the American Meteorological Society, Professor Willett was presented with an award "for extraordinary scientific accomplishments in meteorology, for his contributions to synoptic meteorology, and in particular to our understanding of the large-scale circulation patterns of the atmosphere."

HENRY G. HOUGHTON

ROUND HILL FIELD STATION

Round Hill continued to be a popular spot for both student and staff outings. Tech House, operated by the Technology Christian Association, was occupied every week end and through the week in the summer. The research project of the Department of Meteorology has operated throughout the year with a resident research staff of four. A new project of the Research Laboratory of Electronics will be established at Round Hill in the near future, and additional research activity is in prospect.

Through the untiring efforts of Mr. Herbert D. Hill, the Resident Superintendent, and his staff, the buildings, grounds, and equipment have been brought into an excellent state of repair with the exception of the interior of the mansion. Present plans envisage the use of all of the buildings except the mansion, and no additional work can be housed at Round Hill until the mansion is repaired or new buildings are erected.

HENRY G. HOUGHTON

MILITARY SCIENCE AND TACTICS

The enrollment in the junior year of the elective advanced course (junior and senior years) increased in the fall of 1950 over that in the previous year. The need for technically trained reserve officers was greatly increased with the advent of the Korean conflict, and many more students availed themselves of the opportunity to obtain a Reserve Commission through the R. O. T. C. units at M. I. T. A tabulation of the R. O. T. C. enrollment by units is given below.

	<i>Freshman</i>	<i>Sophomore</i>	<i>Junior</i>	<i>Senior</i>
Army Security Agency	59	48	32	12
Chemical Corps	39	45	34	21
Corps of Engineers	52	62	34	16
Ordnance Corps	45	39	32	11
Quartermaster Corps	26	17	24	5
Signal Corps	35	65	41	18
Totals	256	276	197	83

Major General Charles G. Helmick, U. S. A., presented commissions as second lieutenants in the Army of the United States to 52 graduating seniors. In addition, 21 students were commissioned at summer camp.

Over 200 freshmen signed the deferment agreement to the effect that they will take the advanced R. O. T. C. course and the Government will defer them from induction into the armed forces.

Lt. Colonel Burton B. Bruce, Officer in Charge of the Corps of Engineers Unit, Lt. Colonel James E. Foster, Officer in Charge of the Signal Corps Unit, Lt. Colonel Finis G. Johnson, Officer in Charge of the Army Security Agency, Lt. Colonel John W. Fitzpatrick, Officer in Charge of the Chemical Corps Unit, Major Harold Grossman, and Captain William Bell, III, have completed their tours of duty at M. I. T. and have been replaced by Lt. Colonel John S. Shapland, Major Mark T. Muller, Major John P. Cox, Jr., Lt. Colonel Woodrow W. Reagan, Captain Willard Anderson, and Major Nat Giambelluca, respectively.

CHARLES F. BAISH

NAVAL ARCHITECTURE AND MARINE ENGINEERING

The outstanding event during the past year has been the completion, dedication, and placing in service of the Ship Model Towing Tank in the Hydrodynamics Laboratory. A complete description of this facility was carried in the *Technology Review* of June, 1951. Use of the towing tank as an instructional facility actually began in February, 1951; and prior to its dedication in June, one commercial study had been completed. Authorization of a research investigation for the Society of Naval Architects and Marine Engineers has been received. This project will probably require about two calendar years for completion.

Another facility added to the department this year was a tank suitable for the conducting of experiments in static-stability. This item of equipment was an anonymous gift from an alumnus of this Department. The tank was placed in operation during the fall term, 1950. The department is preparing plans for a Structural Laboratory which will be submitted to the administration at an early date.

From an academic point of view, the outstanding event of the year has been the award of the second Doctor of Science degree in this department in a period of about 30 years, and the award of the first Naval Architect's degree since the authorization of this degree in 1949. Interest of civilian students in graduate work continues high, and both recipients of the scholarships granted by the Society of Naval Architects and Marine Engineers for graduate work in naval architecture and marine engineering elected to study in this Department. There has been a reduction in the number of U. S. Navy officers entering Course XIII-A; however, this has been partially offset by a material increase in the number of U. S. Coast Guard officers and the sending of an Ecuadorian, a Chilean, and two Canadian naval officers to participate in this academic program.

Committees composed of faculty members of the Department made a comprehensive study of the undergraduate curriculum of Course XIII, Naval Architecture and Marine Engineering, and Course XIII-C, Marine Transportation. As a result of their deliberations, these committees proposed revised curricula which were unanimously accepted by the

faculty of the Department and are being placed in operation with the sophomores, Class of 1954, in the fall term, 1951-1952. The revised Course XIII-C curriculum will now make it possible for a graduate of this course to complete the requirements for the master's degree in Naval Architecture and Marine Engineering in one additional academic year. A similar study was made of the Course XIII-A curricula, and the new curricula have also been placed in effect with the students entering in the summer term, 1951.

For the summer term of 1951, an arrangement was made with the various naval facilities, as a result of which intensive instruction in the fields of naval architecture and marine engineering has been given to some of the technical personnel of these activities. A total of 36 individuals participated in this program which is considered to be highly successful and will probably be continued.

The following changes in the faculty personnel have occurred. Professor Edward L. Cochrane has been on leave during the year, serving in Washington as head of the U. S. Maritime Authority. Assistant Professor of Marine Transportation, Gibbs W. Sherrill, a Commander in the U. S. Naval Reserve, was recalled to active duty and was granted a year's leave of absence May 1, 1951. Part of his teaching load will be taken over by Professor Charles H. Blake of the Biology Department, and the balance has been taken care of by rearrangements within the department. The U. S. Navy has decided not to return Captain James M. Farrin, U. S. N., Professor of Naval Construction, to the Institute, and his resignation has been received and accepted. Captain Horatio C. Sexton, U. S. N. (Retired), has been reappointed as Associate Professor of Naval Architecture, and Mr. Norman L. Ficken, Jr., has been reappointed as Instructor. Dr. Laurens Troost, of the University of Delft, and Director of the Netherlands Ship Model Towing Tank, has been appointed as a Visiting Professor of Naval Architecture for the first term of the academic year 1951-1952. The services of Dr. Troost were obtained under an exchange arranged through the Netherlands-American University Association and the Association of American Universities with the help of a Smith-Mundt travel grant. Commander James A. Brown, U. S. N., has been ordered by

the Navy to the Institute for a three-year period effective September 1, 1951, and he has been appointed Associate Professor of Naval Architecture. Two new half-time Teaching Assistants, Messrs. Harold Boericke, Jr. and Henry Kozlowski have been appointed for the academic year 1951-1952, and a third half-time Teaching Assistant has been authorized.

There was an unusual demand in both government and industry for both undergraduate and graduate civilian graduates of this Department. All graduates have been satisfactorily placed in employment.

For the first time, the Department is participating in the Foreign Student Summer Program, and Mr. Fahri Tuncer, of Turkey, will do work in the Ship Model Towing Tank.

This year, also for the first time, the Institute will be officially represented at the International Conference of Ship Tank Superintendents. Professor George C. Manning and Assistant Professor Martin A. Abkowitz will represent the Institute at the Sixth International Conference being held in Washington, D. C., September 10 to 15, 1951.

Professor Frank M. Lewis was elected Chairman of the American Towing Tank Conference at the Ottawa Meeting in September, 1950.

GEORGE C. MANNING

SCHOOL OF SCIENCE

BIOLOGY

The Department and the entire Institute family were saddened by the death in January of Professor John R. Loofbourow, Executive Officer of the Department, Chairman of the Faculty, and member of various Institute committees. Professor Loofbourow played an important part in developing the Department and was held in the highest esteem by his colleagues. Professor Richard S. Bear has been appointed to succeed him as Executive Officer.

Among the curriculum changes adopted during the year were the following: Organic Chemistry lectures (5.41) and laboratory (5.416) were dropped from the summer following the second year; 5.41 was placed in the first term of the second year (in place of Qualitative Analysis, 5.10, which was dropped) and 5.416 in the first term of the third year. A new course, Genetic Cytology, was substituted for Comparative Anatomy, in the first term of the second year and will be given for the first time in the fall term of 1951. Genetics (7.14) was dropped from Courses VII, VII-A and VII-B, and a corresponding number of units of electives substituted. New lecture (7.50) and laboratory (7.51) courses in the Physical Chemistry of Corpuscular Proteins were offered by Professor David F. Waugh. A Seminar on Enzymology, conducted by Professor Irwin W. Sizer, was added to the list of stated courses. An advanced course on Instrumentation and a colloquium on Instrumentation, in collaboration with various medical departments in the Boston area, were given by Professor Kurt S. Lion.

Professor George T. Johnson, after five years of effective service to the Department, accepted a post at the University of Arkansas. Dr. James D. Ebert, who contributed importantly in the revision of the junior courses, transferred to the University of Indiana.

Newly appointed to Instructorships were Dr. Howard P. Jenerick, of the University of Chicago (General Physiology), and Dr. John H. D. Bryan, of Columbia University (Genetic Cytology and Embryology).

During the year 18 post-doctoral medical Fellows and Research Associates were in residence, of whom eight were candidates for the Ph.D. in biophysics or biochemistry. The Department is deeply grateful for the interest and the generous grant given by the Commonwealth Fund, to be used over a period of five years, in support of the program of training for post-doctoral medical fellows.

Research in the Department, being chiefly of a basic nature, has continued along the same general lines as previously described. That this research has been highly productive is seen from publications of staff members listed separately in the President's Report.

The Department is grateful for the generous financial support of the various industrial and foundational agencies listed in the Treasurer's Report. Among the new contributors are the National Dairy Company, the Eli Lilly Company, and the Ethicon Suture Corporation.

The new Dorrance Laboratory to house the Departments of Biology and Food Technology has been partially erected and will probably be ready for occupancy during the spring of 1952.

FRANCIS O. SCHMITT

CHEMISTRY

Recent curriculum changes in the Department of Chemistry have included an increase in laboratory time of third year physical chemistry for Chemistry majors from four to six hours. David P. Shoemaker, recently appointed Assistant Professor of Chemistry, will be in charge of these and other laboratory courses in physical chemistry. Dr. Shoemaker comes to the Department from the California Institute of Technology. His field of research is structural physical chemistry and in particular the application of X-ray crystal structure methods. Dr. George H. Buchi, formerly of the Technische Hochschule (Zürich) and the University of Chicago, has also become an Assistant Professor of Chemistry, and will assume responsibility for the junior laboratory courses in organic chemistry and for a new elective graduate subject in the field of natural products. Dr. Buchi's field of research is

organic biochemistry. During the past year, Dr. Clark C. Stephenson assumed primary responsibility for the course in General Chemistry (5.01, 5.02 and the corresponding laboratories), relieving Dr. James A. Beattie, who remains in charge of several courses in undergraduate and graduate physical chemistry. Special intensive subjects offered again during the 1951 Summer Session, primarily for industrial chemists, were applications of Infrared Spectroscopy, by Dr. Richard C. Lord, and Optical and Electrical Methods of Instrumental Analysis, by Dr. David N. Hume and Dr. Lockhart B. Rogers. These courses continue to attract more registrants than can be accommodated.

The following distinguished visitors to the Department have presented special research seminars attended by members of staff and students in the Chemistry Department: Dr. Roger Adams, University of Illinois; Dr. John C. Bailar, Jr., University of Illinois; Dr. Britton Chance, University of Pennsylvania; Dr. C. K. Ingold, University College, London; Dr. I. M. Kolthoff, University of Minnesota; Dr. Linus Pauling, California Institute of Technology.

Degrees in Chemistry granted during the year ending June 30, 1951, numbered 27 Bachelor candidates, of whom 17 will continue with graduate training here or elsewhere; 3 were commissioned as officers in the armed forces, and 7 were employed in the chemical industry. Graduate degrees numbered 7 Masters' and 31 Doctors,' making the total number of doctoral degrees in Chemistry 443 since 1907.

One honor which came to a member of the Chemistry Department staff during the past year was the American Chemical Society Award in Pure Chemistry for 1951, made to Dr. John C. Sheehan for "outstanding contributions to organic chemistry, including the development of new, useful and elegant syntheses of peptides, β -lactams, hydroxylysine, penicillamine, penillic acid, and compounds with the unique structural features of penicillin."

Fields of research under investigation currently by staff members and students in Chemistry include the following:

(1) Analytical Chemistry: Schemes for qualitative analysis of rare elements; flame photometry; fluorescence; polarography; electrometric separations; chromatography; coulometry; func-

tional group analysis via spectrophotometry and automatic titrations; photometric titrations.

(2) Inorganic and Nuclear Chemistry: Volatile inorganic fluorides; lower valence halides of metals and non-metals; chemistry of less familiar elements; ammonolysis of halides and oxyhalides of silicon; concentrated hydrogen peroxide solutions; single crystals of ferro-electric and ferro-magnetic substances; cation migration in ion-exchange resins; radiochemical studies of the fission products; preparation and properties of organic phosphors; yields of nuclear isomers in different nuclear reactions; new covalent compounds of nickel with the lower halides of the group Vb elements; theoretical analysis of nuclear stability; carrier-free nuclides from cyclotron targets; radio-nuclides by specific nuclear transmutations.

(3) Organic Chemistry: Carbohydrates; heterocyclic compounds; identification and analytical methods; organic peroxides; organometallic compounds; amino acids; synthetic alkaloids; polymerization; reactions of active methylene compounds; reaction mechanisms; synthetic methods; small-ring compounds; tracer studies; relation of structure to reactivity; vitamins; terpenes; blood lipids; other natural products and physiologically active compounds.

(4) Physical Chemistry: Pressure-volume-temperature relations of gases and liquids; the absolute temperature scale; heat capacities and latent heats at low temperatures; properties of gases at low pressures; diffusion of gases; scattering and other properties of molecular beams; electromotive force in concentration cells, and oxidation-reduction potentials; freezing points of liquid solutions; vapor pressures of liquid solutions; infrared, ultraviolet and Raman spectroscopy; precision photometry; kinetics of thermal and photochemical reactions; properties of high polymers; properties of protein solutions; optical and electrical properties of thin metal deposits; study of crystal structure by X-ray diffraction.

ARTHUR C. COPE

FOOD TECHNOLOGY

A signal step in the progress of the Department of Food Technology has been made in the recent establishment of a four-year undergraduate curriculum and option in Biochemical

Engineering, which is designed to provide personnel to meet the rapidly growing need for men having special training in chemical engineering, microbiology, and biochemistry, to serve in the fermentation and anti-biotic plants of chemical and fermentation industries. Already numerous inquiries have come from both students and industries interested in this course. The co-operation and counsel of the staff of the Department of Chemical Engineering in this endeavor have been most helpful.

At the graduate level of instruction, two courses have been initiated, Food Bacteriology and Food Irradiation. The latter was set up because of the projected need of trained men having the combined knowledge of Physics and Food Technology which is indicated in the investigation and utilization of cathode rays in the preservation of foods and other natural products in industry.

Marked progress has been made by several members of the staff of the Food Technology Laboratories in the application of X-rays and cathode rays as a means of preserving foods without the application of heat. Extended studies have been made of the effects of such treatment on food components such as amino acids, vitamins, and enzymes, with the engineering consideration of packaging problems relating thereto. Professor Cecil G. Dunn has been concerned with those phases relating to microorganisms, especially yeasts. Dr. John T. R. Nickerson and Dr. Samuel A. Goldblith have been active in the study of changes in chemical components of foods, and Professor Ernest E. Lockhart has co-operated in objective flavor evaluations. This phase of our activities has been greatly facilitated by the co-operation of Professor John G. Trump and his associates in the High Voltage Laboratories. Similar assistance by Dr. Peter T. Demos in the Laboratory for Nuclear Science and Engineering has enabled the initiation of investigations at higher voltages on foods, using the recently completed linear accelerator.

As the result of developments in this field, the Food Technology Laboratories are now conducting a project on the sterilization of foods for the Navy.

At the request of the Atomic Energy Commission, an investigation is in progress relating to the possible utilization

of radioactive wastes, produced as by-products of plutonium production, to determine their efficacy in sterilizing food and pharmaceutical products, which may result in industrial applications of atomic energy. This project is conducted in co-operation with the Brookhaven National Laboratory. Plans for a small separate structure on the M. I. T. campus to house a 1000-curie source for this purpose have been proposed.

Professor Robert S. Harris, Professor Henry Sherman, and the Nutritional Biochemistry group have been active in a number of research projects among which are studies relating to the metabolism of fats, the nutritive values of glycerides, the effects of phytates in foods on the absorption of radioactive calcium, the metabolism of C_{14} -tagged lactose, the composition of Central American foods, and the investigation of food components from different areas on the development of dental caries.

Professor Cecil G. Dunn has written and published an *Industrial Microbiology Laboratory Manual* which is helpful in our courses in that subject and has received favorable acceptance elsewhere.

Professor Lockhart's studies on analytical and consumer-type taste and flavor panels, especially as they relate to quantitative changes which occur in sugars and spices during storage or processing, are continuing.

Further progress has been made in the field of food packaging and in high-vacuum dehydration techniques, and several papers pertaining to these subjects were presented before annual meetings of technical groups.

Various members of our staff have made valuable contributions to the activities of numerous professional groups during the year. Professor Robert S. Harris has served as Scientific Director of the National Institute of Nutrition of Ecuador and was awarded the decoration "official" in the national order, "Al Merito," by the President of Ecuador. Professor Cecil G. Dunn served as President of the Northeast Branch of the Society of American Bacteriologists. Professor Bernard E. Proctor has served on several National Research Council committees, was Chairman of the Division of Agricultural and Food Chemistry of the American Chemical Society, and became President-elect of the Institute of Food Technologists.

Much time and effort on the part of the entire staff of the

Food Technology Department has been given to the planning and equipping of the new John T. Dorrance Laboratories Building which is to be the new home of Food Technology and the Department of Biology.

Much of the research work conducted would have been impossible without the financial sponsorship of numerous companies in industry and various foundations which have greatly facilitated our progress. Among those to whom we are grateful for co-operation are the American Can Co., the Continental Can Co., Dow Chemical Co., Hood Foundation, Institute of Shortening and Edible Oils, W. K. Kellogg Foundation, National Dairy Research Laboratories, Nestle Co., Nutrition Foundation, Pillsbury Mills, Inc., Procter and Gamble Co., Standard Brands, Inc., Quaker Oats Co., United Fruit Co., Williams-Waterman Foundation, Wilson and Company.

It is with regret that the resignations of Professor William L. Campbell, Head of the Department, and Professor William C. Bauer, who have accepted key positions in industry, are reported.

BERNARD E. PROCTOR

GEOLOGY

Enrollment for the year continued at a high level with full quotas of both undergraduates and graduates and included the largest number of students in geophysics that the Department has ever had.

The third summer operation of our field camp at Crystal Cliffs near Antigonish, Nova Scotia, was most successful, with 36 students in attendance. Twenty-four of the group were M. I. T. undergraduates and graduates from a number of widely separated states; nine came from other institutions in the United States — Amherst, Franklin and Marshall, Notre Dame, Rutgers, St. Lawrence, and Williams — and three came from Nova Scotian institutions — Acadia, St. Francis Xavier, and The Nova Scotia Technical College. In addition to the field instruction given to 18 undergraduates, thesis investigations were carried on by 10 seniors and 8 graduate students. The Crystal Cliffs camp, now permanently established through purchase of the property last year by the Province, is officially called the "Nova Scotia Centre for Geological Research." As

in previous summers, Professor Walter L. Whitehead served as Director of the Camp and was assisted by Professor Roland D. Parks, who instructed in Geological Surveying.

With the purpose of improving and expanding the undergraduate program of instruction, particularly in Geophysics, a co-operative plan for employment of juniors and seniors was worked out with Geophysical Service Incorporated of Dallas, Texas, whose President is Cecil H. Green (VI-A; S.B., S.M., '24). In this plan each interested student will spend the summer as a full-scale employee in one of the company's 30 or more field parties. The students will gain firsthand professional experience, and the Company intends to evaluate each student as a possible permanent employee. Seventeen students — 14 M. I. T. men, 2 from Williams, and 1 from Franklin and Marshall — will spend the summer of 1951 in the first test of the arrangement, officially known as the M. I. T. -G. S. I. Co-operative Plan (for Geophysicists and Geologists).

Research in the Department maintained a healthy balance between theoretical and applied investigations. Professor Martin J. Buerger continued his research in X-ray Crystallography and made preparations for a summer tour of European laboratories to study latest instrumentation in his field. The investigation of the origin of natural gas and petroleum sponsored by the American Petroleum Institute and supervised by Professor Whitehead continued for the eighth year. Professor Whitehead also directed a program of coal research sponsored for the second year by the Nova Scotia Research Foundation. Professor Patrick M. Hurley continued his investigation of age determination of ores, rocks, and sedimentary materials by the helium method and further expanded his research in the broad field of geophysics. The program of spectrographic research on both major and minor rock constituents supported by the Office of Naval Research continued for the third year under the supervision of Professor Louis H. Ahrens.

Professor Warren J. Mead, former Chairman of the Department, continued as Lecturer. Dr. Donald J. MacNeil, Professor of Geology and Chairman of the Geology Department, St. Francis Xavier University, Antigonish, Nova Scotia, again served as Lecturer, participating actively at the Crystal Cliffs

Field Camp and delivering several lectures at M. I. T. during the spring term. Dr. Norman A. Haskell continued as Research Associate in Geophysics; and Dr. Irving I. Breger, former Research Associate, spent the year on a Fulbright Fellowship in Holland, where he pursued geochemical research on coal.

ROBERT R. SHROCK

MATHEMATICS

The registration in Mathematics subjects continued at a high level, averaging around 2,300 students during both the fall and spring semesters. During the year 1949-1950, the Department had used a set of notes on Analytic Geometry and Calculus prepared by Professor George B. Thomas, Jr., as a text in two sections of M11 and M12. On the basis of the experience with these two sections, certain changes were made in the material, and a book by Professor Thomas, in a preliminary edition, was adopted as the first year mathematics text last fall. At the same time, with a view toward possible later changes, revised curricula were put into effect for selected sections of the second year program.

In last year's report, mention was made of the preparation by Professor Francis B. Hildebrand of a new one-semester subject on Methods of Applied Mathematics to follow the present two-semester subject, Advanced Calculus for Engineers. The new subject which was given for the first time during the fall semester, was received with considerable interest. The Department received numerous requests from students in various departments to offer the subject again in the spring semester. This was done, again with a large enrollment.

The Departmental Graduate Committee reviewed in some detail its examination procedure for doctoral candidates. On the basis of this study, several changes were made; perhaps the most important of these were the institution of a qualifying examination to be taken early in the student's graduate career and a change in the oral preliminary examination. The qualifying examination as now set up covers the basic subjects which are a part of every doctoral program while the oral examination now considers more specifically the interest and needs of the

individual student before he embarks on a thesis in the field of his specialization.

Various formal and informal seminars were held during the year. Some of these were planned to help graduate students broaden their general mathematical knowledge while others were designed to enable interested students and staff to advance their knowledge in specialized fields.

Professors Chia-Chiao Lin and Eric Reissner were appointed to membership on the new Institute Committee on Machine Methods of Computation. Professor Lin continued his work on research sponsored by the National Advisory Committee for Aeronautics, and Professor Reissner continued on a research project under the auspices of the Office of Naval Research. Professor Philip Franklin acted again as consultant for Project Whirlwind. Professor George P. Wadsworth conducted several research projects for the Army Air Force and continued to serve as Project Director for the Operations Evaluation Group. Dr. R. Duncan Luce conducted experimental research in the Research Laboratory of Electronics on groups of persons in communication situations.

At the International Congress of Mathematicians held at Harvard in September, Professors Witold Hurewicz and Norbert Wiener gave addresses by invitation of the Organizing Committee. Professor George W. Whitehead gave an invited talk at the conference in Topology at the Congress. Several other members of the Department also presented papers at the Congress. Professor Warren Ambrose served as a member of the panel on Spectral Theory, and Professor William T. Martin served as Chairman of the Budget Committee and as Vice-Chairman of the Organizing Committee of the Congress. Professor Chia-Chiao Lin spoke at the International Conference on Theoretical Fluid Mechanics, which was held immediately preceding the Congress, and Dr. George Springer spoke at a similar conference on the theory of functions of several complex variables.

During the spring semester, Professor Norbert Wiener lectured at the University of Paris while on leave from the Institute on a Fulbright award. Professor Robert H. Cameron, of the University of Minnesota, was Visiting Professor in the Department during the second half of the summer; he taught

a course in Special Functions and conducted a seminar on Integration in Function Space. Doctors Lennart Carleson, of the University of Uppsala and Harvard University, and Wolfgang R. Wasow, of the Institute for Numerical Analysis of the National Bureau of Standards, served as Visiting Lecturers during the spring semester. Dr. George K. Batchelor, of Trinity College, Cambridge University, spent part of the spring semester in the Department lecturing and working on turbulence. Professors Herman H. Goldstine, of the Institute for Advanced Study, Maurice Heins, of Brown University, Heinz Hopf, of the Technical Institute of Zurich and Princeton University, William S. Massey, of Brown University, and Andre Weil, of the University of Chicago, each gave a series of lectures in the Departmental Lecture Series.

WILLIAM T. MARTIN

PHYSICS

The most important teaching development of the year in the Department of Physics was the reorganization of the work of the first two years, the subjects 8.01-8.04. About 20 years had passed since the last major reconsideration of these subjects. In the meantime, modern physics, the study of atomic and molecular structure, had developed from an abstract subject of interest only to the scientists to a practical field with applications to almost all branches of science, engineering, and everyday life. Some minor modifications of the content of 8.04 had been made, to incorporate some of this material, but the Department felt that a more thorough revision was necessary. Also some other changes of emphasis seemed desirable. The wave mechanics, the underlying theory of atomic structure, has pointed to the fact that wave motion plays an even more important role in physics than we had supposed before; the recent developments in acoustics, and in microwaves, have led in the same direction, and suggested to us a unified treatment of all sorts of waves. Finally, in the last 20 years, we had developed different subdivisions of 8.03 and 8.04 for different groups of students: one for the students in most courses, who do not go further in the Physics Department; another for those in Physics, Electrical Engineering, and a few other

courses, who study more advanced work; and during the present year, a still different subdivision, developed by Professor Francis Bitter, for students in Economics, Architecture, and a number of fields who do not have professional need for science. It seemed desirable to formalize this subdivision, which had grown up more or less spontaneously.

With these thoughts in mind, the Department appointed committees to consider the revision of the work of the first two years, and these committees worked actively all during the fall, arriving at conclusions during the winter which will be incorporated into the teaching schedule during the year 1951-1952 (though part of the changes were actually put into effect during the spring of 1951). The new subjects 8.01 and 8.02 will be common to all courses, as at present. They represent a considerable departure from present subject matter. They will start with three weeks of geometrical optics, and then proceed to the development of mechanics; through putting optics in this position, those parts of mechanics which need calculus will be moved further along in the term, making the correlation with the work of the Mathematics Department easier, since there will be a longer time interval between teaching the calculus in Mathematics and using it in Physics. Mechanics continues into 8.02, and then leads into mechanical waves, and sound. At this point physical optics is introduced, the part of light in which wave motion is important, and this is tied in closely with sound waves, emphasizing the similarity of different parts of wave theory. This concludes 8.02, which thus covers almost all of optics (which was formerly in 8.04), but omits thermodynamics and heat, which formerly concluded 8.02. We believe that this arrangement will be more teachable, with fewer mathematical difficulties for the first year student and with better continuity of material.

The work of the second year will be definitely split. Most courses will include 8.03 and 8.04; students in Architecture, Economics, and Business Administration will take 8.032 and 8.042; and these subjects, though handled with different emphasis, will cover largely the same material. They will start with a term of electricity and magnetism, much as in the present 8.03. Then they will lead, through a short study of heat and kinetic theory, into the atomic and molecular theory and

will spend most of the second term on a survey of modern ideas of atomic structure.

The physicists, electrical engineers, and mathematicians, on the other hand, will take different subjects, 8.031 and 8.041, which are set up on the assumption that most of these students will meet more physics, particularly atomic structure, electronics, heat and kinetic theory, and such things, in their third and fourth year work. With this in mind, 8.031 and 8.041 will be studies of electricity and magnetism, a good deal more thorough than 8.03, leading into electromagnetic waves but with only a small amount of modern physics. This is substantially the same material which these groups have been studying for the last few years, and it has been found to give, together with the work of the third and fourth years, a balanced knowledge of classical and modern physics.

This new arrangement of the material requires new texts; and several members of the department have been busily preparing tentative versions of new books, already in use in preliminary form, for the subjects.

With this revision of the work of the first two years, the general survey of the teaching of the Department, initiated after the war, has been completed. This revision included the third and fourth years of Course VIII, reported in the 1948 President's Report, and that of the graduate work, reported in 1949. Such revisions must be made periodically, and the present one has been particularly necessary because of the large increase in the number of students studying physics. Twenty years ago, Course VIII was one of the smallest Courses in the Institute. It has grown in the meantime, until in 1950-1951, as measured by the total number of undergraduate and graduate students, it was the third largest Course in the Institute, being exceeded only by Electrical and Mechanical Engineering. This growth has been just as much in undergraduate as in graduate work; the percentage of graduate students in Course VIII is not substantially higher than in the Institute as a whole. Not only has Course VIII become one of the largest of the Institute Courses, but many more students from other Courses study third and fourth year physics subjects than previously; so that in the magnitude of its teaching contacts with students, considering the work of the first two years

for all Institute students and the more advanced work for Course VIII and other students, Physics is one of the most important Departments in the Institute; and careful and thorough consideration of teaching policies is particularly important. Every effort has been made not only to have a satisfactory curriculum but also to have the material well taught at all levels of instruction. The senior members of the department take part in teaching to an unusual extent; and younger staff members are being trained in teaching methods. During the year, for instance, we have had a number of junior staff members who served as apprentices to senior members, being associated with them and learning teaching methods from them. This policy in a number of cases was strikingly successful and resulted in junior staff members of outstanding success in teaching.

Graduate work and research during the year followed along much the same lines as previously. The main work continued to be connected with the various interdepartmental laboratories, and research results are reported by those laboratories. One propitious result from the Laboratory for Nuclear Science and Engineering must be specially mentioned: Professor Martin Deutsch's work on the structure of positronium. Ever since the discovery of the positron, or positive electron, it had been realized that in principle a positive and a negative electron could become bound together, executing orbits around their center of gravity, acting in some ways like an ordinary atom; such a combination had been named positronium, though without definite experimental evidence of its existence. Professor Deutsch, in a brilliant series of experiments, has now been able to observe positronium in the laboratory and to measure many of its properties.

One field of research has received particular attention during the year: that of solid-state physics. Work in X-ray crystal structure and other aspects of solid-state work has gone on for many years. During the year, to build up the theoretical side of solid-state work, Professor Slater organized a group of students in solid-state and molecular theory with the object of providing a theoretical group to complement the experimental work in this and other departments. This group started under the auspices of the Research Laboratory of Electronics,

but in the middle of the year took on independent existence, supported by a contract with the Office of Naval Research.

During the last few years, the departmental Physics Colloquium has been somewhat lagging in interest. To build it up, two committees were appointed to choose speakers, one committee in nuclear, the other in non-nuclear physics. A good many guest speakers were invited from other institutions. The result of this new policy was an increased interest in the Colloquium with good attendance from among the graduate students and staff.

The Department was somewhat hampered in its activities during the year by the absence of a number of senior staff members. Professors Albert G. Hill, Jerrold R. Zacharias, Martin Deutsch, and George E. Valley, Jr. were all drawn away for part or all of the year, by special tasks connected with defense work. Fortunately, they spent most of their time in Cambridge and were still able to supervise graduate students and research. Professors Bruno B. Rossi and Victor F. Weisskopf were lecturing and studying in Europe for parts of the year. As partial compensation for these absences, Professor Philip M. Morse for the first time since the war was on hand full time, actively teaching and serving as Graduate Registration Officer.

The Department, as usual, was host to a number of meetings and conferences. The M. I. T. Conference on Physical Electronics was held as usual in the spring. Professor Francis W. Sear's summer session for secondary school teachers, sponsored by the Westinghouse Educational Foundation, had its third summer in 1951. The Department served as host for the Executive Committee of the International Union of Pure and Applied Physics at its meeting in September, 1950.

Though the Department in most respects seems in good shape, one disappointment during the year points to a serious outstanding lack. The housing of the department has not kept pace with its growth. The new undergraduate laboratory space in Building 4, made available right after the war, adequately serves the undergraduate students; but the graduate study and research is widely scattered, and part of it is inadequately housed. The George Eastman Laboratory was a research building of the finest quality when built in 1932 and

was very satisfactory for the graduate work until after the war. Now, however, the work has expanded so much that much of it is housed in temporary quarters in Building 20, left over from the Radiation Laboratory. It is true that reconstruction of the cyclotron laboratory and construction of the building for the 12 mev generator have somewhat helped the situation; but the main parts of the Research Laboratory of Electronics and the Laboratory for Nuclear Science and Engineering, including the work of many Department members, are still in temporary space, separated by a considerable distance from the rest of the Department. The administration, realizing the disadvantages of this situation, included in the plans for the \$20,000,000 development drive a new laboratory building for these two laboratories, which it was hoped would adjoin the main Institute group and would help to draw the Department together. It is expected that funds for this combined laboratory will be made available very shortly. The Department will not be able to operate with full effectiveness until it is adequately housed.

After 21 years as Head of the Department, Professor John C. Slater relinquished this post at the end of the academic year 1950-1951 to accept the new post of Institute Professor, giving increased freedom for research and teaching. Professor Nathaniel H. Frank, who has served for several years as Executive Officer, becomes Acting Head of the Department.

JOHN C. SLATER

SCHOOL OF ARCHITECTURE AND PLANNING

ARCHITECTURE

During the year the student enrollment of the Department was at full capacity, being slightly greater than in 1949-1950. In January, 1951, the National Architectural Accrediting Board sent a survey committee, and the Department prepared for this purpose a comprehensive report and discussed its program with the committee. The survey indicated generally high standards but showed also a relatively low provision of drafting space per student. The Visiting Committee of the School of Architecture and Planning also convened during the year under the chairmanship of Dr. Harlow Shapley, with Messrs. Harry J. Carlson, Henry Cohen, Douglas Haskell, and John L. Reid present to assess the present position of the two departments concerned. A longer meeting is envisaged late in 1951.

In the fall term Professor Carl Koch repeated, as design work for graduate students, his course in industrialized housing. This year the study was related to the program of national mobilization and was assisted by Professors Albert G. H. Dietz and Howard R. Staley, of the Department of Building Engineering and Construction, Professor John E. Arnold, of the Department of Mechanical Engineering, Professor John Wulff, of the Department of Metallurgy, Professor Karl W. Deutsch, the Department of English and History, Mr. John P. Horton, of the Department of Civil and Sanitary Engineering, and Mr. James B. Williams, of the Department of Electrical Engineering.

At the close of the study, the work of the students provided part of the subject matter for a two-day conference at which presentations were made by staff, students, and by 11 speakers invited from government and industry. Thirty or 40 other visitors also took part in the conference together with most of our older students. The proceedings of this forum have been published by the Albert Farwell Bemis Foundation under the title, *Housing, a National Security Resource*.

Mr. R. Buckminster Fuller, visiting lecturer, who contributed significantly to this conference, worked this year with the third-year students in architectural design and presented

his concept of the "comprehensive designer" in a program emphasizing the relation of structure to design.

In August, 1950, occurred the five-day symposium on "Solar Energy for Space Heating," under the auspices of the Godfrey L. Cabot Fund, attended by about 90 persons who were mostly visitors to the Institute. Mr. Donald F. Monell, research associate, was responsible for organization. Speakers included staff members and outside authorities in this field. Professor Lawrence B. Anderson was one of the contributors.

The Department has been proud to welcome the leadership of Dean Pietro Belluschi who took up his duties in January and immediately associated himself closely with the teaching program, although busy with administrative problems. He also gave more than a dozen important talks or lectures outside the Institute, participated in five architectural juries elsewhere, and served as a member of the Fine Arts Commission in Washington.

Activities of other staff members should be noted. Professor Robert W. Kennedy spoke at the Ann Arbor Conference, University of Michigan, and at the Cambridge High and Latin School. In June, he began a leave of absence of eight months on a Guggenheim grant. Professor Ralph Rapson won second prize on a national competition for small house design and has been invited by the State Department to work temporarily in Holland for the design of State Department buildings abroad. Professor Herbert L. Beckwith has become Secretary of the National Architectural Accrediting Board, Professor Lawrence B. Anderson, Vice-President of the Association of Collegiate Schools of Architecture. Robert B. Newman has been promoted to the rank of Assistant Professor, and continues his work in the program in architectural acoustics.

As a continuation of previous studies under Mr. Christopher Tunnard, the landscape design consultant this year was Mr. Hideo Sasaki, of the Harvard Graduate School of Design.

Distinguished visitors who lectured to the students in 1950-1951 included the following: Mr. Serge Chermayeff, Mr. Dan Kiley, Mr. Gilbert Herbert, Mr. John Marshall, Mr. Christopher Tunnard, Mr. Hugh Stubbins, Mr. Walter Baermann, Mrs. Sibyl Moholy-Nagy, and Mr. Clarence Stein.

The Harry Wentworth Gardner Travelling Fellowship,

awarded every fourth year, was granted in June to Mr. Walter L. Hill, '50, after a review of the records of all students graduated since 1947.

LAWRENCE B. ANDERSON

BEMIS FOUNDATION

The Foundation's comprehensive study of the prefabricated housing industry in the United States was published jointly by the Technology Press and John Wiley and Sons, Inc. under the title, *The Prefabrication of Houses*, by Burnham Kelly. Also brought out was the Foundation's *Housing Bulletin No. 1*, the first of a series intended to describe current housing research activities in the Foundation and elsewhere in the Institute and to provide a means for the informal distribution of studies not suited to formal publication.

Liaison with the Housing and Home Finance Agency continued through the year; and the Foundation completed negotiations leading to the signing of a contract with the Institute in the amount of \$29,900 for a study of "Methods for Applying Climatological Data in Dwelling Design, Site Selection, and Planning," to be carried out in the School of Architecture and Planning with assistance from the Department of Meteorology. Liaison was also continued with the Building Research Advisory Board, for which the Foundation served as key respondent in the Institute for a formal survey of housing research activity in the United States.

Announced during the year was the creation of an annual Bemis Foundation Fellowship in Housing, granting up to \$2,500 to a qualified candidate submitting a program for a year of graduate study at the Institute in any one of a wide range of fields related to housing. The first award, for the year 1951-1952, was made to James W. Hanson who proposed a doctorate thesis to be entitled, "The Influence of the F.H.A. on the Competitive Structure of the Boston Home Mortgage Market."

Under the direction of Richard W. Hamilton, Research Associate during the year, the Foundation took a major part in the development of a special course in Architecture which explores the future importance of mass production techniques

in the building industry and also in the arrangement of a conference with key government and military officials on the problems of housing in the war emergency. In co-operation with the Department of Architecture, the Foundation published a booklet on the conference and the student presentations which accompanied it entitled, *Housing—A National Security Resource*. Other educational activities included assistance to the Department of City and Regional Planning in the preparation of an exhibit for a meeting of Connecticut community representatives to discuss planning problems stemming from a proposed steel mill in the neighborhood of New London—a proposal which had been the subject of a major school study during the year.

Harold Horowitz was named to the Foundation staff, near the end of the year, to initiate a study of the mechanical facilities in houses—with the long-range objectives of increased independence from centralized community services, improved standards of sanitation for outlying areas, the conservation of water, fuel, and other resources, and the investigation of the possibilities of applying new scientific and technological developments to housing.

The Director served during the year on the Housing Research Council, on the Massachusetts Special Commission on the Structure of the State Government, on the Massachusetts Defense Council as a member of the Structural Protection Committee and as Chairman of the Dispersal of Industry Committee of the Massachusetts Civil Defense Agency, on the Housing Association of Metropolitan Boston as a Director, and on the Commonwealth Housing Foundation as a Trustee. He was also given leave of Absence during the winter months to serve the institute as a member of Project Troy.

Visitors to the Foundation during the year included: M. Maeda, Chief of Housing Finance Section, Housing Bureau, Ministry of Construction, Tokyo, Japan; Roy Grounds, Professor of Architecture, University of Melbourne, Australia; Robert M. Cabot, President's Materials Policy Commission, Washington, D. C.; David B. Waters, United Kingdom Scientific Mission; Mr. J. van Ettinger, Director of Bouwcentrum, Rotterdam, Holland.

BURNHAM KELLY

CITY AND REGIONAL PLANNING

Course IV-B completed its eighteenth year with the largest enrollment it has had since it was established in 1933. Because of the number of highly qualified applicants for graduate study, permission was given for an increase in the quota from 25 to 29 for the spring term only. While there is still pressure at the graduate level, the Department will return to the original quota for the coming year.

Students from Finland, Greece, Mexico, India, and Canada were included in the graduate class during the past year, and applications from foreign countries seem to be on the increase. With the serious shortage of trained planners in the United States in mind, it is not easy to determine what would be a fair proportion of graduate enrollment in the Course that could reasonably be allocated to foreign students.

The Visiting Committee of the School of Architecture and Planning held a one-day meeting during the spring term. Among the questions discussed was the possibility of developing a five-year program of undergraduate and graduate work which would lead to the degrees of Bachelor of City Planning and Master in City Planning. Such a proposal, which contemplates the elimination of the present undergraduate Course as an independent entity, will be given careful consideration during the coming year.

Several well-known practitioners in the field of city and regional planning lectured at the School during the past year; among them were: Professor William G. Holford, of London University; Mr. Coleman Woodbury, Director of the Urban Redevelopment Study in Chicago; and Mr. Charles W. Eliot, II, of Pasadena, California.

Mr. Charles Abrams, eminent writer and lecturer in the field of housing, came up from New York each week during the fall term to give the Housing Seminar, formerly conducted by Professor Lloyd Rodwin. Professor Rodwin was serving as a special consultant during that term for the United States Bureau of the Census.

Professor John T. Howard was re-elected Secretary-Treasurer of the American Institute of Planners at its annual meeting held in Chicago last March, and Professor Roland B. Greeley was re-appointed Managing Editor of the Institute's

Journal. At the same meeting, Professor Frederick J. Adams was appointed Chairman of the Committee on the Qualifications of Planners and that on the Social Responsibility of the Planning Profession.

The series of fall Conferences on City and Regional Planning inaugurated in 1937 was continued last September with a successful two-week Conference which attracted a representative group of men and women from various professional fields.

The Department joins with the Department of Architecture in welcoming Pietro Belluschi as Dean of the School of Architecture and Planning.

FREDERICK J. ADAMS

SCHOOL OF HUMANITIES AND SOCIAL STUDIES

ECONOMICS AND SOCIAL SCIENCE

Important changes have been made in our teaching program during the year. A departmental committee under the chairmanship of Professor Harold A. Freeman made a careful study of Course XIV, and the report of this committee became the basis of a revised undergraduate curriculum. Several members of the Department have participated in planning the new program of sequences in the Humanities. The inter-departmental committee studying this problem has been operating under the chairmanship of Professor Robert L. Bishop. It has devoted much time and thought to the project. We have also introduced some new subjects especially designed for the Sloan Fellows.

The housing investigation being conducted under the direction of Professor W. Rupert Maclaurin has been carried forward during the past year. Special attention has been devoted to the study of comparative costs in different types of house-building companies. Professors Morris A. Adelman and E. Cary Brown have been acting as advisers to the Treasury, and the former has been consultant to the Business Advisory Council of the Department of Commerce. Professor Brown completed his study on the effect of taxes on business decisions and collaborated in preparing a study on *Financing Defense*, recently issued by the Twentieth Century Fund.

Professors Paul Pigors and Charles A. Myers revised their textbook *Personnel Administration* and have edited a new book of readings in this field. Professor Myers spent last fall in Sweden as a visiting specialist in industrial relations under a grant from the United States Department of State. His report on this visit has been published both in this country and in Sweden. Professors Myers and George P. Shultz issued a study on "The Dynamics of a Labor Market" dealing with the effects of a plant shutdown in a New England community. The Technology Press published a study by Professor Shultz entitled, *Pressures on Wage Decisions*. Professors Pigors and Alex Bavelas gave a number of papers at professional societies

and university conferences. The latter has been on leave for part of the year.

Another conference on the operation of the Scanlon Plan of union-management co-operation was held by the Industrial Relations Section in April. The section, in co-operation with the Industrial Liaison Office, held a Conference on Human Relations Problems in Research Management attended by 66 research officers representing 35 companies. The activities of the Industrial Relations Section will be reviewed in a special report.

Professors Bavelas and Paul A. Samuelson have been participating in projects carried on by agencies of the Federal Government. Professor Samuelson has prepared a thorough revision of his textbook. We have strengthened the staff in psychology with the addition of Professors Joseph C. R. Licklider and George A. Miller. Professor Herbert A. Shepard has been awarded one of seven Faculty Research Fellowships given by the Social Science Research Council. He will devote half his time for the next three years to research on communication and organization.

We anticipate further calls on the staff for service in connection with national defense activity. Though these interruptions will create problems in fulfilling our teaching commitments, we are confident that the instruction of students will not suffer. In fact, as the result of the changes in our teaching program mentioned above and of additions to the staff, we hope to enlarge and improve our contribution to the educational work of the Institute.

RALPH E. FREEMAN

ENGLISH AND HISTORY

Work on a two-year core subject which, when completely organized, will serve as a general introduction to the Humanities and Social Sciences has continued throughout the year. Professors John B. Rae and Duncan S. Ballantine were relieved of teaching duties during the second term to devote full time to planning this subject. A generous grant of funds from the Carnegie Corporation made it possible for them to visit Columbia University, University of Chicago, Michigan State College, University of Michigan, University of Minnesota,

Northwestern University, and the University of Wisconsin. At each institution they discussed with those in charge of the program of general education such problems as the selection and compilation of materials, methods of instruction, selection and training of staff, and administration. As a result of their visits they were able to recommend measures which will increase the effectiveness of the planning and conduct of our new program.

With the assistance of Professor Herbert L. Beckwith, Director of Exhibits for the Museum Committee, two exhibits were assembled in the New Gallery to complement the textbook material used in the first year of the core subject. Primitive art and artifacts, most of which were loaned by the Peabody Museum at Salem, Massachusetts, constituted one exhibit. Mr. Ernest S. Dodge, the director of that museum, increased the effectiveness of the exhibit for teaching purposes by means of a gallery talk to members of the Department. The second exhibit picturing Medieval and Renaissance life and art was timed to coincide with the classroom discussion of these periods. To give special emphasis to certain other topics in the first-year subject, Dr. Margaret Mead, Sir Alfred Zimmern, and Dr. Ralph Gabriel came to M. I. T. as visiting lecturers.

Professor Joseph N. Ulman, Jr., has co-operated with Professors Richard Taylor and Thomas F. Jones, Jr., of the Department of Electrical Engineering, in an effort to make the laboratory reports written by sophomores and juniors more realistic experiences in formal report writing. This co-operation has resulted in lectures on report writing to both laboratory staff and students and in a new reporting procedure. Each report is now based on the work of several laboratory periods and requires the student to integrate and appraise a considerable amount of experimental material. A reduction in the number of formal reports makes possible a thorough and rigorous criticism of each report by a member of the English Department. Similar but less extensive efforts to improve the quality of student reports have been carried on with the Departments of Civil Engineering, Mechanical Engineering, Business and Engineering Administration, and Naval Architecture and Marine Engineering.

During each term the Department arranged five weeks of

intensive instruction in the techniques of faster and more accurate reading and more effective study for students who desired it. Although more rapid reading was a major objective, the two experts engaged to give the instruction continually stressed a fact too often neglected, namely that a person's reading speed should vary according to the type of material he is reading and the purpose for which he is reading. Each student paid a fee of \$10.00. Ninety registered the first term and 80 the second. The results were sufficiently satisfactory to warrant making such training available next year.

A gift to M. I. T. by Mrs. Luis de Florez and Miss Edith King in memory of their mother, Mrs. Ellen King, has made it possible for the department to offer each year a substantial prize in books for the best piece of writing submitted by a freshman. During her long service to M. I. T., first as hostess in the Roger's Building and later as librarian in Walker Memorial, Mrs. King was an understanding friend and wise counselor to a host of students.

Professor Matthew Richard Copithorne retired in June after 33 years of devoted service to M. I. T. He will be missed by his colleagues and long remembered by hundreds of M. I. T. students for the painstaking care with which he taught them to use the English language and to enjoy the pleasures and wisdom to be found in good books.

Professor Walt W. Rostow joined the department in September as Associate Professor of Economic History. Since the war he has served as assistant to the executive secretary of the Economic Commission for Europe, as visiting professor at Cambridge University, and as Harmsworth Visiting Professor at Oxford. He is author of the book, *British Economy of the Nineteenth Century*.

Professor George de Santillana represented M. I. T. at the Sixth International Conference of the History of Science at Amsterdam.

Dr. Robert L. Koehl was awarded a Carnegie Internship in General Education at the University of Chicago for the coming year. He will do some teaching, but he will spend the larger part of his time studying the organization, subject matter, and teaching methods used in the University's very successful program of general education.

Professor Karl W. Deutsch completed a manuscript on "Nationalism and Social Communication" which received the Sumner Prize in Political Science at Harvard University. Dr. Robert K. Lamb was elected Secretary of the Society of Applied Anthropology. Professor Elting E. Morison has continued his editing of the Theodore Roosevelt letters, the first two volumes of which were published in April. Professor E. Neal Hartley's research on the seventeenth century iron works built at Saugus, Massachusetts, has progressed steadily. Other members of the department have served on the committees of several of the professional societies and have presented papers at the meetings of American Historical Association, Conference on Science, Philosophy, and Religion, Economic History Association, Mississippi Valley Historical Association, The Institute of World Affairs, Society of Applied Anthropology, American Academy of Political and Social Science, and American Society for Engineering Education.

HOWARD R. BARTLETT

MODERN LANGUAGES

The major development in the Department of Modern Languages in the past year was the addition of four new subjects on a more mature level than any offered in recent years. Two elective subjects in contemporary French thought as reflected in the literature were added for students already able to read and speak French. The first deals with the period of the Third Republic and the second with the war and postwar period.

Two other more general electives were added, one in social linguistics and the other in applied semantics. These subjects are in seminar form and are intended primarily for graduate students, though undergraduates with a good linguistic background are also admitted.

All four of the subjects require maturity of thought similar to the senior Humanities courses, and they have been accepted for substitution for the senior Humanities requirement on petition by qualified students.

In the recent past, the Department of Modern Languages has offered only elementary and intermediate subjects in language, but the Department hopes that a sufficient number

of well-prepared students in French and German will be found at the Institute to justify Humanities subjects in both these areas. Surely it is in the interest of men with unusual language qualifications that they be encouraged to use and develop these abilities in such a way as to contribute to their cultural background.

Two research projects, both of which are financed by the Carnegie Grant for Scientific Aids to Learning, continued under Department administration. The larger of the two has been directed by Professor James W. Perry to developing new methods of indexing scientific papers so that electronic devices may be used for searching and correlating purposes. Fundamentally, this involves the use of words, phrases, and terminology in general, that is, a special language, as means for designating the subject matter of documents in such a way that machines can accomplish recognition and selecting operations formerly performed by scientific and clerical personnel. In developing machine-indexing methods, the needs of various fields of learning have been constantly kept in mind through maintaining contact with such diverse fields as chemistry, law, medicine, electrical engineering, and agriculture.

In addition to studies in the field of methodology, considerable effort has been devoted to the development of new machines. Collaborative work with the International Business Machines Corporation has resulted in a new set of electronically controlled punched-card machines, whose effectiveness for searching and correlating has been tested and demonstrated. The adaptability of high-speed digital computers has also been studied, and it appears that these machines are not well suited to searching and correlating operations. On the other hand, preliminary design studies indicate that the component units of digital computers can be used to construct an electronic machine able to search properly designed indexes at ultra-high speed.

The other research work is under the direction of Professor William N. Locke and is in the field of speech analysis, the attempt to correlate acoustical data on speech with the subjective identification of the individual speech sounds of which spoken language is composed. Various approaches are being attempted: frequency analysis of speech sounds, the produc-

tion of synthetic vowels, the search for criteria which may be recognized electronically as defining a given speech sound. Successful conclusion of these studies would at the same time cast much light on the process of speech communication and make possible the building of a speech typewriter.

Work in speech analysis is going on also at Harvard and Northeastern University; so it has seemed desirable to effect some co-ordination. To this end, weekly luncheons have been held at the Institute where one of the men in the field discusses the direction his work is taking.

In the staff of the Department two changes are to be noted: the resignation at the end of the year of Charles W. Steinmetz as Instructor of German and the part-time appointment for the year of Frederick Herman as Instructor in German.

WILLIAM N. LOCKE

MUSEUMS AND EXHIBITIONS

The Museum Committee's program of exhibits this year was a varied one. It included exhibitions of painting, sculpture, photography, stained glass, textiles, lithographs, and prints. Out of a total of 16 exhibits, nine were organized by the Museum Committee. This record is gratifying to the committee because it represents an increase of activity over past years and is consistent with what it believes it should be striving to do.

At the request of the Department of English and History, two exhibits were arranged to complement readings and classroom discussion in its first year subject. One was an exhibition of the art and artifacts of a primitive culture, and the other was a pictorial exhibit of life in the Middle Ages and the Renaissance. The success of this experiment indicates that further efforts to co-ordinate some of the museum activities directly with the educational program would be profitable.

An exhibition of stables and mobiles by Alexander Calder aroused much interest among the students and stimulated some of them to attempt similar constructions. It was probably the largest and most complete show by this artist to be held in Boston, and attracted more public attention than any other exhibit at M. I. T.

As part of the commemorative program for the 2,000th anniversary of Paris, the French Government prepared an exhibit of Art Sacré. Through our museum facilities the greater Boston public was able to see this exhibition before it went on tour of other American museums.

Other outstanding exhibits included "The New Landscape," a collection of scientific photographs selected by Professor Gyorgy Kepes; "Lithographs by Toulouse — Lautrec" loaned from the Albert H. Wiggin collection of the Boston Public Library; "Anni Albers Textiles"; and "Robert Maillart, Engineer."

HERBERT L. BECKWITH
HOWARD R. BARTLETT

SCHOOL OF INDUSTRIAL MANAGEMENT

BUSINESS AND ENGINEERING ADMINISTRATION

December 20, marking the announcement of a grant to the Institute of more than \$5,000,000 by the Alfred P. Sloan Foundation for the establishment of a School of Industrial Management, will for many years remain a memorable date in the annals of this Department. So substantial a gift brings to Technology new dimensions of service to society, to the nation, and, indeed, to the world. The Department looks forward to the opportunity of becoming a constructive part of this larger usefulness which has been opened to the Institute through the generosity of the Foundation and its Chairman, Alfred P. Sloan, Jr.

Prior to this date, the constructive efforts of the Department were chiefly concentrated upon teaching methods and curricular content. As a result, the staff unanimously approved a complete revision of the current undergraduate program including the requirement of a new second-year subject which provides a unique approach to the basic problems of top administration.

Following upon the December announcement, the various departmental committees (described in detail in last year's report) turned their attention to the many questions of policy, procedure, and personnel to which the new opportunity gave rise. At this stage, such considerations could be only of a tentative and preliminary nature, and are therefore inappropriate for inclusion in the present report. Yet it is proper to state that these considerations have been assigned top priority in the allocation of departmental time available for the study of constructive measures.

In recent years, increased attention has been given to the element of social contribution as an inseparable factor in the modern complex of administrative responsibilities. A survey of the service activities of our departmental staff members also reflects a clear desire and determination on their part to practice what they are preaching. A summary of these extra-curricular efforts follows.

Professor Douglass V. Brown, in addition to his activities as liaison officer with the Department of Economics and Social Science, consented again to serve for an interim period as Chairman of the Faculty. He also has been active as a member of the Research Advisory Board of the Committee for Economic Development and has further served as industrial arbitrator on several occasions.

Professor Ronald H. Robnett has been acting for a considerable period as Fiscal Officer of the Division of Industrial Cooperation.

Professor Ross M. Cunningham has served the American Marketing Association during the past year as chairman of its Census Advisory Committee which has had for its aim the encouragement of greater use of Census data among businessmen. Professor Cunningham also served on the Boston Census Tract Committee of the American Statistical Association.

Professor Gerald B. Tallman has entered upon his fourth year as director of the Sloan Fellowship Program for Executive Development.

At the request of the Government of Puerto Rico Economic Development Administration, Dr. Tallman conducted an investigation covering a long-term plan of industrial growth for the island. This report is being followed as a guide to insular government expenditures of some \$10,000,000 yearly. He has also been active in developing plans for the implementation of Point IV (Technical Aid) programs in Latin America.

Professor Edwin A. Boyan, at the request of the Economic Cooperation Administration, conducted two highly successful top-management seminars in Holland and in Western Germany, where American methods of increasing productivity were discussed. As a result of these presentations, Professor Boyan has been asked to give extended courses in this subject in both countries and has been invited to become senior consultant to two of the most important industries in Europe.

Professor Thomas M. Hill has been the moving spirit in a collaborative effort on a new text in accounting which has special emphasis on the administrative viewpoint. This volume has now been published.

Professor Hill has also served as business manager and as a member of the budget committee of two philanthropic

organizations in Boston. During the year he prepared an extensive report for the Boston Class II Milk Price Committee in which his recommendations proved both salutary and constructive. His additional activities as a member of the Committee on Concepts and Standards of the American Accounting Association have been exceptionally significant.

Professor John A. Beckett contributed directly to the high rating of the Boston Chapter of the National Association of Cost Accountants, of which he was Program Director. He has spoken before a number of Chapters in the East on matters of Distribution Costing and Direct Costing; these addresses were subsequently published in the *N.A.C.A. Bulletin*. He was elected Vice-President of the Boston Chapter for the year 1951-1952.

Since last spring, he has been doing research for the Government on Navy contracts and subcontracts. Last June, Professor Beckett was Chairman of the Conference of New England Accounting Instructors which was held at M. I. T. Evidence of the success of the Conference was the enthusiasm shown, by both the Committee and those attending, toward the future improvement of methods for teaching accounting.

Professor Carroll J. Brown continues as a member of the Federal Mediation and Conciliation Service as well as the American Arbitration Association. He has acted as arbitrator in several important negotiations affecting industrial establishments.

During the summer Professor Brown attended the International Management Congress held in Brussels, Belgium, and assisted Professor Erwin H. Schell in the conduct of 11 shipboard seminars and also in the preliminary rehearsals of the several panel sessions of the Congress.

Professor William E. Ritchie has published a textbook in the field of production planning and control as the result of several years of investigation. His activities as a member of the School Building Committee in Norwell went far toward the authorization of a new school building of modern design.

Professor W. Van Alan Clark, Jr., has applied the concepts of the classroom to the plant reorganization and expansion of a specialty manufacturing enterprise which have materially benefited under his direction.

In conjunction with other colleagues, Professor Clark has also undertaken a series of critical inquiries into individual industrial establishments in the interest of shortening the manufacturing interval. This development is proving of practical service to the manufacturers studied and is at the same time yielding valuable teaching material.

Professor James S. Cross has acted as Treasurer of the New England Chapter of the American Marketing Association and in conjunction with Professor Ross M. Cunningham, has been engaged in the preparation of a text on Industrial Marketing.

As management counsel to a chemical manufacturing establishment, he has rehabilitated its policies and procedures with the result that it is in a profitable operating condition for the first time in several years.

The department has continued to profit by the unstinted co-operation of the many companies and individuals who have given of their time and effort in opening their plants for visitation and study and in conducting administrative seminars with student groups.

Sincere appreciation is again extended to John R. Macomber, '97, to Newmann Marsilius, '17, and to Howard D. Williams, '11, for their continued gifts of unrestricted funds for departmental use.

ERWIN H. SCHELL

INTERDEPARTMENTAL LABORATORIES

ACOUSTICS LABORATORY

Miles of oscillograms, data from large-scale acoustics experiments over a period of several years, have been of particular concern to the Laboratory during the current year. All available techniques for reducing such data were explored with assistance from the Institute's Committee on Machine Methods of Computation. It was concluded that existing facilities were not suited to the task at hand and that novel techniques would be required to handle the complex wave signals characteristic of these experiments and of many others in our field.

The Laboratory then embarked on the design of an analog computing system specially adapted to acoustics research needs. Commercially available components were used where possible and formed most of the central computing portion of the system. Virtually nothing suitable, however, was available for use as terminal equipment, to read data into the computer and to provide results in useful form. This situation led to a number of developments in special instruments and information-handling devices.

During the current year our computer has almost reached maturity, and we now have an extraordinarily versatile facility for acoustics research. Information can be introduced directly from oscillograms, from graphs of functions, from microphones and recording machines, from electronic function generators, and almost any source of information encountered in acoustics experiments. This information can be processed in many ways. Special attention has been given to the inclusion of non-linear operations and correlational techniques, and to the introduction of empirical functions into the computations. The processed information can be displayed on an oscilloscope, or punched on a paper tape, or used to draw the function graphically, or fed to a typewriter, or even inserted back at the input for further processing.

The original miles of data can now be handled. More

important, entirely new fields of acoustics investigations are opened up by this versatile computer. Already a number of problems have been started which are expected to lead to Master's and Doctor's theses.

Our new computer is spotlighted in this report because it has started to have a profound influence on almost every branch of our program. Previously impracticable investigations in physical acoustics, in audio communications, in psychological and medical studies, and in architectural acoustics are for the first time becoming possible.

The other major developments in the research program during the year are described in the following paragraphs.

Architectural Acoustics. Instrumentation for the study of sound transmission through wall structures has proceeded steadily throughout the year, including the installation of an overhead crane system for handling large test panels. Preliminary measurements on the multiple speaker source and on a simple panel have been successfully carried out. At the same time, the completion of an extensive theoretical and experimental thesis study of boundary damping in plates has advanced our understanding of this factor in the transmission of sound through wall structures.

Criteria for predicting psychological disturbance from physical measurements have been developed for the effects of background noise in offices and of echoes in auditoriums. The latter study is being extended, by magnetic recording techniques, to include a number of echoes intermixed with reverberation. Finally, a scaled study of sound transmission over an audience has extended the scant amount of existing information on this subject.

Communication Acoustics. Speech communication studies have included further investigation of speech analysis techniques and of the processes of speech production and perception. Investigation of a speech analysis method based on the measurement of certain short-time statistical properties of the speech wave formed the subject of a Master's thesis. Study of transmission properties of the vocal tract has led to the design and construction of a speech synthesizer in the form of an electrical analogue to the vocal mechanism. Details of the perception of the basic components of speech sounds were examined to

aid in determining the essential information-bearing elements in the speech wave. In collaboration with linguists, a binary scheme for specifying the distinctive features of the individual speech sounds in terms of the speech mechanism and in terms of speech spectra was proposed. A study of speech reinforcement systems for large halls, originating from experience with systems developed for the Mid-Century Convocation, was completed and submitted for publication.

A new program linking the fields of psychology and communication acoustics is concerned with a study of the presentation of information to the ear and the assimilation of that information by the receiver. Attention is focused primarily on information rates. The program has been started with the simplest messages, encoded as binary signals, 0 and 1, and studies have been made of the rates at which they can be relayed and the extents to which they can be stored by the listener.

Instrumentation. The design and development of special instruments for acoustics research was a major activity of the Laboratory this year. Completed instruments include a direct-reading loudness meter, a direct-reading device for measuring acoustic impedance, a precision meter for determining the period between alternate axis-crossings of a signal, and a magnetic recording device for producing controllable artificial reverberation and multiple echoes. A polar scanner and recorder and a variable time delay using magnetic recording have also been completed.

Another variable time delay, of extremely high stability, is currently under development. This system also makes use of magnetic recording, but the flutter present in all existing magnetic recorders has been eliminated by the use of pulse width modulation and sampling circuits. The stability of the final system will be determined by the stability of the oscillator which controls the sampling rate. A prototype system has been built and performs satisfactorily; a more refined system is under construction.

This device, as well as many of the others mentioned, should find widespread applications in fields other than acoustics, but the development of all these instruments has been predicated upon the need for them in our own research.

Medical Acoustics. Continued progress was made toward the detection and localization of intracranial tumors by the use of ultrasound. A major obstacle was presented by the discovery that signals from the variations in the thickness of the skull almost overshadow the desired signals from the brain tissue and the ventricles. Several possible means for compensating for the skull attenuation are currently under investigation, including some data-processing techniques suggested by the computer program.

During the year, improved transducers of barium titanate, better means of scanning the head with an ultrasonic beam, and a new presentation method were developed. The controlled study of the effects of ultrasound on biological tissue were extended and a paper was published on damage to nerve tissue. Transmission properties of tissue were also investigated.

Physical Acoustics. A basically new method for the measurement of sound absorption coefficients was developed and reported. The method involves free-field measurements on large samples as the angle of incidence is varied continuously. An average of the results at various angles yields rigorously the statistical absorption coefficient which heretofore has been measured only approximately in reverberation chamber methods. A refined theory of absorption by perforated materials was completed during the year, giving results that agree closely with measurements obtained by the new free-field method.

An extensive theoretical and experimental investigation of sound transmission through metal plates immersed in liquids was published. A thesis was written on ultrasonic propagation in glass plates as related to the temper of the glass. Previous studies on acoustic resonators were extended to encompass the effects of a periodic structure of partitions in a duct. The theory of reciprocity calibration of microphones was modified to cover certain special configurations that extend the usefulness of reciprocity calibrations in non-anechoic rooms.

Administration and General Activities. There were no major changes in plant, space, and general facilities. However, there was a marked increase in personnel associated with the Laboratory, bringing the total above 100 for the first time. The resulting pressure made it necessary to reapportion the

available research and office space and to undertake some minor internal construction.

The financial support continued to derive mainly from the Office of Naval Research, the Bureau of Ships, the United States Air Force, and the National Institute of Health. The Office of Naval Research contract was extended to a three-year term to assure continuing support over that period. An increased appropriation from the Bureau of Ships supported the development of the computer program. A special grant from the Damon Runyon Memorial Fund provided some additional support for the medical program. Research Fellowships were sponsored by the Armstrong Cork Company and the Acoustical Materials Association.

A large portion of the year's research was reported in some 20 journal articles, in 12 student theses, and in 25 papers presented at meetings of several professional societies. An indication of the widening interest in acoustics can be illustrated by listing the societies at which our members delivered papers: The Acoustical Society of America, American Institute of Architects, American Medical Association Conference on Noise in Industry, Chicago Acoustical and Audio Group, Institute of Radio Engineers, American Institute of Electrical Engineers, National Electronics Conference, National Noise Abatement Symposium, American College of Surgeons, Industrial Hygiene Foundation, and American Institute of Chemical Engineers.

As an active member of the Institute community, the Acoustics Laboratory has welcomed many opportunities to join with other Laboratories and Departments in research activities of mutual interest. Active collaboration with the Plastics Laboratory, the Research Laboratory of Electronics, and the Instrumentation Laboratory on a variety of projects was carried on during the past year. Joint guidance and the loan of some equipment led to two Bachelors' theses in the Department of Chemical Engineering, as previous collaboration has contributed to theses and research in Biology, Naval Architecture, Textile Technology, and Mechanical Engineering as well as in Physics, Electrical Engineering, and Architecture. Assistance was given to several Institute activities on problems of room acoustics and noise and vibration control.

A special Summer Session course on sonics for industrial testing and processing was given by Professor Richard H. Bolt and Dr. Theodor F. Hueter with assistance from several members of the Laboratory and visiting specialists. The Laboratory also participated in demonstration lectures for the Alumni Association and for student engineering groups.

Assistant Professorships were received by three members of the Laboratory, Dr. K. Uno Ingard in Physics, Dr. Jordan J. Baruch in Electrical Engineering, and Mr. Robert B. Newman in Architecture. Dr. Osman K. Mawardi, who has made valuable contributions in theoretical acoustics, joined the Institute as Assistant Professor in Electrical Engineering.

Guests included Mr. Alan T. Pickles, head of the Physics Division of the Building Research Station, England, who spent the year with us on a Commonwealth Fellowship. Mr. C. G. M. Fant, of the Royal Institute of Technology, Stockholm, extended his visit and during the year made valuable contributions on the transmission properties of the vocal tract.

In November the Laboratory was host for a meeting of the Acoustical Society of America, of which Professor Philip M. Morse was President during 1950-1951.

RICHARD H. BOLT

RESEARCH LABORATORY OF ELECTRONICS

During the past year the basic research and education of the Laboratory has continued at the high level of the past. However, since the last report, the Laboratory has undergone a sizable expansion into fields of more immediate practical application. In addition, there has been a sizable demand on our senior staff for work on special projects and assignments for Government agencies. During the past year Professors Alex Bavelas, Robert M. Fano, George G. Harvey, Albert G. Hill, Jerome B. Wiesner, and Jerrold R. Zacharias and Mr. Louis D. Smullin have devoted sizable fractions of their time to such special projects. Fortunately, younger members of the staff, many of whom have just finished their graduate training, have been available as replacements, and the basic work of the Laboratory has not suffered.

Perhaps the most noteworthy discovery of the year in

which the Laboratory participated came about because of the collaboration of Professor Wiesner in one such project; this was the discovery of a new kind of radio propagation at very high frequencies observable over long distances. Heretofore, it was thought impossible to have radio propagation beyond the line of sight at frequencies greater than 30 megacycles per second, since ionospheric reflections stop as that frequency is approached. However, a general ionospheric theory worked out by Professor Henry G. Booker of Cornell University indicated that there might be a strong scattering of radio waves by the ionosphere around the direction of propagation which would make possible propagation at high frequencies. As a result of co-operative work between Mr. Dana K. Bailey, of the National Bureau of Standards, Dr. Lloyd V. Berkner, of the Carnegie Institution of Washington, D. C., Professor Edward M. Purcell, of Harvard, Dr. Winfield W. Salisbury, of the Collins Radio Company, Professor Wiesner, and Professor Booker, these theoretical predictions of Professor Booker's were made more definite; and a test was run between Cedar Rapids, Iowa, and Silver Springs, Maryland. Positive proof of the predictions was obtained immediately, and it may well be that a high order of improvement in certain radio communications will result.

Dr. John Granlund and Dr. Charles A. Stutt have spent the past several months in England collaborating with Professor Lawrence B. Arguimbau on the development of new frequency modulation receivers for high-quality reception. Improvements made during the past year indicate that a wide applicability of these receivers will exist. Actually, the receivers used in the propagation measurements mentioned earlier have been of Professor Arguimbau's design. In addition, a major improvement in the quality of transatlantic communications seems practicable by the use of these receivers.

General work in the field of statistical theory of communications under Professors Wilbur B. Davenport, Robert M. Fano, Yuk-Wing Lee, J. Francis Reintjes, and Jerome B. Wiesner continue and are provoking more and more attention from other laboratories. A special three-week summer course in June and July was conducted to which senior scientists and engineers from other laboratories were invited. Only 56

persons could be accommodated because of the limit of laboratory facilities, but applications were about three times this number. Applications of this theory to practical problems are under way in this Laboratory and in many other places.

Work on the statistical study of air traffic control problems done for the Civil Aeronautics Authority by Professors Lan J. Chu, Samuel J. Mason, and Richard B. Adler has now been successfully completed.

The recent discovery and perfection of the transistor as an active circuit element by the Bell Telephone Laboratories is recognized as an event of first rank importance in the electronic field. It is necessary for any laboratory in the broad field of electronics to achieve and maintain a measure of proficiency in the preparation and use of these devices, and Professors Adler and Zacharias are organizing a group for this purpose, with adequate attention paid to both the circuit element and the physics point of view.

During the past year the high-powered rising sun magnetron of Dr. Stuart T. Martin has been almost completed. Professor Chu and Mr. Smullin have made many important improvements in traveling wave amplifier design in so far as noise level is concerned. It is now believed that the traveling wave tube will soon be competitive with the crystal diode as a microwave signal detector.

The group working on circuit synthesis under Professors Ernst A. Guillemin, John G. Linvill, and Dr. Manuel V. Cerrillo continue at a high-rate of productivity, and much fundamental knowledge in this field is being obtained. Professor Ronald E. Scott and his collaborators working on various electronic computing devices have not only advanced the computing art but have been an invaluable asset to other workers in the Laboratory.

Many interesting and important results have been obtained in the general field of radio frequency spectroscopy. Professor Francis Bitter and his group have developed a new optical resonance method which will aid greatly in increasing the number of atoms for which the precise measurement of hyper-fine structure is possible. The molecular beam group under Professor Jerrold R. Zacharias and Dr. Benjamin Bederson has been investigating departures of hyper-fine structure measure-

ments from the Breit-Rabi formula and has made some important discoveries concerning the structure of the nucleus. Professor Bernard T. Feld and his students have worked out the theoretical values for this structure determination. The group under Professor Malcom W. P. Strandberg has almost finished a long-term effort on the measurement and understanding of various small interactions in molecular spectroscopy. In addition, this group has worked out the experimental and theoretical techniques for the precise measurement of nuclear magnetic moments by means of microwave molecular spectroscopy. Professor Arthur F. Kip's group has extended its paramagnetic investigations to aid in the understanding of the structure of the liquid state of matter. With the departure of Professor Kip for the University of California at Berkeley, this work will continue under the general direction of Professor Strandberg.

Professor Wayne B. Nottingham's group continues very active work in the field of physical electronics; of particular note is the extension of its methods to the study of semiconductors and insulators. Professors William P. Allis and Sanborn C. Brown and their collaborators continue to get important results in the field of gaseous conductivity. Worthy of note was the first measurement of the collision cross section between atoms and electrons at thermal energies. The measurement is in agreement with the prediction of Allis and Morse in 1936.

Professors Melvin A. Herlin and Laszlo Tisza and their associates in the Low Temperature Laboratory are continuing their very interesting work on the properties of liquid helium and the properties of superconducting metals. The soft X-ray spectrograph of Professor George G. Harvey and his students has been used during the past year to determine the energy states of the conduction electrons in several metals.

The amount of outside interest in the work of the Laboratory continues to increase. In addition to several symposia conducted by the Laboratory, the number of informal conferences and visits has been great. More than 50 foreign scientists and students have been guests of the Laboratory for periods from several days to the entire year.

ALBERT G. HILL

LABORATORY FOR NUCLEAR SCIENCE AND ENGINEERING

The Laboratory for Nuclear Science and Engineering has had a busy year both in basic research and in substantial completion of new research facilities.

Some of the outstanding researches of the past year were concerned with the new V-particle, the existence of positronium, energy levels in light nuclei, scattering of deuterons and protons by nuclei, production of mesons by photons, chemical studies of products of fission and their nuclear processes, and theoretical studies of nuclear and meson dynamics.

Some of the more prominent advances in research facilities were the completion of the electron linear accelerator, the improvement of the synchrotron into a reliable instrument, and continued assembly and testing of the 12 Mev Van de Graaff generator.

The Laboratory for Nuclear Science and Engineering has operated at substantially the same level this year as previously and plans to maintain approximately the same staff and facilities in the future. With the completion of the last of our large nuclear machines in sight, there is a marked trend toward even more basic research activity than before. The temporary absence, for emergency defense work, of a few of our senior personnel will be compensated in part by the presence of a number of visitors and by additions to our regular staff.

DAVID H. FRISCH

SPECTROSCOPY LABORATORY

The activities of the Spectroscopy Laboratory include a wide range of investigations dealing with the structures of atoms and molecules. Research is carried on by staff and students from the Departments of Physics, Chemistry, and Biology; and support for the work is provided by Government agencies, private research foundations, and industrial firms.

During the past year the large ruling engine for diffraction gratings has been put into operation. Some 20 small test gratings have been ruled using interferometric control of groove spacing. A contract has been written with the Office of Naval Research for support of the completion and further operation of the engine, and it is expected that large gratings and echelles,

a special type of grating newly devised on this project by Professor George R. Harrison, will soon be in production. The large Bitter electromagnet has been in further use in the production of Zeeman spectrograms which have been applied to the analysis of dysprosium, praseodymium, and other complex rare earth spectra by Dr. James E. Archer and various graduate students.

In the field of molecular structure, apparatus for the study of vacuum ultraviolet absorption spectra at liquid helium temperatures has been put into use by Mr. Robert S. McDonald and Professor Richard C. Lord. A recording grating spectrometer of high aperture has also been constructed for work in fluorescence and the Raman effect. It has been applied initially to a study of the fluorescence of hydrocarbons used in scintillation counters by Professor John W. Irvine, Jr. and Mr. Raymond C. Sangster of the Department of Chemistry. Infrared spectra have been investigated in detail for numerous deuterium compounds and at long wave lengths for materials of interest in the solid-state field, particularly elementary germanium and silicon, cesium bromide, and arsenic sulphide glass. The Laboratory again sponsored an intensive course in infrared spectroscopy for research personnel during the summer. Dr. Foil A. Miller, of the Mellon Institute of Industrial Research, co-operated with Professor Lord in giving the course, which was attended by about 100 research scientists from industrial, government, and academic laboratories. Some two-thirds of these followed a program of laboratory training in addition to the classroom work.

The investigations of trace elements in biological systems by spectrochemical methods have been continued by Dr. Bert L. Vallee and his co-workers from the Department of Biology. Procedures for the quantitative determination of a dozen important metallic elements simultaneously have been developed and are being applied to various biological samples. Trace elements in human white blood cells have been measured in quantities as small as one part per million of ashed sample with a precision of 10 per cent or less. Work is in progress on the effect of argon and argon-helium atmospheres on the burning time and sensitivity of analyses of biological samples.

The Laboratory, along with many other parts of the

Institute, suffered a serious loss in the death of Professor John R. Loofbourow. He had been a member of the Laboratory's steering committee from its inception, and both as an adviser and as a participant in the Laboratory's research activities, was responsible for much of the Laboratory's productivity. Dr. James E. Archer of the Department of Physics succeeds him on the steering committee.

During the past year, the publications from the Laboratory have been entirely in the form of journal articles by staff and students and are listed under the publications of their respective departments. One contract for support of the Laboratory's work by the Office of Naval Research has been completed, and another one begun. New projects with the Engineer Research and Development Board, the Atomic Energy Commission, and the Office of Ordnance Research have been approved. The facilities of the Laboratory have been extended to numerous investigators from other institutions.

RICHARD C. LORD

TREASURER'S REPORT

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, 1951 (pages 232 and 233) and the statement of income and expense (page 234) for the year ended June 30, 1951. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the accompanying financial statements present fairly the position of Massachusetts Institute of Technology at June 30, 1951, and the results of its operations for the year then ended.

LYBRAND, ROSS BROS. & MONTGOMERY

Boston, Massachusetts
September 14, 1951

REPORT OF THE AUDITING COMMITTEE

To the Corporation of the Massachusetts Institute of Technology:

The Auditing Committee reports that Lybrand, Ross Bros. & Montgomery were employed to make an audit of the books and accounts of the Institute for the fiscal year ended June 30, 1951 and their certificate is submitted herewith.

Respectfully,

REDFIELD PROCTOR
HAROLD BUGBEE
BRADLEY DEWEY, *Chairman*

FINANCIAL REVIEW

To the Corporation:

OPERATIONS

The year 1950-51 was a period of increasing activity, with the total volume of operations reaching \$23,469,000 compared with \$21,470,000 last year. The greater part of the expansion was in revenues from research contracts which increased to \$15,020,000 from \$12,858,000 in 1949-50. Tuition income declined but this reduction in revenues was largely offset by higher income from investments and income from gifts and other receipts used for current expenses. Total salaries and wages were \$14,875,000 for the year and made up 63% of all expenses. The most important changes in general expenses were the higher costs of allowances for pensions and insurance and the reduced expenses of the Development Program. Lower plant expenses reflected a decrease in special charges for alterations and maintenance but the cost of normal plant operations increased over the previous year.

The rise in overhead allowances under research contracts to \$2,580,000 from \$2,184,000 was due largely to the greater volume of research operations. These allowances included \$1,978,000 for general administration and plant expenses and \$601,000 for the use of the facilities and funds of the Institute. Research salaries and wages reimbursable directly by contract were 66% of the total of all research and academic salaries and wages for the year.

FUNDS

The invested and other funds of the Institute were \$56,817,000 on June 30, 1951, and \$52,682,000 on June 30, 1950. The net increase of \$4,135,000 in funds during the year consisted of \$1,660,000 in endowment funds, \$1,448,000 in building funds and \$1,027,000 in other classes of funds. The major addition to the endowment was the Faculty Salary Fund of \$1,000,000 established from other invested resources, to fund a part of the cost of the increase in staff salaries made in the spring of 1951.

Over the last ten years the invested and other funds have

increased \$20,213,000. More than two-thirds of the new resources have been in funds for current expenditure and these funds for the most part have been temporarily invested with the endowment funds. During the last five years the withdrawal of funds available for immediate use has been replaced with new funds so that funds temporarily invested, including student loan and reserve funds, have been about 30% on the average of all funds from year to year.

On June 30, 1951, the endowment funds were \$38,787,000 and 68% of all invested and other funds, as compared to 90% of all invested and other funds ten years ago.

PLANT

At the close of the fiscal year the book value of the plant of the Institute was \$28,577,539 and construction in progress when completed will bring the value of the educational plant to well over \$30,000,000. \$11,267,000, which is equivalent to almost 40% of the present plant, was added to the facilities for education and research in the five years ended June 30, 1951. The principal addition to plant in 1950-51 was the Sloan Building, purchased from the Lever Brothers Company. Construction under way on the John Thompson Dorrance Laboratory and the Metals Processing Laboratory, together with other buildings, resulted in a total increase in plant of \$4,364,000 during the twelve months under review.

GIFTS

The gifts, grants and bequests of \$9,145,000 received in cash, securities and other property during the year included a large proportion of the resources made available to M.I.T. through the Development Program by the alumni and friends of the Institute. The gifts reported herewith do not include subscriptions payable in the future to the Development Program funds. Gifts received specifically for buildings during the year were \$3,797,000 which may be compared with the expenditure of funds contributed for buildings of \$3,934,000. Funds unexpended and available for buildings, however, were \$3,100,000 at the close of the year as against \$1,652,000 a year earlier because unrestricted development funds of \$1,500,000 were transferred to funds for the completion of buildings.

Gifts available for immediate use of \$4,424,000 were about half of all gifts, grants and bequests received during 1950-51. Unrestricted development funds in the amount of \$1,769,000 were over one-third of all gifts for immediate use. The gifts actually used for operating expenses during the year are included in gifts and other receipts of \$2,183,000 shown on the Statement of Income and Expense. Development Program funds and grants from industrial companies have contributed substantially to the operating revenues of the Institute during the past three years. Funds have thereby been conserved that otherwise would have been used for current expenses. Industrial grants of \$695,000 were expended within fields of interest to the participating companies in the fiscal year ended June 30, 1951.

If the revenues for reimbursement of direct research contract expenses are excluded from total revenues, the traditional sources of income — tuition and investment income — make up but half of the total operating income of the Institute. Gifts for immediate use, industrial grants and other sources of current income are now of major importance in financing the program in education and research from year to year. This fundamental change in the sources of support for current operations underscores the need constantly to build the endowment and other funds of the Institute so as to meet the forces of inflation and to stabilize the greater scale of operations brought about by the widened responsibilities of M.I.T. The increase of the endowment funds is the next step in the Institute's long-range development plan now that many, but not all, of its building requirements have been financed.

INVESTMENTS

The proportion of the General Investments at market in common stocks at the end of the fiscal year has been steadily rising for five years. Common stocks have increased from 33.7% on June 30, 1946, to 45.9% on June 30, 1951. During these years real estate increased from 7.6% to 17.2% with the greater part of the increase in buildings for Institute use. Over the same interval bonds have declined from 50.8% to 27.9%. With the growth in funds held for short term investment,

commercial paper has increased to 5.8% of General Investments. During the twelve months ended June 30, 1951, common stocks increased from 40.9% to 45.9% and bonds moved downward from 32.8% to 27.9%.

The renovation of Burton House brought the total investment of the Institute's endowment and other funds in dormitories and housing projects to \$4,875,000 and 8.1% of General Investments. \$109,000 was provided from dormitory and other operating income for investment amortization, bringing the reserve set aside largely for this purpose to \$189,000 at the year end.

Dividend income on common stocks has increased sharply in recent years, from 43.2% of all income on General Investments in 1946-47 to 63.6% in 1949-50 and further to 65.5% in 1950-51. With the greater investment in stocks, and the higher dividend income, the rate earned for the funds sharing in the income from the General Investments increased from 3.98% in 1949-50 to 5.02% in 1950-51 on the average book value of the funds. Four per cent was distributed to the funds for the fourth consecutive year, bringing the average for 1941-51 to 3.76%. In consideration of the heavy proportion of investment income from dividends on common stocks, the income over and above 4% on the funds for the fiscal year 1951 was added to unallocated investment income. On June 30, 1951, the unallocated investment income was \$773,000 and was equal to about one-third of the income on General Investments of \$2,363,000 for the year ended on the same date. Of the income from all investments of \$2,583,000 for the year 1951, \$1,426,000 was used for current expenses, \$626,000 was added to fund balances and largely redistributed against current expenditures, while \$531,000 was added to unallocated investment income.

On June 30, 1951, \$1,646,000 was advanced to finance a part of the operations under research contracts. These advances supplemented advances of \$2,620,000 from the U. S. Government and made it possible to carry a total of \$4,266,000 in accounts receivable and contracts in progress for the research program at the end of the fiscal year.

GENERAL

In the past decade, the scale of operations has increased fourfold, and plant and building funds together have nearly doubled. In this ten-year period total invested funds have increased 50% and the endowment funds 18%. As the size of the student body has grown from 3,100 to over 5,000 the endowment per student has dropped to \$7,500 from \$10,800 in 1941. If both endowment funds and funds available directly for support of current operations can be augmented, the position of the Institute will be strengthened and its capacity to produce educational and research services will be unimpaired in the years ahead.

Respectfully submitted,

JOSEPH J. SNYDER, *Treasurer.*

SCHEDULE A

BALANCE SHEET

JUNE 30, 1951

INVESTMENTS

General investments:		
U. S. Government bonds	\$15,066,378	
Other bonds	2,165,876	
Preferred stocks	182,900	
Common stocks	17,258,020	
Real estate (including \$5,425,211 devoted to Institute use) and mortgages	10,495,924	
Commercial paper	3,459,694	
Advances for current operations (per contra) . .	1,628,784	
	<hr/>	
Total general investments (A-1)		\$50,257,576
Investments of funds separately invested (A-2)		3,613,398
Students' notes receivable (A-12)		538,612
		<hr/>
		\$54,409,586

CURRENT AND DEFERRED ASSETS

Cash:		
General purposes	\$ 1,865,649	
Segregated for certain research contracts	620,383	
Students' safe-keeping deposits	100,673	\$ 2,586,705
	<hr/>	
Accounts receivable:		
U. S. Government (A-13)	\$ 2,192,253	
Other (A-13)	178,782	2,371,035
	<hr/>	
Contracts in progress:		
U. S. Government (A-14)	\$ 2,147,253	
Other (A-14)	204,513	2,351,766
	<hr/>	
Inventories, prepaid expenses and deferred charges (A-15)		710,931
Unamortized service facilities		467,161
		<hr/>
		\$ 8,487,598

EDUCATIONAL PLANT

Land, buildings and equipment (A-19)	\$28,577,539
	<hr/>
	\$91,474,723
	<hr/>

BALANCE SHEET

233

SCHEDULE A

BALANCE SHEET

JUNE 30, 1951

INVESTED FUNDS

Endowment funds:	
Income for general purposes.....(A-3)	\$29,090,419
Income for designated purposes.....(A-4)	9,697,282
Total endowment funds.....	\$38,787,701
Student loan funds.....(A-5)	2,503,761
Building funds.....(A-6)	3,099,982
Invested funds for current use:	
For general purposes.....(A-7)	\$ 1,427,696
For designated purposes.....(A-8)	3,419,763
Total invested funds for current use.....	4,847,459
Unexpended endowment income for designated purposes.(A-4)	903,422
Agency and annuity funds.....(A-9 & 10)	947,941
General investment gain and loss account.....(A-11)	3,319,320
	<u>\$54,409,586</u>

CURRENT LIABILITIES, FUNDS AND SURPLUS

Advances from invested funds (per contra)....	\$ 1,628,784
Accounts payable and accrued wages.....	604,787
Students' advance fees and deposits.....(A-16)	263,484
Students' safe-keeping deposits.....	100,673
Withholdings, deposits and other credits..(A-17)	433,408
Advances by U. S. Government for certain research contracts.....	<u>3,240,068</u>

Total current liabilities..... \$ 6,271,204

Gifts and other receipts for current expenses (including \$42,546 unexpended balances of appropriated income)....(A-18)	1,634,574
Investment income unallocated to funds.....	773,421
Deficit from operations.....	(191,601)
	<u>\$ 8,487,598</u>

EDUCATIONAL PLANT CAPITAL

Endowment for educational plant.....(A-20)	\$28,577,539
	<u>\$91,474,723</u>

REPORT OF THE TREASURER

SCHEDULE B
STATEMENT OF INCOME AND EXPENSES
FOR YEAR ENDED JUNE 30, 1951

INCOME

Educational and General		
Tuition and other fees (B-1)	\$	3,914,292
Investment income used for current expenses (B-2)		1,426,435
Gifts and other receipts used for current expenses (B-2)		2,182,871
Research contracts:		
Reimbursement for direct expenses . . . (B-3)	\$12,440,470	
Allowances for expenses of administration and plant operations	1,978,488	14,418,958
		<hr/>
Other income (B-4)		55,670
		<hr/>
Total educational and general		\$21,998,226
Auxiliary activities — dormitories, dining services and housing projects (B-13)		1,470,568
		<hr/>
Total operating income		\$23,468,794

EXPENSES

Educational and General		
Academic expenses (including research expenses of academic departments):		
Salaries and wages (B-5)	\$	3,925,370
Departmental expenses (B-6)		910,475
Library and museum (B-7)		231,586
		<hr/>
Research contracts — direct expenses:		
Salaries and wages (B-3)	\$	7,471,909
Materials and services		3,344,146
Subcontracts, travel and other		1,624,415
		<hr/>
General and administrative expenses (B-9)		2,397,196
Plant operation (B-10)		1,644,134
Medical department (B-11)		143,387
Undergraduate budget board (B-12)		250,851
		<hr/>
Total educational and general		\$21,943,469
Auxiliary activities — dormitories, dining services and housing projects (B-13)		1,539,790
		<hr/>
Total operating expenses		\$23,483,259
		<hr/>
Excess of operating expenses over operating income for year . . .	\$	14,465
Deficit June 30, 1950		191,432
		<hr/>
	\$	205,897
Net reduction of unexpended balances of appropriated income . .		14,296
		<hr/>
Deficit June 30, 1951	\$	191,601
		<hr/>

LOAN FUND COMMITTEE

235

REPORT OF THE TECHNOLOGY LOAN FUND COMMITTEE
COMPARATIVE BALANCE SHEET

ASSETS				
	June 30, 1950		June 30, 1951	
Cash.....	\$ 86,934.05		\$ 61,607.21	
Investments (Schedule A-2).....	1,570,416.29	\$1,657,350.34	1,569,218.38	\$1,630,825.59
Student Notes Receivable:				
Loans 1930 to date.....	\$2,179,510.75		\$2,341,516.75	
Less Repayments (including \$9,344.69 charged off).....	1,751,623.28	427,887.47	1,821,150.89	520,365.86
TOTAL ASSETS.....		<u>\$2,085,237.81</u>		<u>\$2,151,191.45</u>
LIABILITIES				
Technology Loan Fund:				
Total Subscriptions.....		\$1,451,295.18		\$1,451,295.18
Add:				
Investment Income (net).....	\$ 621,955.91		\$ 691,311.66	
Interest from Loans.....	229,623.48		234,184.65	
Class of 1895 Memorial Fund.....	4,824.00	856,403.39	5,824.00	931,320.31
		\$2,307,698.57		\$2,382,615.49
Deduct:				
Net Loss on Sales of Securities.....	\$ 181,486.97		\$ 189,840.26	
Written Off, Deceased Borrowers.....	5,125.32		5,125.32	
Legal Settlements.....	3,609.38		4,219.37	
Life Insurance Premiums.....	32,239.09	222,460.76	32,239.09	231,424.04
TOTAL LIABILITIES.....		<u>\$2,085,237.81</u>		<u>\$2,151,191.45</u>

RECEIPTS AND EXPENDITURES FOR 1950-1951

RECEIPTS			
Income (Investments).....		\$ 69,355.75	
Interest (Loans).....		4,561.17	
Class of 1895 Memorial Fund.....		1,000.00	
		<u>\$ 74,916.92</u>	
EXPENDITURES			
Loans made during year.....		\$ 162,006.00	
Less: Repayments (plus charge-offs).....		69,527.61	
		<u>\$ 92,478.39</u>	
Loss on Sale of Securities.....		8,353.29	
Deceased Borrowers.....		.....
Legal Settlements.....		609.99	101,441.67
NET DECREASE IN CASH AND INVESTMENTS.....			<u>\$ 26,524.75</u>

TECHNOLOGY LOAN FUND COMMITTEE
Karl T. Compton, *Chairman*

Gerard Swope
Pierre S. du Pont

William C. Potter
Joseph J. Snyder

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

ASSETS

	<i>June 30, 1950</i>	<i>June 30, 1951</i>
Cash.....	\$ 100,658.84	\$ 59,572.67
Investments (page 237).....	2,712,411.70	3,178,118.88 ¹
Total.....	\$2,813,070.54	\$3,237,691.55

¹ Market Value June 30, 1951, \$3,609,865.01.

LIABILITIES

Teachers' Annuity Fund (5% salary deduction, plus interest).....	\$1,594,651.63	\$1,749,113.53
*M.I.T. Pension Fund (3% appropriation, plus interest).....	1,073,233.06	1,173,136.25
Special Reserves for Annuity Payments....	123,698.30	280,954.49
Total Liabilities.....	\$2,791,582.99	\$3,203,204.27
Reserve Fund (including undistributed income).....	21,487.55	34,487.28
Total.....	\$2,813,070.54	\$3,237,691.55

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

RECEIPTS AND EXPENDITURES FOR 1950-1951

RECEIPTS

5% salary deductions added to Teachers' Annuity Fund....	\$ 237,007.97
3% appropriations added to M.I.T. Pension Fund.....	142,339.76
Income from investments (Net).....	123,853.50
Gain on sale of securities.....	182.48
Total Receipts.....	\$503,383.71

EXPENDITURES

Paid on account of withdrawal or decease of members.....	\$ 65,928.26
Pension paid directly to retired former members.....	12,834.44
Total Expenditures.....	78,762.70
Net Increase of Ledger Assets.....	\$ 424,621.01

TRUSTEES OF THE M.I.T. PENSION ASSOCIATION

Karl T. Compton
Ralph E. Freeman

Joseph J. Snyder
John R. Macomber

A RECORD OF INVESTMENTS HELD FOR ACCOUNT OF THE
TRUSTEES OF THE M.I.T. PENSION ASSOCIATION

<i>Par Value or Shares</i>				<i>Book Value</i>	<i>Net Income</i>
\$175,000	U. S. Treasury	2¼s	1959-62	\$ 175,876.25	\$ 2,705.58
125,000	U. S. Treasury	2½s	1963-68	126,110.00	3,035.00
250,000	U. S. Treasury	2¼s	1964-69	251,737.50	4,472.50
150,000	U. S. Treasury	2½s	1965-70	151,930.00	2,865.72
100,000	U. S. Treasury, "B"	2¾s	1975-80	100,000.00	. . . . .
1,010,000	U. S. Savings, "G"	2½s	1954-63	1,010,000.00	22,750.00
35,000	Alabama Power	3½s	1972	35,000.00	1,225.00
50,000	Am. Tel. & Tel.	2¾s	1961	53,600.00	975.00
50,000	Am. Tel. & Tel.	2¾s	1980	50,090.00	1,365.00
50,000	Comm. Edison	3s	1977	52,300.00	1,400.00
50,000	Louisiana Pr. & Lt.	3s	1974	51,242.00	1,324.27
50,000	Pac. Gas & Elec.	3s	1974	51,425.00	1,425.00
50,000	Philadelphia Electric	2¾s	1974	50,275.00	1,350.00
35,000	So. California Edison	3s	1965	36,500.00	950.00
25,000	Balt. & Ohio	4s	1975	24,987.50	1,000.00
800	du Pont			29,504.20	4,360.00
1,213	Eastman Kodak			28,510.58	2,029.00
1,500	General Electric			63,519.71	5,325.00
1,200	General Motors			29,332.24	7,800.00
900	Gulf Oil			67,460.86	1,800.00
527	Int. Business Machines			26,443.18	2,057.00
1,600	Sears Roebuck			29,391.89	4,400.00
1,000	Standard Oil Company (Indiana)			42,892.95	3,133.50
1,800	Standard Oil Company (New Jersey)			43,765.46	5,467.25
1,500	Union Carbide and Carbon			41,575.54	4,500.00
1,500	United Fruit			38,575.21	7,500.00
1,200	United Shoe Machinery			66,904.62	2,500.00
200	Am. Telephone & Telegraph			32,877.59	1,800.00
1,200	Cleveland Electric Illuminating			44,110.95	2,880.00
1,800	Houston Lighting & Power			26,132.53	1,650.00
2,000	Middle South Utilities, Inc.			33,214.83	1,200.00
1,000	Public Service of Indiana			29,496.30	1,800.00
2,750	Virginia Electric & Power			54,409.82	2,700.00
560	Bankers Trust, N. Y.			26,737.50	1,120.00
500	First National Bank, Boston			27,500.00	1,125.00
100	Guaranty Trust, N. Y.			23,989.50	1,400.00
560	National City Bank, New York			24,318.28	600.00
1,440	Fireman's Fund Insurance			40,950.00	2,520.00
267	Hartford Fire			18,338.67	801.00
600	Insurance Co. of North America			16,000.00	1,500.00
	Real Estate, Albany, N. Y.			51,093.22	2,339.04
	Income from stocks and bonds sold . . . . .			. . . . .	2,703.64
Total Pension Association				\$3,178,118.88	\$123,853.50

STATEMENT ON ACCOUNTS

Supporting schedules for the Balance Sheet as of June 30, 1951 and the Statement of Income and Expenses for the year then ended have been drawn from the Institute's books of account and are presented herewith. Schedule A-1 through A-20 relate to the Balance Sheet, Schedule A; and Schedules B-1 through B-13 to the Statement of Income and Expense, Schedule B.

D. L. RHIND
Bursar

J. A. LITTLE, C.P.A.
Accounting Officer

W. A. HOKANSON
Assistant Bursar

SCHEDULE A-1

GENERAL INVESTMENTS

<i>Par Value</i>			<i>Book Value</i>	<i>Net Income</i>
U. S. GOVERNMENT BONDS				
\$1,000,000	U. S. Treasury . . . 2½'s	1954-52	\$ 1,000,700.00	\$ 24,300.00
4,500,000	U. S. Treasury . . . 2¼'s	1962-59	4,487,031.25	91,607.14
1,000,000	U. S. Treasury . . . 2½'s	1967-62	981,718.75	2,850.27
1,500,000	U. S. Treasury . . . 2½'s	1968-63	1,469,218.75	4,739.00
5,100,000	U. S. Treasury . . . 2½'s	1969-64	5,173,000.00	121,500.00
1,500,000	U. S. Treasury . . . 2½'s	1971-66	1,537,708.94	33,500.00
417,000	U. S. Savings "G" . 2½'s	1953-56	417,000.00	10,425.00
	Income from bonds sold			87,615.91
	Total U. S. Government Bonds . . .		\$15,066,377.69	\$ 376,537.32
CANADIAN BONDS				
\$ 200,000	Interprovincial Pipe Line 3½'s	1970	\$ 197,375.00	\$ (1,176.38)
PUBLIC UTILITY BONDS				
\$ 200,000	Am. & For. Pr. 5's	2030	\$ 197,182.41	\$ 10,000.00
78,000	Puget Sound Pr. Lt. 4¼'s	1972	79,679.53	3,115.00
	Total Public Utility Bonds		\$ 276,861.94	\$ 13,115.00
RAILROAD BONDS				
\$ 100,000	Baltimore & Ohio . . . 4's	1975	\$ 86,985.00	\$ 4,000.00
50,000	B. & O., P., L. E. & W. Va. . . . 4's	1980	48,643.75	2,000.00
115,000	Northern Pacific . . . 4's	1997	105,228.29	4,600.00
153,000	Southern Pacific . . . 4½'s	1981	150,781.75	6,817.50
	Total Railroad Bonds		\$ 391,638.79	\$ 17,417.50
OTHER BONDS				
\$1,000,000	Com'l Credit Co. . . 2¾'s	1954-57	\$ 1,000,000.00	\$ 27,500.00
300,000	International Bank 3's	1976	300,000.00	(196.91)
	Income from bonds sold			9,086.84
	Total Other Bonds		\$ 1,300,000.00	\$ 36,389.93
<i>Shares</i>				
PREFERRED STOCKS				
200	Christiana Sec. Co. \$7.00		\$ 28,400.00	\$ 350.00
1,500	N. E. Gas & Elec. 4.50		154,500.00	6,750.00
	Total Preferred Stock		\$ 182,900.00	\$ 7,100.00

REPORT OF THE TREASURER

SCHEDULE A-1 — (Continued)

Shares		Book Value	Net Income
INDUSTRIAL COMMON STOCKS			
<i>Agricultural Equipment</i>			
4,000	Caterpillar Tractor Co.....	\$ 92,194.13	\$ 11,000.00
6,000	International Harvester Co.....	79,912.25	12,900.00
<i>Automobile</i>			
4,275	Chrysler Corporation.....	150,144.60	45,956.25
52,736	General Motors Corp.....	2,092,934.78	162,361.00
<i>Building Supplies</i>			
6,000	Johns-Manville Corp.....	187,886.86	23,400.00
4,200	National Lead Co.....	118,093.64	18,900.00
6,000	Pittsburgh Plate Glass Co.....	83,197.11	15,600.00
2,000	Sherwin Williams Co.....	100,988.10	6,750.00
<i>Chemicals</i>			
4,000	Allied Chemical & Dye Corp....	169,177.26	12,000.00
500	American Cyanamid Co.....	50,919.54	.....
266	Christiana Securities Co.....	717,374.35	109,110.09
1,570	Dow Chemical Company.....	96,903.84	3,643.80
1,495	E. I. du Pont de Nemours & Company.....	123,159.75	2,665.10
33,005	Eastman Kodak Company.....	478,610.26	55,202.00
10,000	Hercules Powder Co.....	492,799.94	32,400.00
6,020	Merck & Co., Inc.....	110,483.44	13,545.00
4,100	Monsanto Chemical Company...	96,803.58	11,650.00
13,777	Union Carbide & Carbon Corp....	273,602.10	41,267.00
<i>Containers</i>			
3,000	American Can Company.....	294,888.57	16,500.00
6,070	Owens-Illinois Glass Co.....	348,022.10	22,640.00
<i>Electrical Equipment</i>			
15,000	Thomas A. Edison, Inc.....	180,000.00	15,000.00
8,965	General Electric Company.....	233,807.47	31,797.75
3,200	General Radio Company.....	73,850.00	5,475.00
6,000	Westinghouse Electric Corp.....	107,827.11	13,200.00
<i>Food and Beverages</i>			
3,150	Liquid Carbonic Corp.....	53,551.11	4,095.00
12,306	United Fruit Company.....	202,533.18	61,530.00
<i>Machinery</i>			
6,000	Draper Corporation.....	96,132.10	17,000.00
6,000	United Shoe Machinery Corp....	352,340.53	15,000.00
<i>Metal Mining</i>			
4,850	International Nickel Company...	163,067.43	9,700.00
3,943	Kennecott Copper Corp.....	245,819.30	16,337.50

INVESTMENTS

241

SCHEDULE A-1 — (Continued)

<i>Shares</i>	<i>Book Value</i>	<i>Net Income</i>
<i>INDUSTRIAL COMMON STOCKS — (Continued)</i>		
<i>Office Equipment</i>		
1,106 International Business Machines Corp.....	\$ 47,863.23	\$ 4,312.00
3,180 National Cash Register Co.....	96,166.04	8,904.00
<i>Oil</i>		
3,500 Gulf Oil Corporation.....	184,894.62	14,000.00
8,000 Humble Oil & Refining Co.....	339,294.10	32,000.00
3,500 Ohio Oil Company.....	106,531.25	9,975.00
3,000 Phillips Petroleum Company....	168,069.52	12,600.00
14,700 Socony Vacuum Oil Co., Inc....	251,737.50	22,785.00
11,350 Standard Oil of California.....	343,751.66	31,780.00
7,040 Standard Oil (Indiana).....	284,581.62	22,039.10
18,394 Standard Oil (New Jersey).....	428,412.93	57,128.00
4,260 Texas Company.....	117,349.92	13,819.00
<i>Paper</i>		
10,008 International Paper Co.....	180,484.79	30,024.00
<i>Retail Trade</i>		
4,000 Montgomery Ward & Company..	261,266.32	16,000.00
5,000 J. C. Penny Company.....	154,666.05	17,500.00
6,844 Sears, Roebuck & Company.....	154,362.79	18,506.00
<i>Soap</i>		
2,100 Colgate-Palmolive-Peet Co.....	100,920.68	6,100.00
7,500 Procter & Gamble Co.....	261,143.86	22,500.00
<i>Steel</i>		
6,000 Inland Steel Co.....	199,974.49	24,000.00
6,600 National Steel Corp.....	149,488.34	21,450.00
<i>Tobacco</i>		
2,024 American Tobacco Co.....	154,736.11	8,096.00
2,625 Liggett & Myers Tobacco Co....	183,606.14	13,125.00
<i>Miscellaneous</i>		
2,500 Consolidated Rendering Co.....	169,500.00	15,000.00
4,016 Minnesota Mining & Mfg. Co....	74,380.40	3,808.00
Income on stocks sold.....	.....	12,971.70
Total Industrial Common Stocks.	<u>\$12,280,206.79</u>	<u>\$1,245,048.29</u>

REPORT OF THE TREASURER

SCHEDULE A-1 — (Continued)

<i>Shares</i>		<i>Book Value</i>	<i>Net Income</i>
PUBLIC UTILITY COMMON STOCKS			
8,340	American Gas & Electric Co.	\$ 340,845.38	\$ 25,020.00
1,010	American Tel. & Tel. Co.	128,273.13	9,031.50
4,080	Boston Edison Company	147,729.74	11,368.00
8,075	Commonwealth Edison Co.	230,222.21	12,920.00
3,500	Illinois Power Company	127,251.83	7,700.00
4,000	Southern California Edison Co.	141,089.14	8,000.00
6,000	Texas Gas Transmission Corp.	102,750.00	.....
8,869	Virginia Electric & Power Co.	172,333.36	9,669.60
	Total Public Utility Common Stocks	\$1,390,494.79	\$ 83,709.10
RAILROAD COMMON STOCKS			
2,043	Atchison, Topeka & Santa Fe Ry.	\$184,244.69	\$ 19,337.00
2,000	Great Northern Railway Co. P/d	95,877.13	7,500.00
2,400	Southern Railway Co.	122,400.00	4,800.00
	Income on stocks sold . . . . .	.....	2,400.00
	Total Railroad Common Stocks	\$402,521.82	\$ 34,037.00
BANK STOCKS			
3,750	Bankers Trust Co., New York	\$ 189,613.75	\$ 7,500.00
2,285	The Hanover Bank, New York	233,581.79	8,285.00
2,425	Cont. Ill. Nat. Bank, Chicago	174,564.00	9,700.00
4,986	The First National Bank, Boston	300,481.21	11,218.50
1,152	Guaranty Trust Co. of New York	321,949.04	16,128.00
833	Harris Trust & Savings, Chicago	146,362.00	9,498.00
6,800	National City Bank of New York	292,278.20	12,180.00
	Income on stocks sold . . . . .	.....	20,277.22
	Total Bank Stocks	\$1,658,829.99	\$94,786.72
INSURANCE STOCKS			
4,167	Boston Insurance Company	\$197,914.51	\$10,439.35
2,125	Continental Ins. Co., New York	68,383.05	5,312.50
7,180	Fireman's Fund Ins. Co., Calif.	207,774.20	12,565.00
2,308	Hartford Fire Ins. Co., Conn.	112,547.69	6,924.00
6,400	Insurance Co. of North America	161,635.55	16,000.00
	Income on stock sold . . . . .	.....	6,000.00
	Total Insurance Stocks	\$748,255.00	\$57,240.85

SCHEDULE A-1 — (Continued)

<i>Shares</i>		<i>Book Value</i>	<i>Net Income</i>
OTHER STOCKS			
6,000	Am. Research & Development Corp.	\$150,000.00	.....
10,250	Bond Investment Trust of America	202,031.50	\$ 8,200.00
16,522	Railway & Light Securities Co. . . .	252,880.11	15,899.25
1,000	Stone & Webster, Inc.	29,507.65	2,000.00
	Investment in 25 other securities.	143,292.63	6,231.20
	Total Other Stocks	\$777,711.89	\$32,330.45
MORTGAGE NOTES			
	Common Street, Belmont	\$6,750.00	\$ 272.81
	Park Avenue, Arlington	8,327.41	386.55
	Putnam Place, Roxbury	3,300.00	158.01
	Ruby Avenue, Marblehead	6,300.00	294.75
	Spear and Wibird Streets, Quincy .	4,100.00	205.00
	Alpha Tau Omega	9,500.00	520.00
	Beta Theta Pi	19,000.00	1,037.50
	Delta Kappa Epsilon	11,000.00	460.85
	Kappa Sigma	9,000.00	450.00
	Lambda Chi Alpha	12,958.66	501.60
	Pi Lambda Phi	7,000.00	525.00
	Phi Gamma Delta	2,750.00	175.01
	Phi Kappa	13,250.00	693.75
	Phi Mu Delta	5,500.00	343.75
	Sigma Chi	3,500.00	175.00
	Income on paid-up mortgages . . . .	.....	235.72
	Total Mortgage Notes	\$122,236.07	\$ 6,435.30
REAL ESTATE DEVOTED TO INSTITUTE USE			
<i>Dormitories and Housing</i>			
	111 Bay State Road, Boston	\$17,000.00	\$ 680.00
	120 Bay State Road, Boston	30,000.00	451.12
	Graduate House	647,951.94	.....
	Baker House	2,064,180.53	.....
	Burton House	1,656,055.32*	.....
	Westgate Veterans' Housing	459,492.60	10,432.49
	Total Dormitories and Housing . . .	\$4,874,680.39	\$11,563.61
<i>Research</i>			
	565 Memorial Drive, Cambridge . .	\$ 200,560.50	\$10,028.00
	209 Mass. Ave., Cambridge	100,000.00	5,000.00
	Wood Street, Lexington, Mass. . . .	68,074.04	3,403.00
	68-92 Albany Street, Cambridge . .	181,895.99	4,316.65
	Total for Research	\$ 550,530.53	\$22,747.65

*Not including first mortgage of \$412,187.80.

REPORT OF THE TREASURER

SCHEDULE A-1 — (Continued)

	<i>Book Value</i>	<i>Net Income</i>
OTHER REAL ESTATE		
80 Memorial Drive, Cambridge...	\$906,972.52	\$45,014.73
100 Memorial Drive, Cambridge..	153,510.85	3,299.36
333 Memorial Drive, Cambridge..	40,000.00	.....
500 Memorial Drive, Cambridge (Building and Fixtures).....	61,431.25	2,585.57
540-550 Memorial Drive, Cam- bridge (Land).....	351,099.51	8,795.20
640 Memorial Drive, Cambridge..	480,286.59*	26,715.62
Gloversville, N. Y.....	224,588.79	11,259.00
New London, Conn.....	235,488.69	11,250.84
Plattsburgh, N. Y.....	181,258.76	8,314.61
Taunton, Mass.....	192,669.37	8,760.64
Waltham, Mass.....	644,819.89	25,526.12
Willimantic, Conn.....	157,419.01	7,154.32
Main Street, Worcester, Mass...	190,695.34	8,669.95
Federal Street, Worcester, Mass...	379,276.78	18,275.41
Bexley Hall, Cambridge.....	150,280.61	10,912.84
76-94 Mass. Ave., Cambridge....	448,678.74	838.24
Franklin Street, Boston.....	150,000.00	7,631.36
Income on real estate now in educational plant.....	.....	280.00
Total Other Real Estate.....	\$4,948,476.70	\$205,283.81
 <i>Par Value</i>		
COMMERCIAL PAPER		
\$1,000,000 Com. Inv. Trust, Inc. . . . 1952	\$985,000.00	.....
1,000,000 Gen. Elec. Credit Corp. . . 1952	997,500.00	\$(2,083.33)
500,000 General Motors Acceptance Corp. 1951	492,416.67	.....
1,000,000 General Motors Acceptance Corp. 1952	984,777.78	.....
Income from notes matured.....	.....	56,458.34
Total Commercial Paper and Notes	\$3,459,694.45	\$54,375.01
Advances for current operations..	\$1,628,784.03	\$66,000.00
Total General Investments.....	\$50,257,575.87	\$2,362,941.16
	(Schedule A)	

*Not including first mortgage of \$477,500.00.

SCHEDULE A-2

INVESTMENTS OF FUNDS SEPARATELY INVESTED

<i>Par Value or Shares</i>		<i>Book Value</i>	<i>Net Income</i>
INVESTMENTS, AVOCA FUND			
3,600	General Radio	\$ 76,200.00	\$6,300.00
	Income from stock sold . . . . .	.....	500.00
			<u>\$6,800.00</u>
INVESTMENTS, BABSON FUND			
\$2,000	U. S. Treasury 2½s 1956-59	\$ 2,000.00	\$ 45.00
1,000	U. S. Savings "G" 2½s 1961	1,000.00	25.00
1,000	U. S. Savings "G" 2½s 1963	1,000.00	.....
20	E. I. du Pont de Nemours & Co.	1,722.86	34.00
80	United Stores, Cum. Conv. Pfd.	8,034.54	480.00
80	United Stores, 2d Pfd.	1,288.56	120.00
30	Standard Oil, Ind.	1,429.30	94.20
	<i>Total Babson Fund</i>	<u>\$ 16,475.26</u>	<u>\$ 798.20</u>
INVESTMENTS, MALCOLM COTTON BROWN FUND			
\$2,500	U. S. Savings "G" 2½s 1954	\$ 2,500.00	\$ 62.50
1,000	U. S. Savings "G" 2½s 1961	1,000.00	25.00
30	General Electric	1,019.70	106.50
	<i>Total Brown Fund</i>	<u>\$ 4,519.70</u>	<u>\$ 194.00</u>
INVESTMENTS, CLASS OF 1919 FUND			
\$4,650	United States Savings "F" 1955-57	\$ 3,441.00	.....
INVESTMENTS, CLASS OF 1920 FUND			
\$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>
INVESTMENTS, DRAPER FUND			
\$29,900	U. S. Savings "G" 2½s 1954	\$ 29,900.00	\$ 747.50
24,000	U. S. Savings "G" 2½s 1955	24,000.00	600.00
10,000	U. S. Savings "G" 2½s 1959	10,000.00	250.00
21,000	U. S. Savings "G" 2½s 1960	21,000.00	525.00
5,000	Baltimore & Ohio 4s 1975	5,000.00	200.00
5,000	Northern Pacific 4s 1997	4,598.31	200.00
5,000	Southern Pacific 4½s 1981	5,000.00	225.00
100	du Pont de Nemours	4,731.05	545.00
60	Standard Oil, N. J.	2,010.78	187.50
	<i>Total Draper Fund</i>	<u>\$106,240.14</u>	<u>\$3,480.00</u>

REPORT OF THE TREASURER

SCHEDULE A-2 — (Continued)

<i>Par Value or Shares</i>		<i>Book Value</i>	<i>Net Income</i>
INVESTMENTS, ARTHUR D. LITTLE MEMORIAL FUND			
\$40,000	U. S. Treasury 2s 1953-51	\$ 40,000.00	\$ 800.00
40,000	U. S. Treasury 2s 1954-52	40,000.00	800.00
466	Arthur D. Little, Inc., Pfd.	46,600.00	2,796.00
5,543	Arthur D. Little, Inc., Com.	110,860.00	52,658.50
	<i>Total Little Fund</i>	<u>\$237,460.00</u>	<u>\$57,054.50</u>
INVESTMENTS, RICHARD LEE RUSSEL FUND			
\$1,000	Mortgage Note (participation)	\$ 1,000.00	\$ 50.00
3,000	Mortgage	3,000.00	150.00
	<i>Total Russel Fund</i>	<u>\$ 4,000.00</u>	<u>\$ 200.00</u>
INVESTMENTS, SOLAR ENERGY FUND			
5,000	Godfrey L. Cabot, Inc.	\$647,700.00	\$59,712.58
530	General Electric	20,171.83	1,881.50
324	Mission Corporation	6,291.00	730.73
	Income from stocks . . . . .	.....	62.25
	<i>Total Solar Energy Fund</i>	<u>\$674,162.83</u>	<u>\$62,387.06</u>

INVESTMENTS

247

SCHEDULE A-2 — (Continued)

<i>Par Value or Shares</i>		<i>Book Value</i>	<i>Net Income</i>
INVESTMENTS, JONATHAN WHITNEY FUND			
\$331,000	U. S. Savings "G" 2½s 1954-58	\$331,000.00	\$ 8,275.00
40,000	Niagara Mohawk Pr. . . . 2½s 1980	40,000.00	36.33
40,000	Pacific Gas & Elec. 3s 1974	41,103.37	288.33
410	Bankers Trust, N. Y.	18,937.50	820.00
500	Boston Edison	18,567.12	1,400.00
374	Boston Insurance	19,145.78	937.45
300	Chrysler	16,594.85	3,225.00
400	du Pont	15,279.10	2,180.00
250	First National Bank of Boston	11,525.00	562.50
500	General Electric	13,188.05	1,775.00
66	Guaranty Trust, N. Y.	18,087.30	924.00
400	Inland Steel	16,220.12	1,600.00
750	International Paper	14,642.60	2,250.00
450	National City, N. Y.	20,792.55	840.00
644	Standard Oil, N. J.	12,311.87	2,012.50
450	United Fruit	10,690.25	2,250.00
	Income from stocks and bonds sold . . . . .	.....	2,461.54
	<i>Total Whitney Fund</i>	<u>\$618,085.46</u>	<u>\$31,837.65</u>

INVESTMENTS, TECHNOLOGY LOAN FUND			
\$600,000	U. S. Savings "G" 2½s 1954-60	\$600,000.00	\$15,000.00
20,000	U. S. Treasury 1½s 1955	20,000.00	300.00
100,000	U. S. Treasury 2s 1953-51	100,000.00	2,000.00
96,000	U. S. Treasury 2¼s 1962-59	96,000.00	2,160.00
88,000	U. S. Treasury 2½s 1958-56	88,000.00	2,200.00
100,000	U. S. Treasury 2½s 1954-52	100,000.00	2,500.00
35,000	American Tel. & Tel. . . . 2¾s 1980	35,000.00	962.50
15,000	Pacific Gas & Elec. 3s 1974	15,000.00	450.00
450	American Can	36,089.83	2,475.00
1,200	Cleveland Electric Illuminating	46,337.47	2,880.00
800	du Pont	29,304.00	4,360.00
1,000	General Electric	25,813.25	3,550.00
177	Guaranty Trust, N. Y.	50,333.82	2,478.00
625	Gulf Oil	32,630.80	2,500.00
1,210	National Cash Register	38,458.96	3,223.00
1,250	National City, N. Y.	46,541.50	2,310.00
2,000	Public Service of Indiana	54,706.84	2,250.00
750	Procter & Gamble	29,511.45	2,250.00
280	St. Paul Fire & Marine Ins.	6,737.50	224.00
1,286	Standard Oil, N. J.	24,864.43	4,018.75
1,200	Union Carbide and Carbon	27,726.00	3,600.00
900	United Fruit	21,360.20	4,500.00
534	Hartford Fire Insurance of Conn.	44,802.33	1,602.00
	Income from stocks sold . . . . .	.....	1,562.50
	<i>Total Technology Loan Fund</i>	<u>\$1,569,218.38</u>	<u>\$69,355.75</u>

REPORT OF THE TREASURER

SCHEDULE A-2 — (Continued)

<i>Par Value or Shares</i>			<i>Book Value</i>	<i>Net Income</i>
INVESTMENTS, JOSEPH HEWETT FUND				
\$11,000	U. S. Treasury 2¼s	1959-62	\$ 10,893.44	\$ 53.04
67,000	U. S. Savings "G" 2½s	1954-61	67,000.00	1,675.00
15,000	Alabama Power 3½s	1972	15,000.00	525.00
4,000	Puget Sound Pr. & Lt. 4¼s	1972	4,000.00	536.62
12,000	Baltimore & Ohio 4s	1975	12,000.00	480.00
10,000	Northern Pacific 4s	1997	10,400.00	350.00
10,000	Southern Pacific 4½s	1981	10,180.00	420.00
12,000	Texas & New Orleans 3½s	1990	12,000.00	405.00
120	Bankers Trust, N. Y.		4,775.00	240.00
22	Guaranty Trust, N. Y.		5,078.70	308.00
100	American Can		7,520.00	550.00
200	du Pont		8,271.55	1,090.00
300	General Electric		8,107.50	1,065.00
181	National Cash Register		5,406.74	482.80
200	St. Paul Fire & Marine Insurance		4,812.50	160.00
200	Standard Oil Company (Indiana)		9,498.65	627.00
438	Standard Oil Company (New Jersey)		8,533.38	1,362.75
300	Union Carbide and Carbon		6,944.20	900.00
300	United Fruit		7,120.00	1,500.00
<i>Total Hewett Fund</i>			<u>\$217,541.66</u>	<u>\$12,730.21</u>
INVESTMENTS, GEORGE S. WITMER FUND				
\$17,800	U. S. Savings "G" 2½s	1954-61	\$ 17,800.00	\$445.00
4,000	Am. Tel. & Tel. 2¾s	1971	4,000.00	(13.52)
5,000	Atlantic Coast Line 4s	1952	4,854.44	200.00
5,000	Northern Pacific 4s	1997	4,903.79	200.00
4,000	Southern Pacific 4½s	1981	3,942.68	180.00
150	Commonwealth Edison		5,082.43	240.00
205	Middle South Utilities		1,384.05	235.76
140	Pacific Gas & Electric		5,467.32	280.00
295	United Gas Corporation		2,165.95	295.00
120	St. Paul Fire & Marine Insurance		2,887.50	96.00
50	General Electric		1,718.25	177.50
90	General Motors		2,503.46	585.00
100	R. J. Reynolds Tobacco		4,200.00	200.00
100	The Sperry Corporation		2,500.00	300.00
43	Standard Oil Company (Indiana)		1,967.70	135.02
86	Standard Oil Company (New Jersey)		1,715.20	268.75
90	Union Carbide and Carbon		2,051.85	270.00
65	Bankers Trust, N. Y.		3,071.50	130.00
22	Guaranty Trust, N. Y.		5,920.20	308.00
	Real Estate, Sanford, Fla.		3,977.27	253.43
	Income from stocks sold . . . . .		.....	190.00
<i>Total Witmer Fund</i>			<u>\$ 82,113.59</u>	<u>\$4,975.94</u>
<i>Total of Investments of Funds Separately Invested</i>			<u>\$3,613,398.52</u>	<u>\$249,813.31</u>
(Schedule A)				

INVESTMENTS

249

INVESTMENTS — SUMMARY

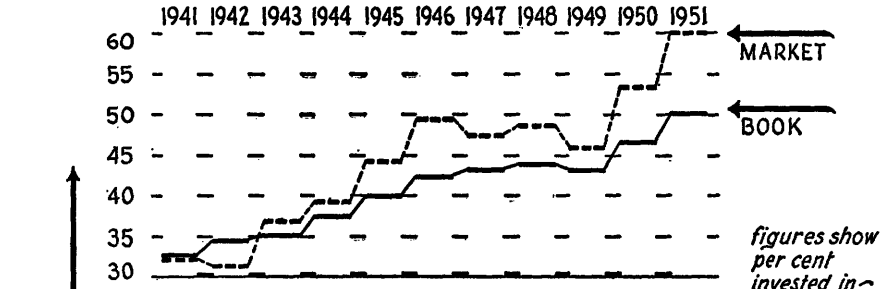
JUNE 30, 1951

General Investments	Book Value	Market Value	Per Cent	Net Income	Per Cent
Bonds					
U. S. Government.....	\$15,066,378	\$14,614,921	24.3	\$ 376,537	15.9
Canadian.....	197,375	172,500	.3	(1,176)	(.0)
Public Utility.....	276,862	275,565	.5	13,115	.6
Railroad.....	391,639	375,630	.7	17,417	.7
Other.....	1,300,000	1,289,500	2.1	36,390	1.5
Total.....	\$17,232,254	\$16,728,116	27.9	\$ 442,283	18.7
Preferred Stocks.....	\$ 182,900	\$ 182,300	.3	\$ 7,100	.3
Common Stocks					
Industrial.....	\$12,280,207	\$21,568,619	35.9	\$1,245,048	52.7
Public Utility.....	1,390,495	1,543,735	2.6	83,709	3.5
Railroad.....	402,522	506,021	.8	34,037	1.5
Bank.....	1,658,829	1,664,142	2.8	94,787	4.0
Insurance.....	748,255	1,471,360	2.5	57,241	2.4
Other.....	777,712	812,149	1.3	32,330	1.4
Total.....	\$17,258,020	\$27,566,026	45.9	\$1,547,152	65.5
Mortgage Notes.....	\$ 122,236	\$ 122,236	.2	\$ 6,435	.3
Real Estate					
For Institute Use.....	\$ 5,425,211	\$ 5,425,211	9.0	\$ 34,312	1.4
Other Property.....	4,948,477	4,948,477	8.2	205,284	8.7
Total.....	\$10,373,688	\$10,373,688	17.2	\$ 239,596	10.1
Commercial Paper.....	\$ 3,459,694	\$ 3,459,694	5.8	\$ 54,375	2.3
Advanced for Current Operations.....	\$ 1,628,784	\$ 1,628,784	2.7	\$ 66,000	2.8
Total General Investments.....	\$50,257,576	\$60,060,845	100.0	\$2,362,941	100.0
Special Investments.....	\$ 3,613,398	\$ 4,173,540		\$ 249,813	
Students' Notes Receivable.....	\$ 538,612	\$ 538,612			*
Charge for financial services.....				\$ (30,000)	
Total Investments.....	\$54,409,586	\$64,772,997		\$2,582,754	

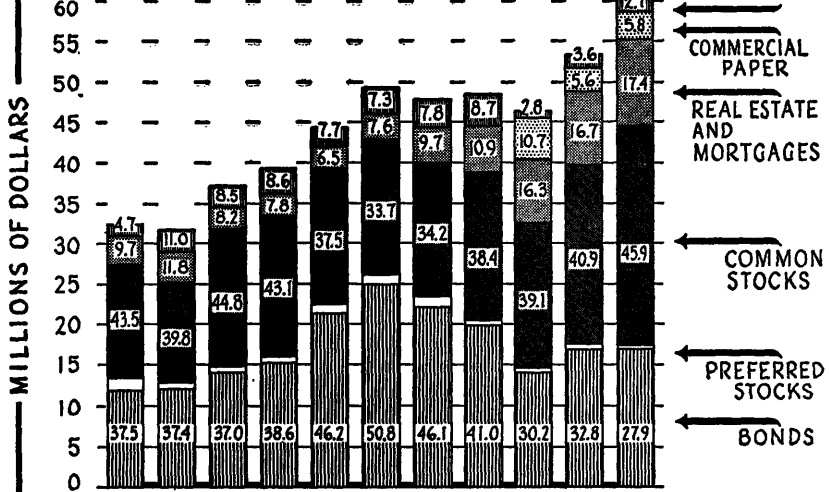
* Interest credited directly to student loan funds.

GENERAL INVESTMENTS . . . 1941-1951

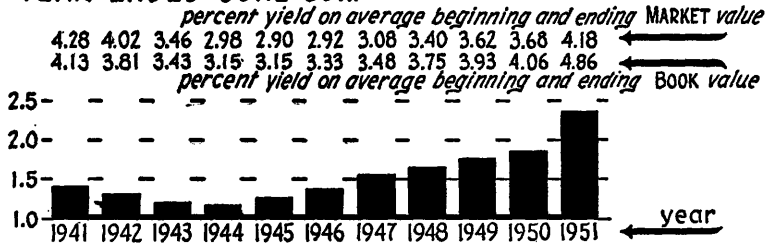
BOOK AND MARKET VALUE AS OF JUNE 30th -



MARKET VALUE AS OF JUNE 30th -



INCOME YEAR ENDED JUNE 30th -



SUMMARY OF FUNDS

	<i>Balance, June 30, 1950</i>	<i>Gifts and Other Receipts</i>	<i>Investment Income</i>	<i>Transfers In-(Out)</i>	<i>Expenses</i>	<i>Other Charges</i>	<i>Balance, June 30, 1951</i>
Endowment funds:							
Income for general purposes (A-3)	\$27,998,129	\$ 86,586	\$1,121,716	\$1,004,900	\$1,120,912	.....	\$29,090,419
Income for designated purposes (A-4)	9,129,365	531,308	.....*	36,609	.....	.....	9,697,282
Student loan funds (A-5)	2,293,421	224,114	75,836	1,000	.....	\$ 610	2,503,761
Building funds (A-6)	1,652,244	3,797,212	76,634	1,508,129	.....	3,934,237	3,099,982
Invested funds for current use:							
For general purposes (A-7)	1,119,948	2,206,392	84,496	(1,642,130)	296,341	44,669	1,427,696
For designated purposes (A-8)	3,536,979	1,326,690	140,652	(1,020,928)	263,764	299,866	3,419,763
Unexpended endowment income for designated purposes (A-4)	915,269	5,843	506,261	(45,723)	261,793	216,435	903,422
Agency and annuity funds (A-9 and 10)	945,613	89,550	46,458	(104,214)	.....	29,466	947,941
General investments gain and loss account (A-11)	3,493,036	(173,716)	.....	.....	.....	.....	3,319,320
Total invested funds	\$50,994,004	\$8,093,979	\$2,052,053	\$ (262,357)	\$1,942,810	\$4,525,283	\$54,409,586
Gifts and other receipts for current expenses (A-18)	1,445,833	1,878,895	.....	262,357	1,666,496	286,015	1,634,574
Investment income unallocated to funds	242,720	.....	530,701	.....	.....	.....	773,421
	<u>\$52,682,557</u>	<u>\$9,972,874</u>	<u>\$2,582,754</u>	<u>.....</u>	<u>\$3,609,306</u>	<u>\$4,811,298</u>	<u>\$56,817,581</u>
Gifts received during the year per list, page 336	\$9,145,107						
Other receipts (research contract allowances for use of facilities; sales of services, publications, etc.; royalties and miscellaneous receipts)	827,767						
	<u>\$9,972,874</u>						
Investment income used for expenses per statement of Income and Expenses					\$1,426,435		
Gifts and other receipts used for expenses per statement of Income and Expenses					2,182,871		
					<u>\$3,609,306</u>		
Expenditures for buildings added to Educational Plant						\$4,363,576	
Scholarship and fellowship awards charged to funds						323,788	
Other charges to funds not representing operating expenses						123,934	
						<u>\$4,811,298</u>	

* See Unexpended endowment income for designated purposes.

REPORT OF THE TREASURER

ENDOWMENT FUNDS

PRINCIPAL		INCOME						
Balance June 30, 1950	Gifts, Receipts and Transfers	Balance June 30, 1951	Schedule A-3	Balance June 30, 1950	Investment Income	Expended	Transfers and Other Charges	Balance June 30, 1951
			GENERAL PURPOSE					
\$ 5,000.00	.....	\$ 5,000.00	101 George Robert Armstrong.....	.....	\$ 200.00	200.00	.....	.....
.....	1,825.00	1,825.00	102 Henry E. Bemis Memorial.....	.....	60.00	60.00	.....	.....
962,243.40	62,860.55	1,025,103.95	103 George Blackburn Memorial.....	.....	49,372.00	40,372.00	.....	.....
12,514.55	.....	12,514.55	105 Clara H. Briggs.....	.....	500.00	500.00	.....	.....
17,170.01	.....	17,170.01	107 James A. Carney.....	.....	688.00	688.00	.....	.....
35,858.15	.....	35,858.15	109 Charles Choate.....	.....	1,436.00	1,436.00	.....	.....
18,160.69	1,575.95	19,736.64	110 Class of 1909.....	.....	752.00	752.00	.....	.....
107,618.75	.....	107,618.75	111 Eben S. Draper.....	.....	3,480.00	3,480.00	.....	.....
221,325.48	.....	221,325.48	113 Coleman du Pont.....	.....	8,852.00	8,852.00	.....	.....
9,498,869.55	.....	9,498,869.55	115 Eastman Contract.....	.....	379,956.00	379,956.00	.....	.....
261,148.19	.....	261,148.19	117 Charles W. Eaton.....	.....	10,444.00	10,444.00	.....	.....
7,573,855.60	.....	7,573,855.60	119 Educational Endowment.....	.....	302,956.00	302,956.00	.....	.....
30,000.00	.....	30,000.00	121 Martha Ann Edwards.....	.....	1,200.00	1,200.00	.....	.....
25,000.00	.....	25,000.00	123 William Endicott.....	.....	1,000.00	1,000.00	.....	.....
.....	1,000,000.00 TR.	1,000,000.00	124 Faculty Salary Endowment.....	.....	.....	.....	.....	.....
1,000,000.00	.....	1,000,000.00	125 Francis Appleton Foster.....	.....	40,000.00	40,000.00	.....	.....
299,926.65	.....	299,926.65	127 John W. Foster.....	.....	11,996.00	11,996.00	.....	.....
5,000.00	.....	5,000.00	129 Alexis H. French.....	.....	200.00	200.00	.....	.....
90,996.92	12.72	91,009.64	131 Jonathan French.....	.....	3,640.00	3,640.00	.....	.....
2,208,482.92	.....	2,208,482.92	133 Henry C. Frick.....	.....	88,340.00	88,340.00	.....	.....
1,527,440.00	2,550.00	1,529,990.00	135 General Endowment.....	.....	61,116.00	61,116.00	.....	.....
215,684.43	.....	215,684.43	137 Eliot Granger.....	.....	864.00	864.00	.....	.....
1,000,000.00	.....	1,000,000.00	139 Charles Hayden.....	.....	40,000.00	40,000.00	.....	.....
366,430.96	.....	366,430.96	141 John Marshall Hills.....	.....	14,656.00	14,656.00	.....	.....
36,809.70	.....	36,809.70	142 Walter W. Hodges.....	.....	1,472.00	1,472.00	.....	.....

FUNDS

163,654.21	.....	163,654.21	James Fund.....	.....	6,548.00	.....
68,893.95	.....	68,893.95	Dale G. Kilburn.....	.....	2,756.00	.....
100.00	.....	100.00	Charles C. Ladd.....	.....	600.00	.....
15,000.00	.....	15,000.00	Thomas McCammon.....	.....	196.00	.....
250.00	.....	5,150.00	Charles T. and Charles R. Main Memorial	.....	1,000.00	.....
4,900.00 TR.	.....			.....	1,000.00	.....
25,000.00	.....	25,000.00	Kate M. Morse.....	.....	48.00	.....
25,000.00	.....	1,200.00	Everett Mons.....	.....	2,000.00	.....
1,200.00	.....	50,000.00	Samuel Munch Memorial.....	.....	3,340.00	.....
50,000.00	.....	83,452.36	Richard Perkins.....	.....	40,860.00	.....
83,452.36	.....		J. W. and B. L. Randall.....	.....	10,008.00	.....
1,021,475.00	.....	1,021,475.00	John D. Rockefeller, Jr.....	.....	2,784.00	696.00 TR.
250,225.00	.....	250,225.00	William Barton Rogers Memorial.....	.....	104.00	.....
69,607.87	696.00 TR.	70,303.87	Saltonstall Fund.....	.....	192.00	.....
2,415.63	2,575.00	4,990.63	Homer E. Sargent.....	.....	2,000.00	.....
4,764.40	.....	4,764.40	Samuel E. Sawyer.....	.....	2,000.00	.....
59,000.00	.....	50,000.00	Andrew Hastings Spring.....	.....	188.00	.....
4,677.35	.....	4,677.35	George C. Stone.....	.....	1,004.00	.....
25,061.62	.....	25,061.62	Seth K. Sweetser.....	.....	1,808.00	.....
45,242.61	.....	45,242.61	Henry P. Talbot.....	.....	944.00	.....
23,613.59	.....	23,613.59	William J. Walker.....	.....	164.00	.....
.....	4,500.00	4,500.00	Richard Watcoat Memorial.....	.....	1,444.00	.....
36,057.19	.....	36,057.19	Horace Herbert Watson.....	.....	216.00	.....
1,500.00	5,212.28	6,712.28	Arthur P. Watt Memorial.....	.....	200.00	.....
5,000.00	.....	5,000.00	Albion B. K. Welch.....	.....	6,972.00	.....
174,194.00	3,800.00	175,994.00	Everett Westcott.....	.....	9,892.00	.....
246,980.62	1,324.25	248,304.87	Marion Westcott.....	.....	1,080.00	108.00 TR.
26,980.65	108.00 TR.	27,088.65	George Wigglesworth.....	.....	10,188.00	.....
254,703.94	.....	254,703.94	Edwin A. Wyeth.....	.....		.....
\$37,998,128.94	\$1,005,704.00 TR.	\$29,090,418.69	Totals.....	\$1,121,716.00	\$1,120,912.00	\$804.00 TR.
	\$86,585.75 Gifts		(Schedule A)			

Note: The number beside the fund name is a reference from alphabetical list of funds at end of this report. Items not otherwise identified in the Gifts, Receipts and Transfers column are gifts. TR. identifies a transfer; O.R., Other Receipt; O.C., Other Charge.

REPORT OF THE TREASURER

ENDOWMENT FUNDS

PRINCIPAL

	PRINCIPAL		INCOME					
	Balance June 30, 1950	Gifts, Receipts and Transfers	Balance June 30, 1951	Schedule A-4	Investment Income	Expended	Transfers and Other Charges	Balance June 30, 1951
	\$ 13,082.20	.....	\$ 13,082.20	.....	\$ 524.00	\$ 450.00	.....	\$ 74.00
	12,342.05	608.00 TR. } 6,184.20	19,134.25	.....	608.00	.....	608.00 TR.	.....
	308,941.88	.....	308,941.88	\$ 57,419.29	14,616.00	14,606.99	.....	57,338.30
	25,200.00	.....	25,200.00	14,325.89	1,580.00	392.51	.....	15,513.38
	.....	20,000.00	20,000.00	.....	68.00	.....	.....	68.00
	10,000.00	.....	10,000.00	264.00	412.00	.....	.....	676.00
	50,000.00	.....	50,000.00	12,760.20	2,264.00	12,520.00	.....	2,504.20
	7,309.77	.....	7,309.77	40.95	292.00	66.90	.....	266.05
	1,633.60	.....	1,633.60	366.44	76.00	384.59	.....	57.85
	95,955.67	.....	95,955.67	.....	3,840.00	3,840.00	.....	.....
	400,000.00	.....	400,000.00	.....	16,000.00	.....	.....	.....
	10,000.00	.....	10,000.00	.....	404.00	400.00	.....	315.23
	75,001.48	.....	75,001.48	1,265.78	3,052.00	3,000.00	.....	1,317.78
	67,058.49	.....	67,058.49	3,091.47	2,800.00	3,000.00	.....	2,891.47
	.....	250,000.00	250,000.00	.....	5,826.00	.....	.....	5,826.00
	158,675.53	.....	158,675.53	53,756.48	57,054.50	100,000.00	7,500.00 TR.	3,310.98
	5,000.00	.....	5,000.00	.....	200.00	200.00	.....	.....
	4,250.00	.....	4,250.00	1,604.25	196.00	1,800.00	.....	.25
	5,000.00	.....	5,000.00	1,378.88	228.00	1,606.00	.....	.88
	395,676.29	.....	395,676.29	.....	15,828.00	15,828.00	.....	.....
	12,000.00	.....	12,000.00	808.00	492.00	1,040.00	.....	260.00
	15,076.05	.....	15,076.05	11,109.52	1,048.00	700.00	.....	11,457.52
	30,000.00	.....	30,000.00	22,753.78	2,036.00	2,100.00	1,600.00 TR.	21,089.78

DEPARTMENTS AND RESEARCH

201	William Parsons Atkinson (English).....
202	Julian M. Avery (Research).....
203	Albert Farwell Bemis (Bemis Fdn.).....
205	Frank Walter Boles Memorial (Arch.).....
206	William Felton Brown (Architecture).....
207	Godfrey L. Cabot (Chemical Eng.).....
208	Samuel Cabot (Chemical Engineering).....
209	William E. Chamberlain (Architecture).....
211	Crosby Honorary (Geology).....
213	Susan E. Dorr (Physics).....
215	George Eastman (Chemistry and Physics).....
217	Harold H. Fletcher (Medical).....
219	William R. Kales (Medical).....
221	Arthur E. Kennelly (Mathematics).....
222	Kresge Foundation (Chapel).....
223	Arthur D. Little Memorial (Chemistry and Chem. Eng.).....
225	Katherine Bigelow Lowell (Physics).....
227	George Henry May (Chemistry).....
231	Edward D. Peters (Geology).....
233	Pratt Naval Architecture.....
234	Raymond B. Price (Chemistry).....
235	Ellen H. Richards (Sanitary Chemistry)
237	Charlotte B. Richardson (Chemical Eng.).....

.....	2,723.00	Henry Darwin Rogers (Research).....	.....	.....	.....	6,858.28 TR.	.....
201,549.97	6,858.28 TR.	William Barton and Emma Savage Rogers (Research).....	.....	8,040.00	.....	1,181.72 R.E. Tax	168.00
2,000.00	2,000.00	Frances E. Roper (Mechanical Eng.).....	164.00	84.00	.....	.....	.....
25,000.00	25,000.00	Arthur Rotch (Architecture).....	.....	1,000.00	1,000.00	.....	.....
.....	1,000.00	Dorothy B. Schwarz Memorial (Textile Tech.).....	.....	.....	.....	.....	.....
643,511.63	643,511.63	Solar Energy (Research).....	43,704.45	62,387.06	1,000.00	19,360.76 TR.	85,730.75
294,196.26	294,196.26	Edmund K. Turner (Civil Engineering).....	.....	11,768.00	8,500.00	2,942.00 TR.	326.00
250,000.00	250,000.00	United Fruit Company (Food Technology).....	1,668.00	10,068.00	5,000.00	.....	6,736.00
15,000.00	15,000.00	William R. Ware (Architecture).....	957.18	628.00	608.27	120.00 Tuit.	856.91
.....	1,174.53	Stephen H. Wilder (Research).....	.....	4.00	.....	.....	4.00
.....	1,174.53	.....	.....	.....	.....	.....	.....
\$3,133,460.87	\$ 10,408.28 TR.	.....	\$227,749.79	\$223,423.56	\$194,213.56	\$38,869.04 TR.	\$216,789.33
.....	\$281,081.73 Gifts	.....	.....	.....	.....	\$ 1,301.72 O.C.	.....

FUNDS

\$ 10,000.00	.....	Walter S. Barker.....	\$ 644.66	\$ 416.00	\$ 417.10	.....	\$ 643.56
20,000.00	.....	Samuel Berke.....	1,817.24	856.00	865.41	.....	1,807.83
.....	\$ 2,275.00	Davis R. Dewey.....	.....	16.00	.....	.....	16.00
5,000.00	.....	Charles Lewis Flint.....	968.55	232.00	240.00	.....	960.55
5,000.00	.....	Edith Morrill Hobbs.....	202.75	208.00	138.74	.....	272.01
2,000.00	.....	William Hall Kerr.....	2,861.81	192.00	78.00	.....	2,975.81
10,000.00	.....	George A. Osborne.....	3,556.84	536.00	397.86	.....	3,694.98
5,000.00	.....	Arthur Rotch (Architectural).....	.....	200.00	200.00	.....	.....
2,500.00	.....	John Hume Todd.....	1,549.98	160.00	100.00	.....	1,609.98
68,072.34	.....	Theodore N. Vail Memorial.....	3,016.87	2,836.00	2,368.37	.....	3,484.50
\$ 127,572.34	\$ 2,275.00 Gifts	.....	\$ 14,618.70	\$ 5,652.00	\$ 4,805.48	.....	\$ 15,465.22

REPORT OF THE TREASURER

ENDOWMENT FUNDS

PRINCIPAL		INCOME				
Balance June 30, 1950	Gifts, Receipts and Transfers	Balance June 30, 1951	Schedule A-4 Continued	Balance June 30, 1950	Transfers and Other Charges	Balance June 30, 1951
\$ 36,551.31	.....	\$ 36,551.31	SALARIES	.....	.....	.....
500.00	.....	500.00	281 Samuel C. Cobb.....	\$ 1,464.00	\$ 1,464.00	.....
20,000.00	.....	20,000.00	283 Sarah H. Forbes.....	20.00	20.00	.....
18,800.00	.....	18,800.00	285 George A. Gardner.....	800.00	800.00	.....
.....	\$2,630.00	.....	287 James Hayward.....	752.00	752.00	.....
.....	500.00 Tr. }	3,130.00	288 Dugald C. Jackson Professorship.....	92.00	.....	\$ 92.00
18,800.00	.....	18,800.00	289 William P. Mason.....	752.00	752.00	.....
25,000.00	.....	25,000.00	291 Henry B. Rogers.....	1,000.00	1,000.00	.....
350,000.00	.....	350,000.00	293 Alfred P. Sloan Professorship.....	14,628.00	13,520.46	16,838.98
25,000.00	.....	25,000.00	295 Nathaniel Thayer.....	1,000.00	1,000.00	.....
23,700.00	.....	23,700.00	297 Elihu Thomson.....	948.00	948.00	.....
\$ 518,351.31	\$2,630.00 Gifts	\$ 521,481.31		\$21,456.00	\$20,256.46	\$ 16,950.98
	500.00 Tr.					

GRADUATE SCHOLARSHIPS AND FELLOWSHIPS

\$ 360,000.00	.....	\$ 360,000.00	301 Edward Austin.....	\$ 72,650.79	.....	\$ 64,794.79
25,000.00	.....	25,000.00	303 William Sumner Boles.....	1,288.00	\$25,000.00 Tuit.	7,233.27
1,506.25	.....	1,506.25	305 Malcolm Cotton Brown.....	2,650.54	800.00 Tuit.	2,444.54
7,988.02	.....	7,988.02	307 Francis W. Chandler.....	3,748.62	400.00 Tuit.	4,108.62
10,100.00	.....	10,100.00	309 Collamore.....	5,626.43	108.00 Tuit.	5,042.43
				616.00	1,200.00 Tuit.	

FUNDS

5,000.00	.....	Dalton Graduate Chemical	2,953.04	320.00	.....	3,273.04
108,772.07	.....	Richard C. du Pont Memorial	15,975.00	4,912.00	4,300.00	13,175.56
20,000.00	.....	Clarence J. Hicks Memorial	841.25	828.00	.....	669.25
5,000.00	.....	Edith Morrill Hobbs	440.00	212.00	.....	362.00
6,540.00	.....	Rebecca R. Joslin	7,382.33	556.00	.....	7,938.33
5,000.00	.....	Wilfred Lewis	3,185.76	328.00	.....	3,513.76
37,137.44	.....	Moore	4,452.43	1,660.00	.....	4,312.43
59,592.11	.....	James F. Norris	2,396.00	2,480.00	.....	3,076.00
6,000.00	.....	Willard B. Perkins	2,095.13	324.00	.....	2,419.13
20,057.03	.....	Henry Bromfield Rogers	8,224.05	1,120.00	.....	7,744.05
2,000.00	.....	Richard Lee Russel	2,909.79	200.00	.....	3,109.79
10,000.00	.....	Henry Saltonstall	2,496.41	500.00	.....	2,996.41
10,000.00	.....	James Savage	4,815.73	584.00	200.00	4,599.73
10,000.00	.....	Susan H. Swett	2,902.55	512.00	.....	2,714.55
100,050.00	.....	Gerard Swope	5,831.50	4,236.00	400.00	8,067.50
10,000.00	.....	Frank Hall Thorp	2,424.56	496.00	.....	2,320.56
1,900.00	.....	Tillotson	164.00	84.00	.....	248.00
409,018.92	.....	Thomas Upham	1,337.00	16,404.00	17,000.00	741.00
10,000.00	.....	Luis Francisco Verges	2,595.22	504.00	.....	3,099.22
516,197.01	\$4,621.84	Jonathan Whitney	81,445.09	31,837.65	.....	86,909.13
		Securities			26,373.61	
		Gains			.....
\$1,756,858.85	\$4,621.84	O. R.	\$245,878.49	\$87,807.65	\$24,400.00	\$244,703.09
					911.44 Tr.	
					\$63,671.61	

REPORT OF THE TREASURER

ENDOWMENT FUNDS

INCOME

PRINCIPAL

PRINCIPAL		INCOME					
Balance June 30, 1950	Gifts, Receipts and Transfers	Balance June 30, 1951	Balance June 30, 1950	Investment Income	Expended	Transfers and Other Charges	Balance June 30, 1951
\$ 400.00	.....	\$ 400.00	\$ 152.37	\$ 20.00	.....	\$ 150.00 Tuit.	\$ 22.37
5,000.00	.....	5,000.00	118.08	204.00	.....	200.00 Tuit.	122.08
2,172.24	.....	2,172.24	295.89	96.00	.....	200.00 Tuit.	191.89
39,060.49	\$872.00 TR.	39,932.49	4,573.62	1,744.00	.....	872.00 TR.	4,445.62
50,000.00	.....	50,000.00	.....	2,000.00	.....	1,000.00 Tuit.	.....
						2,000.00 Tuit.	
6,550.64	.....	6,550.64	511.50	276.00	.....	600.00 Tuit.	187.50
10,000.00	.....	10,000.00	344.15	412.00	.....	300.00 Tuit.	456.15
10,000.00	.....	10,000.00	182.10	408.00	.....	300.00 Tuit.	290.10
571,722.39	37.10	571,759.49	110,226.28	26,716.00	.....	400.00 TR.	81,175.96
6,024.79	.....	6,024.79	822.96	272.00	.....	55,366.32 Tuit.	1,094.96
.....	30,000.00	30,000.00	.....	800.00	.....	.....	800.00
25,000.00	.....	25,000.00	1,072.34	1,044.00	.....	1,000.00 Tuit.	1,116.34
12,265.07	.....	12,265.07	875.96	524.00	.....	500.00 Tuit.	859.96
4,900.00	.....	4,900.00	340.72	208.00	.....	200.00 Tuit.	348.72
.....	1,462.50 TR.	1,462.50	.....	64.00	.....	(152.00)TR.	216.00
25,000.00	.....	25,000.00	.....	1,000.00	.....	1,000.00 TR.	.....
20,510.88	5.00	20,515.88	4,409.63	996.00	.....	200.00 Tuit.	5,205.63
1,529.35	.....	1,529.35	400.64	76.00	.....	.....	476.64
5,000.00	.....	5,000.00	280.26	212.00	.....	150.00 Tuit.	342.26
36,018.50	.....	36,018.50	6,823.23	1,628.00	.....	6,000.00 Tuit.	2,451.23
153,415.61	.....	153,415.61	26,727.20	7,204.00	.....	3,600.00 Tuit.	30,331.20
25,000.00	.....	25,000.00	3,525.89	1,120.00	.....	2,950.00 Tuit.	2,595.89
3,500.00	.....	3,500.00	617.58	164.00	.....	.....	781.58
.....	13,100.00	13,100.00	.....	264.00	.....	.....	264.00

UNDERGRADUATE SCHOLARSHIPS

Schedule A-4 Continued

351	Louie G. Applebee.....	.....
353	Elisha Atkins.....	.....
357	Thomas Wendell Bailey.....	.....
359	Charles Tidd Baker.....	.....
361	Billings Student.....	.....
363	Huse Templeton Blanchard.....	.....
365	Levi Boles.....	.....
367	Jonathan Bourne.....	.....
369	Albert G. Boyden.....	.....
371	Harriet L. Brown.....	.....
372	Godfrey L. Cabot.....	.....
373	Mabel Blake Case.....	.....
375	Nino Teshar Catlin.....	.....
377	Lucius Clapp.....	.....
378	A. V. Clarke.....	.....
379	Class of 1895 Memorial.....	.....
385	Class of 1922.....	.....
389	Class of 1938.....	.....
393	Fred L. and Florence L. Coburn.....	.....
397	Coffin Memorial.....	.....
399	William A. Conant.....	.....
401	Albert Conro.....	.....
403	George R. Cooke.....	.....
404	John G. Crane.....	.....

FUNDS

50,551.06	.....	Lucretia Crocker.....	32,094.77	3,304.00	.....	35,398.77
1,250.00	3,279.90	Eunice M. Cruff.....	44.00	172.00	.....	216.00
5,000.00	.....	Isaac W. Danforth.....	282.48	212.00	.....	294.48
500,000.00	.....	Development Fund Scholarships.....	.....	20,000.00	200.00 Tuit.	20,000.00
40,000.00	.....	Ann White Dickinson.....	558.38	1,624.00	.....	582.38
2,857.10	.....	Dormitory Fund.....	278.32	124.00	.....	402.32
50,000.00	.....	Thomas Messinger Drown.....	1,094.84	2,040.00	2,000.00 Tuit.	1,074.84
100,000.00	.....	Frances and William Emerson.....	6,603.85	4,264.00	3,218.00 Tuit.	6,569.85
5,000.00	.....	Farnsworth.....	377.84	212.00	300.00 Tuit.	289.84
5,000.00	.....	Charles Lewis Flint.....	240.22	208.00	200.00 Tuit.	248.22
3,454.87	.....	Sarah S. Forbes.....	171.50	144.00	150.00 Tuit.	165.50
1,000.00	.....	Philip Jacob Friedlander.....	174.50	44.00	150.00 Tuit.	68.50
89,452.96	.....	Norman H. George.....	7,074.18	3,848.00	4,400.00 Tuit.	6,522.18
10,000.00	.....	Arthur B. Gilmore.....	1,715.25	460.00	800.00 Tuit.	1,375.25
10,000.00	4,000.00	Barnett D. Gordon.....	428.75	472.00	400.00 Tuit.	500.75
54,413.71	.....	Lucia G. Hall.....	1,368.50	2,220.00	2,000.00 Tuit.	1,588.50
76,814.92	109.15	Hall-Mercer.....	1,843.80	3,148.00	3,000.00 Tuit.	1,991.80
241,074.18	.....	James H. Haate.....	11,191.23	10,092.00	10,000.00 Tuit.	11,283.23
100,000.00	.....	Charles Hayden Memorial.....	.....	4,000.00	4,000.00 TR.	.....
.....	.....	Charles Hayden Memorial, Special.....	22,238.86	1,020.00	{ (4,000.00) TR, (5,000.00) Gift }	26,303.86
5,000.00	.....	George Hollingsworth.....	167.73	208.00	5,955.00 Tuit.	175.73

REPORT OF THE TREASURER

PRINCIPAL		INCOME			
Balance June 30, 1950	Gifts, Receipts and Transfers	Balance June 30, 1951	Expended	Transfers and Other Charges	Balance June 30, 1951
\$ 5,955.89	.....	\$ 5,955.89	.....	.....	\$ 260.00
17,600.36	\$ 6,000.00	24,200.36	.....	\$ 300.00 Tuit.	880.00
7,495.80	.....	7,495.80	.....	300.00 Tuit.	415.25
3,000.00	.....	3,000.00	.....	200.00 Tuit.	135.76
5,000.00	.....	5,000.00	.....	300.00 Tuit.	242.08
25,000.00	.....	25,000.00	.....	2,080.00 Tuit.	1,719.99
41,254.33	.....	41,254.33	.....	1,600.00 Tuit.	2,103.50
7,500.00	.....	7,500.00	.....	5,620.00 Tuit.	5,821.35
18,000.00	.....	18,000.00	.....	800.00 Tuit.	1,524.75
2,000.00	220.00	2,220.00	.....	.....	377.29
10,474.75	.....	10,474.75	.....	400.00 Tuit.	844.00
5,000.00	.....	5,000.00	.....	200.00 Tuit.	224.91
5,577.00	200.00	5,777.00	.....	4,223.00 TR.	2,059.31
5,000.00	4,223.00 TR.	2,314.76	.....	150.00 Tuit.	221.88
2,314.76	.....	2,314.76	.....	.....	1,787.89
.....	498.00	523.00	.....	.....	.....
2,000.00	25.00 TR.	2,000.00	.....	300.00 Tuit.	167.23
10,000.00	.....	10,000.00	.....	.....	432.00
6,750.00	.....	6,750.00	.....	(400.00) TR.	915.25
111,682.17	.....	111,682.17	.....	(425.00) Gifts	.....
.....	.....	.....	.....	200.00 Tuit.	.....
5,000.00	.....	5,000.00	.....	.....	18,098.50
75,856.47	.....	75,856.47	.....	.....	12,430.13
2,500.00	.....	2,500.00	.....	3,000.00 Tuit.	970.75
2,000.00	.....	2,000.00	.....	200.00 Tuit.	135.48
5,000.00	.....	5,000.00	.....	.....	453.80
.....	.....	.....	.....	200.00 Tuit.	96.77

ENDOWMENT FUNDS

INCOME

Schedule A-4 Continued

UNDERGRADUATE SCHOLARSHIPS (Continued)

	Balance June 30, 1950	Investment Income	Expended	Transfers and Other Charges	Balance June 30, 1951
441 Loren C. Holm.....	\$ 20.00	\$ 240.00	.....	.....	\$ 260.00
442 Elias Howe, Jr.....	352.00	828.00	.....	\$ 300.00 Tuit.	880.00
443 Samuel P. Hunt.....	399.25	316.00	.....	300.00 Tuit.	415.25
444 T. Sterry Hunt.....	207.76	128.00	.....	200.00 Tuit.	135.76
445 William F. Huntington.....	330.08	212.00	.....	300.00 Tuit.	242.08
449 David L. Jewell.....	2,711.99	1,088.00	.....	2,080.00 Tuit.	1,719.99
451 Edward A. Jones.....	1,975.50	1,728.00	.....	1,600.00 Tuit.	2,103.50
453 Joy Scholarships.....	10,809.35	632.00	.....	5,620.00 Tuit.	5,821.35
454 Amelia S. Kneisner.....	1,544.75	780.00	.....	800.00 Tuit.	1,524.75
456 Kurrelmeyer.....	285.29	92.00	.....	.....	377.29
457 Jacob and Jennie Lichter.....	792.00	452.00	.....	400.00 Tuit.	844.00
458 William Litchfield.....	216.91	208.00	.....	200.00 Tuit.	224.91
459 Charles E. Locke Memorial.....	5,842.31	440.00	.....	4,223.00 TR.	2,059.31
460 Elisha T. Loring.....	163.88	208.00	.....	150.00 Tuit.	221.88
461 Lowell Institute.....	1,631.89	156.00	.....	.....	1,787.89
462 Alice MacLaurin.....	.....	.....	.....	.....	.....
463 Rupert A. Marden.....	375.23	92.00	.....	300.00 Tuit.	167.23
464 Waldo A. Martin.....	32.00	400.00	.....	.....	432.00
465 M. I. T. Club of Chicago.....	2.25	288.00	.....	(400.00) TR.	915.25
467 Margaret A. Mathews.....	13,106.50	4,992.00	.....	(425.00) Gifts	.....
469 George Henry May.....	11,854.13	576.00	.....	.....	18,098.50
471 Robert W. Milne.....	898.75	3,072.00	.....	3,000.00 Tuit.	12,430.13
473 James H. Mirrless.....	227.48	108.00	.....	200.00 Tuit.	970.75
475 Fred W. Morrill.....	357.80	96.00	.....	.....	135.48
477 Nichols.....	92.77	204.00	.....	200.00 Tuit.	453.80

FUNDS

35,378.77	.....	35,378.77	478	Wm. E. Nickerson.....	1,156.00	1,460.00	.....	1,000.00	Tuit.	1,616.00
5,000.00	.....	5,000.00	479	Charles C. Nichols.....	369.40	212.00	.....	350.00	Tuit.	231.40
5,000.00	.....	5,000.00	481	John Felt Osgood.....	354.88	212.00	.....	350.00	Tuit.	216.88
17,641.69	.....	17,641.69	483	George L. Parmelee.....	192.00	712.00	.....	650.00	Tuit.	254.00
59,731.18	.....	59,731.18	484	Frank Stetson Pecker.....	1,060.00	2,432.00	.....	2,000.00	Tuit.	1,492.00
50,000.00	.....	50,000.00	485	Richard Perkins.....	825.21	2,032.00	.....	2,000.00	Tuit.	857.21
.....	47,646.29	47,646.29	486	Charles H. and Helen Bartlett Pray.....	.....	1,092.00	.....	.....	.....	1,092.00
7,689.28	.....	7,689.28	487	Florence E. Prince.....	382.50	320.00	.....	300.00	Tuit.	402.50
21,117.00	.....	21,117.00	489	Thomas Adelbert Read.....	673.42	872.00	.....	800.00	Tuit.	745.42
2,850.00	.....	2,850.00	491	Willis Ward Reeves.....	124.00	120.00	.....	.....	.....	244.00
31,719.32	.....	31,719.32	493	Charles A. Richards.....	840.22	1,304.00	.....	1,250.00	Tuit.	894.22
6,290.20	.....	6,290.20	494	John Roach.....	837.51	284.00	.....	350.00	Tuit.	771.51
.....	25,000.00	25,000.00	495	Karl Robbins.....	.....	332.00	.....	.....	.....	332.00
36,504.83	.....	36,504.83	496	William B. Rogers.....	22,614.01	2,398.00	.....	(38.68)	Int.on	24,960.69
3,557.42	.....	3,557.42	497	William P. Ryan Memorial.....	2,532.71	240.00	.....	(29.01)	Int.on	2,801.72
43,821.12	.....	43,821.12	499	John P. Schenkl.....	2,624.01	1,852.00	.....	2,000.00	Tuit.	2,476.01
4,800.00	.....	4,800.00	500	Paul D. Seghers, Jr.....	424.00	204.00	.....	400.00	Tuit.	228.00
10,000.00	.....	10,000.00	501	Frank Arnold Sherman.....	416.00	416.00	.....	350.00	Tuit.	482.00
5,000.00	.....	5,000.00	503	Thomas Sherwin.....	388.48	216.00	.....	200.00	Tuit.	404.48
10,000.00	.....	10,000.00	505	G. H. Miller Smith.....	682.25	428.00	.....	.....	.....	1,110.25
.....	5,000.00	5,000.00	506	H. Hilliard Smith.....	.....	116.00	.....	.....	.....	116.00
33,019.41	.....	33,019.41	507	Horace T. Smith.....	2,462.54	1,420.00	.....	1,300.00	Tuit.	2,582.54
600.00	.....	600.00	509	Sons and Daughters of New England Puritan Colony.....	281.88	36.00	.....	.....	.....	317.88
10,896.14	.....	10,896.14	511	Anna Spooner.....	421.12	448.00	.....	600.00	Tuit.	269.12

REPORT OF THE TREASURER

ENDOWMENT FUNDS

PRINCIPAL		INCOME						
Balance June 30, 1950	Gifts, Receipts and Transfers	Balance June 30, 1951	Schedule A-4 Continued	Balance June 30, 1950	Investment Income	Expended	Transfers and Other Charges	Balance June 30, 1951
\$ 2,338.16	.....	2,338.16	UNDERGRADUATE SCHOLARSHIPS (Continued)	\$ 254.70	\$ 104.00	.....	\$ 100.00 Tuit.	258.70
465.00	.....	465.00	513 Samuel E. Tinkham.....	507.64	40.00	.....	.....	547.64
1,000.00	.....	1,000.00	515 F. B. Tough.....	224.00	44.00	.....	200.00 Tuit.	68.00
1,000.00	.....	1,000.00	517 Susan Upham.....	177.35	48.00	.....	.....	225.35
25,000.00	.....	25,000.00	519 Samson R. Urbino.....	4,871.05	1,196.00	.....	1,100.00 Tuit.	4,967.05
60,718.27	.....	60,718.27	521 Vermont Scholarship.....	308.00	2,440.00	.....	2,400.00 Tuit.	348.00
9,761.45	.....	9,761.45	523 Ann White Yose.....	202.09	3,984.00	.....	350.00 Tuit.	3,836.09
55,000.00 \$ (5,000.00)TR.	.....	50,000.00	525 Arthur M. Waitt.....	405.75	2,016.00	.....	2,000.00 Tuit.	421.75
13,359.48	.....	13,359.48	527 Grant Walker.....	720.30	560.00	.....	700.00 Tuit.	580.30
4,000.00	.....	4,000.00	529 James Watt.....	305.36	168.00	.....	300.00 Tuit.	173.36
5,000.00	.....	5,000.00	531 Louis Weisbein.....	4,444.78	368.00	.....	800.00 Tuit.	4,012.78
5,000.00	.....	5,000.00	533 Frances Erving Weston.....	688.79	216.00	.....	600.00 Tuit.	304.79
4,515.65	.....	4,515.65	535 Samuel Martin Weston.....	187.37	188.00	.....	200.00 Tuit.	175.37
5,065.51	.....	5,065.51	537 Amasa J. Whiting.....	977.48	236.00	.....	500.00 Tuit.	713.48
66,538.18	.....	66,538.18	539 Elizabeth Babcock Willmann.....	4,011.53	2,784.00	.....	4,000.00 Tuit.	2,795.53
			541 Morrill Wyman.....					
							(67.69)Interest	
							(\$425.00)Gifts	
							5,943.00 TR.	
\$3,405,278.35	1,582.50 TR.	\$3,406,860.85		\$362,327.60	\$156,064.00	\$ 1,080.00	\$151,389.32 Tuit.	\$365,471.97

		PRIZES			
\$ 10,000.00	\$ 2,649.18	Gain on Securities	\$ 12,649.18		
5,000.00	.....	551 Babson.....	\$ 4,558.30	\$ 798.20	\$ 5,356.50
447.00	200.00	553 Robert A. Boit.....	2,047.91	280.00	2,077.91
12,759.50	11,025.66	555 Class of 1904.....	416.71	40.00	456.71
2,145.00	.....	556 Karl T. Compton.....	144.00	692.00	836.00
		557 William Emerson.....	633.95	112.00	745.95
9,824.00	.....	558 Harry M. Goodwin.....	236.00	404.00	640.00
1,050.00	.....	559 Roger Defriez Hunneman.....	63.00	44.00	27.00
.....	1,200.00	560 Ellen A. King Memorial.....	.....	56.00	356.00
.....	10.00 TR.	561 George J. Mead.....	.....	536.00	536.00
2,700.00	.....	562 James Means.....	1,704.33	176.00	1,778.13
5,000.00	.....	565 Arthur Rotch.....	3,936.97	356.00	3,940.97
5,000.00	.....	567 Arthur Rotch Special.....	10,272.63	612.00	10,884.63
1,000.00	.....	568 Henry Webb Salisbury.....	374.63	56.00	386.51
.....	5,000.00	569 Silent Hoist and Crane Co. Materials Handling Award.....	.....	116.00	16.00
1,880.00	.....	571 Samuel W. Stratton.....	67.51	76.00	143.51
\$73,739.68 Gifts					
	2,649.18	Gain	\$ 4,354.20	\$ 1,121.83	\$ 28,038.31
\$ 56,805.50	10.00 TR.		\$ 24,455.94	(\$350.00) Gift	
			FUNDS		

REPORT OF THE TREASURER

ENDOWMENT FUNDS

PRINCIPAL		INCOME				
Balance June 30, 1950	Gifts, Receipts and Transfers	Balance June 30, 1950	Investment Income	Expended	Transfers and Other Charges	Balance June 30, 1951
.....
\$5,743.39	439.08 Royalties	.....	\$ 1,132.00	.....	.....	\$ 1,132.00
.....	24,108.00 TR.	.....	.....	.....	.....	.....
.....	11,454.28	.....	.....	.....	.....	.....
.....	978.99	.....	152.00	.....	\$ 72.48 O.C.	79.52
.....	10,000.00	.....	20.00	.....	.....	20.00
\$ 13,965.16	.....	\$ 1,410.33	200.00	.....	.....	200.00
.....	.....	.....	612.00	\$ 179.53	.....	1,851.80
1,510.00	.....	.....	60.00	.....	.....	70.00
10,000.00	.....	10.00	480.00	.....	.....	2,455.17
100,000.00	.....	2,085.62	4,580.00	110.45	.....	8,921.69
4,002.50	.....	19,726.69	176.00	15,585.00	.....	485.24
1,559.64	.....	559.24	92.00	250.00	.....	787.63
.....	.....	695.63	.....	.....	.....	.....
\$ 131,037.30	\$ 28,176.66 Gifts	\$ 24,487.51	\$ 7,504.00	\$ 15,915.98	\$ 72.48 O.C.	\$ 16,003.05
.....	439.08 O.R.	.....	.....	.....	.....	.....
.....	24,108.00 TR.	.....	.....	.....	.....	.....
\$9,120,364.52	\$523,598.51 Gifts	\$915,269.47	\$506,261.41	\$561,793.01	\$ 45,723.48 TR.	\$903,421.95
.....	7,710.10 O.R.	.....	.....	.....	216,435.13 O.C.	.....
.....	36,608.78 TR.	.....	.....	.....	(5,842.69) O.R.	.....

(Schedule A)

(Schedule A)

SCHEDULE A-5

STUDENT LOAN FUNDS

	Balance		Receipts	Investment	Transferred	Expense	Other Charges	Balance	
	June 30, 1950	June 30, 1951						June 30, 1951	June 30, 1951
583 Bursar's.....	\$ 38,774.40	\$	45.48 Interest	\$ 1,420.00	.....	.....	.....	\$ 40,239.88
585 Dean's.....	12,870.63		29.95 Interest	400.00	.....	.....	.....	13,300.58
587 Carl P. Dennett.....	2,053.30		62.50 Interest	24.00	.....	.....	.....	2,139.80
588 Ethel L. Fryer.....	.....		2,500.00	40.00	.....	.....	.....	2,540.00
589 Nathan R. George.....	37,222.12		.....	1,488.00	.....	.....	.....	38,710.12
590 Lamson-Virgin.....	11,463.50		.....	460.00	.....	.....	.....	11,923.50
591 George J. Mead.....	.....		225,256.07	2,156.00	.....	.....	.....	227,412.07
592 Medical Department.....	5,606.96		.....	120.00	.....	.....	.....	5,726.96
593 Minnie Hempel Rogers.....	1,435.54		.....	56.00	.....	.....	.....	1,491.54
595 Summer Surveying Camp....	3,241.59		12.24 Interest	96.00	.....	.....	.....	3,349.83
597 Technology Loan.....	2,085,237.81		(3,792.12) Loss on	69,355.75 \$	(1,000.00)	.....	609.99 Write Off	2,151,191.45
598 William H. Timbie.....	5,515.50		..... Security	220.00	.....	.....	.....	5,735.50
Totals.....	\$2,203,421.35	\$	227,756.07 Gifts (3,641.95) O.R. (net)	\$75,835.75	(1,000.00)	.....	609.99	\$2,503,761.23

(Schedule A)

REPORT OF THE TREASURER

SCHEDULE A-6
BUILDING FUNDS

	<i>Balance June 30, 1950</i>	<i>Gifts and Other Receipts</i>	<i>Investment Income</i>	<i>Transferred</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance June 30, 1951</i>
600 Campbell Soup Company.....	\$1,011,936.89	.....	\$30,940.00	.....	.....	\$ 811,827.51	\$ 231,049.38
601 Arthur J. Conner.....	237,461.87	.....	9,500.00	.....	.....	.....	246,961.87
602 Development Building Fund.	.....	.....	.....	.....	.....	.....	1,500,000.00
603 George Eastman.....	140,209.95	.....	5,608.00	.....	.....	.....	145,817.95
604 Electronics Laboratory.....	104.00	\$ 100.00	4.00	.....	.....	.....	208.00
605 Faculty Club.....	.....	280.00	4.00	.....	.....	.....	284.00
606 Matilda A. Fraser.....	1,147.98	.....	44.00	.....	.....	.....	1,191.98
611 Hydrodynamics Laboratory and Towing Tank.....	.....	29,632.42	632.00	(8,129.31)	.....	38,393.73	.....
612 Kresge Foundation.....	.....	500,000.00	11,654.00	.....	.....	.....	511,654.00
613 Library Building.....	1,141.50	.....	44.00	.....	.....	1,185.50	.....
614 Low Temperature Refrigeration Laboratory..	.....	12,200.00	72.00	.....	.....	.....	12,272.00
615 Metals Processing Laboratory	11,367.97	5,000.00	556.00	.....	.....	.....	16,923.97
617 Alfred P. Sloan Foundation -- School of Industrial Mgt. ...	.....	2,500,000.00	.....	.....	.....	2,500,000.00	.....
619 Alfred P. Sloan Metals Proc- essing Laboratory.....	230,229.18	750,000.00	16,832.00	.....	.....	582,830.50	414,230.68
621 Charles D. Waterbury.....	18,644.65	.....	744.00	.....	.....	.....	19,388.65
<i>Totals.....</i>	<i>\$1,652,243.99</i>	<i>\$3,797,212.42</i>	<i>\$76,634.00</i>	<i>\$(1,508,129.31)</i>	<i>.....</i>	<i>\$3,934,237.24</i>	<i>\$3,099,982.48</i>

SCHEDULE A-7
OTHER INVESTED FUNDS

	Balance		Receipts		Investment		Expenses		Balance
	June 30, 1950	June 30, 1951	Gifts and Other	Income	Transferred	Expense	Other Charges	June 30, 1951	
GENERAL PURPOSES									
623 Anonymous H.	\$ 10,000.00	\$ 10,000.00	.....	\$ 400.00	.....	400.00	.....	4,902.00
625 Anonymous J.	1,702.00	1,702.00	3,200.00	124.00	.....	124.00	.....	25,000.00
626 Anonymous LE.	10,000.00	10,000.00	15,000.00	692.00	.....	692.00	.....	6,500.00
627 Anonymous M.	1,500.00	1,500.00	5,000.00	176.00	.....	176.00	.....	67,150.00
629 Anonymous R.	67,150.00	67,150.00	.....	2,688.00	.....	2,688.00	.....	20,736.94
633 Edmund Dana Barbour.	20,736.94	20,736.94	.....	828.00	.....	828.00	.....	2,10
635 Stephen L. Bartlett.	2.10	2.10	.....	.....	.....	.....	.....	25,000.00
636 Class of 1890. ....	.....	.....	25,000.00	584.00	.....	584.00	.....	15,621.00
637 Class of 1899.	15,621.00	15,621.00	.....	624.00	.....	624.00	.....	15,411.00
638 Class of 1900. ....	.....	.....	.....	616.00	(15,411.00)	616.00	.....	69,368.25
639 Class of 1901. ....	.....	.....	69,736.55	312.00	.....	680.30	.....	63,319.67
640 Class of 1923.	63,319.67	63,319.67	.....	2,532.00	.....	2,532.00	.....	81,328.28
641 Class of 1924.	81,765.42	81,765.42	.....	3,260.00	.....	3,697.14	.....	43,611.00
642 Class of 1925.	43,083.24	43,083.24	{ 500.00	1,732.00	.....	1,732.00	.....	64,694.64
643 Class of 1926. ....	.....	.....	{ 27.76 O.R. }	.....	(64,694.64)	.....	.....	101,245.54
644 Arthur J. Conner.	101,245.54	101,245.54	8,246.25	4,156.00	.....	12,402.25	.....	1,577.44
645 Co-operative Foundation.	1,577.44	1,577.44	.....	64.00	.....	64.00	.....	31,339.21
646 Development Fund.	19,929.04	19,929.04	1,768,823.01	33,024.00	1,604,579.31	141,188.27	44,669.26	20,000.00	
647 Charles H. Eames.	20,000.00	20,000.00	.....	800.00	.....	800.00	.....	.....
648 Ford Motor Co. ....	.....	.....	166,665.00	1,668.00	133,000.00	35,333.00	.....	.....
649 Erastus C. Gaffield.	1,796.58	1,796.58	.....	72.00	.....	72.00	.....	1,796.58
650 Edward C. Hall. ....	.....	.....	7,151.69	120.00	.....	120.00	.....	7,151.69
651 William T. Henry.	70,044.55	70,044.55	26,430.00	3,104.00	.....	29,534.00	.....	70,044.55

REPORT OF THE TREASURER

SCHEDULE A. — (Continued)
OTHER INVESTED FUNDS (Continued)

GENERAL PURPOSES (Continued)	Balance June 30, 1950	Gifts and Other Receipts	Investment Income	Transferred	Expense	Other Charges	Balance June 30, 1951
653 Ernest R. Hoshach.....	\$ 1,000.00	.....	\$ 40.00	.....	40.00	.....	\$ 1,000.00
659 Keller.....	50.27	.....	4.00	.....	.....	.....	54.27
661 Edwin J. Lewis, Jr.....	24,303.54	.....	972.00	.....	972.00	.....	24,303.54
663 Augustus B. Martin, Jr.....	61,000.00	3,890.54	2,544.00	.....	1,263.80	.....	66,170.74
664 M. I. T., Little Trust.....	.....	4,941.67	36.00	.....	36.00	.....	4,941.67
665 Alice Butts Metcalf.....	50,000.00	.....	2,000.00	.....	2,000.00	.....	50,000.00
666 Leonard Metcalf Memorial..	2,573.48	96,732.10	3,388.00	.....	3,388.00	.....	99,305.58
667 John Wells Mors.....	50,000.00	.....	2,000.00	.....	2,000.00	.....	50,000.00
668 National Public Health Overhead.....	.....	.....	116.00	(11,771.00)	.....	.....	11,887.00
669 E. Mortimer Newlin.....	.....	64.49	.....	.....	.....	.....	64.49
670 William E. Nickerson.....	35,378.78	.....	1,416.00	.....	1,416.00	.....	35,378.78
671 Edward A. Sumner.....	10,694.44	.....	428.00	.....	428.00	.....	10,694.44
673 Herman W. Tamkin.....	14,860.13	.....	596.00	.....	596.00	.....	14,860.13
675 Towle.....	10,500.00	.....	420.00	1,427.00	420.00	.....	9,073.00
677 Charles A. Tripp.....	100,000.00	.....	3,456.00	.....	45,682.50	.....	57,773.50
679 Grant Walker.....	25,500.00	4,982.93	1,320.00	(5,000.00)	1,320.00	.....	35,482.93
681 Edwin S. Webster.....	25,217.50	.....	1,008.00	.....	1,008.00	.....	25,217.50
683 Harry C. Wiess.....	157,277.50	.....	6,292.00	.....	.....	.....	163,569.50
684 Belle A. Williston.....	17,118.68	.....	684.00	.....	684.00	.....	17,118.68
686 Edwin J. Wood.....	5,000.00	.....	200.00	.....	200.00	.....	5,000.00
Totals.....	\$1,119,947.84	\$2,206,364.23	\$84,496.00	\$1,642,129.67	\$296,341.26	\$ 44,669.26	\$1,427,695.64
		27.76 O.R.					

(Schedule A)

SCHEDULE A-8

DEPARTMENTS AND RESEARCH		Balance June 30, 1950	Gifts and Other Receipts	Investment Income	Transferred	Expense	Other Charges	Balance June 30, 1951
701	Anonymous S.	\$ 367,071.00	.....	\$14,680.00 \$	333,000.00 \$	14,000.00	.....	\$ 34,751.00
703	Applied Mathematics	12,893.50	.....	372.00	7,200.00	.....	.....	6,065.50
705	Badger — Chemical Engineering	6,218.41	.....	244.00	.....	177.85	.....	6,284.56
709	Bemis — Land Account	2,000.00	.....	.....	.....	.....	2,000.00 Land Sold	.....
710	Samuel Berke, Humanities . . . . .	..... \$	5,000.00	100.00	.....	.....	.....	5,100.00
715	Carnegie Corporation, Humanities Grant . . . . .	.....	150,000.00	1,900.00	5,000.00	.....	.....	146,900.00
717	Chemical Engineering Practice	247,200.05	.....	9,168.00	.....	47,538.99	.....	208,829.06
718	Collins Helium Cryostat	2,306.53	525.60 Royalty	112.00	.....	.....	.....	2,944.13
720	Theodore M. Edison Research	.....	90,000.00	2,700.00	.....	.....	.....	92,700.00
721	Electronics, Research Laboratory of	66,188.50	.....	2,748.00	(5,700.00)	.....	.....	74,636.50
722	Electronics, Industrial Fellowships in	89,786.25	15,000.00	3,852.00	(5,000.00)	6,100.00	2,950.00 Tuit	104,588.25
723	Food Technology	71,829.73	10,000.00	1,636.00	61,225.60	1,000.00	.....	21,240.13
724	Ford Motor Co. — Ind. Rel.	26,118.00	.....	1,016.00	.....	550.00	800.00 Tuit.	25,784.00
725	John A. Grimmons	4,278.05	3,915.17	204.00	.....	725.00	.....	7,672.22
729	Harvey Non-Ferrous Forgings	11,256.00	.....	452.00	.....	.....	.....	11,708.00
731	Hayden Dental Clinic	1,296.34	.....	32.00	.....	1,328.34	.....	.....
733	Industrial Economics, Graduate	33,235.55	7,000.00	1,368.00	.....	5,000.00	.....	36,603.55
737	Industrial Fund	615,376.44	113,036.18*	23,476.00	259,671.00	69,668.39	.....	422,549.23
739	Industrial Relations Section	153,736.48	14,900.00	5,904.00	.....	16,390.74	5,986.00 Tuit.	152,163.74
741	Instrumentation Fund	183,250.24	.....	7,024.00	5,500.00	10,250.00	.....	174,524.24

* Appropriation of research revenues, see Schedule B-3.

REPORT OF THE TREASURER

SCHEDULE A-8—(Continued)
OTHER INVESTED FUNDS (Continued)

	<i>Balance June 30, 1950</i>	<i>Receipts Gifts and Other</i>	<i>Investment Income</i>	<i>Transferred</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance June 30, 1951</i>
DEPARTMENTS AND RESEARCH (Continued)							
743 A. Norton Kent	\$ 212.00		8.00				\$ 220.00
746 Arthur D. Little Low Temperature Res.....		\$ 11,600.00					
749 John Lawrence Mauran.....	3,436.87		116.00				11,716.00
750 Merrill Foundation.....	9,467.99		128.00	\$	450.00		3,114.87
751 Susan Minns.....	40,000.00		252.00		6,736.62		2,983.37
753 Forris Jewett Moore.....	27,154.12	75,000.00	1,080.00	\$ 150.00	129.95	\$ 75,000.00 Building	40,000.00 27,954.17
755 Nuclear Science and Engineering.....	1,024.00		40.00				1,064.00
757 F. Ward Paine.....	3,867.87		156.00				4,023.87
758 Theodore B. Parker Memorial	3,086.00		108.00			800.00 Tuit.	2,394.00
759 Pratt Spectroscopy.....	42,840.00		1,620.00		5,000.00		39,460.00
760 Radioactivity Center.....	33,987.00		1,360.00				35,347.00
761 Richards Memorial.....	962.98		40.00				1,002.98
763 W. T. Sedgwick.....	44,736.69		1,752.00		3,689.88		42,798.81
765 Servomechanism Laboratory.	28,346.25		508.00	28,350.00			564.25
767 Servomechanism Research...	54,515.33		2,180.00				56,695.33
769 Sloan Automotive Laboratory	5,280.17		208.00		204.00		5,284.17
771 Special Research, Padelford..	2,950.42		120.00				3,070.42
775 Henry N. Sweet.....	1,218.72		48.00		48.00		1,218.72
777 Swift Amino Acid.....	4,264.50	10,000.00	200.00	4,264.50			10,200.00
781 Nellie Florence Treat.....	737.00		28.00				765.00
783 Twentieth Century Fox Film Corporation.....	2,902.75		116.00				3,018.75
785 William Lyman Underwood..	8,927.92		356.00				9,283.92
	<u>\$2,213,959.65</u>	<u>\$ 392,415.17</u>	<u>\$ 87,472.00</u>	<u>\$ 693,661.10</u>	<u>\$188,987.76</u>	<u>\$ 87,536.00</u>	<u>\$1,837,223.74</u>
	113,561.78 O.R.						

LIBRARY

791	Boston Stein Club.....	\$ 14,967.25	\$	300.00	476.00	.....	\$	6,655.87	\$	9,087.38
792	Carnegie S. A. L. Center.....	51,017.00		.....	1,700.00	59,775.00	.....	.....		1,942.00
793	Frank Harvey Cilley.....	85,955.59		.....	3,332.00	3,200.00	\$	300.00		84,887.59
795	Class of 1874.....	291.67		.....	12.00	.....		10.00		293.67
797	Arthur Elson.....	567.31		.....	24.00	.....		20.00		571.31
799	Library Growth.....	5,113.49		.....	204.00	.....		.....		5,317.49
800	Charles W. Tucker.....	.....		500.00	16.00	.....		.....		516.00
		\$ 157,012.31	\$	800.00	\$ 5,764.00	\$ 53,975.00	\$	330.00	\$	6,655.87

MISCELLANEOUS FUNDS AND DEPOSITS

801	Albert.....	\$	540.00	\$	6,000.00	.....	.....	.....	\$	4,346.50
802	Anonymous P.....	.....	.....	38,950.00	3,096.00	(61,050.00)	.....	.....	.....	103,096.00
803	Athletic Fields Special.....	654.40		.....	16.00	.....	\$	437.74		232.66
804	Bess Bigelow.....	35,794.24		.....	1,432.00	.....	.....	.....		37,226.24
805	A. V. Clarke Scholarship.....	1,614.50		.....	.....	1,614.50	.....	.....	.....	.....
806	Class of 1898.....	26,090.42		900.00	1,068.00	.....	.....	1,068.00		26,990.42
807	Class of 1917.....	1,315.81		.....	52.00	.....	.....	.....		1,367.81
808	Class of 1918 Organ.....	106.88		.....	4.00	.....	.....	.....		110.88
809	Arthur Dean.....	.....		82,104.10	1,168.00	.....	.....	.....		83,272.10
810	Davis R. Dewey Memorial... ..	651.70		.....	28.00	.....	.....	.....		679.70
811	Drama Club Theatre.....	624.39		.....	24.00	.....	.....	.....		648.39
812	Haffenreffer Foundation.....	.....		25,000.00	584.00	.....	.....	.....		25,584.00
813	Oscar H. Horovitz.....	2,202.75		.....	88.00	.....	.....	.....		2,290.75
814	Ellen A. King Mem. Stud....	10.00		.....	.....	10.00	.....	.....		.....
815	Llora C. Krueger.....	1,307.36		.....	36.00	.....	.....	800.00	Tuit.	543.36

271

REPORT OF THE TREASURER

SCHEDULE A-8—(Continued)

OTHER INVESTED FUNDS (Continued)

MISCELLANEOUS FUNDS AND DEPOSITS (Continued)	Balance June 30, 1950	Gifts and Other Receipts	Investment Income	Transferred	Expense	Other Charges	Balance June 30, 1951
816 Lever Bros. Co.....	\$ 2,632.00	.....	\$ 72.00	.....	\$ 1,700.00	.....	\$ 1,004.00
817 Arthur D. Little Memorial Lectureship.....	5,242.80 \$	5,000.00	212.00	.....	2,701.61	.....	7,753.19
818 John R. Macomber.....	104.49	3,383.57	32.00 \$	1,200.00	1,660.66	.....	659.40
820 M. I. T. Alumni 1949-50....	77,563.42	.....	3,104.00	.....	.....	.....	80,667.42
821 M. I. T. Alumni 1950-51....	1,213.50	87.00	48.00	.....	.....	.....	1,348.50
822 M. I. T. Teachers Insurance.	224,057.94	94,893.21 2% Appro- piation	9,480.00	.....	.....	\$ 42,571.81	285,859.34
823 John D. Mitsch Memorial....	2,959.00	.....	120.00	.....	.....	.....	3,079.00
825 Henry A. Morss Nautical....	61.90	.....	4.00	.....	.....	.....	67.90
829 President's, Special.....	8,684.61	.....	324.00	1,000.00	.....	200.00 Tuit.	7,808.61
830 Tubby Rogers.....	787.88	25.00	24.00	.....	502.50	.....	334.38
831 William Patrick Ryan, Special	219.06	.....	8.00	.....	.....	.....	227.06
833 Sedgwick Memorial Lecture..	18,733.86	123.51 O.R.	752.00	.....	50.00	.....	19,559.37
835 Tau Beta Pi Memorial Scholarship.....	2,693.85	.....	108.00	.....	.....	.....	2,801.85
839 Technology Press.....	110,912.13	.....	2,740.00	29,933.58	25,002.75	.....	58,715.80
841 Towle Lecture.....	973.00	.....	.....	973.00	.....	.....	.....
	\$ 527,753.89 \$	161,449.67 Gifts 95,016.72 O.R.	\$24,760.00 \$	(26,318.92) \$	32,055.26 \$	46,969.31	\$ 756,274.63

RESERVES		FUNDS	
850	Amortization of Dormitories.	\$ 77,418.21	\$ 109,076.72
861	Photo Service.	23,181.54	Amortization \$ 3,096.00
863	Use of Facilities.	518,229.96	656.00 \$ (360.05) \$ 13,984.76
865	Walker Memorial.	14,726.50	18,188.00 299,970.88 25,500.00 \$ 158,704.18
867	Walker Memorial Dining Service.	4,697.00	588.00
			128.00
			2,906.64
			1,918.36
			\$ 723,649.52
			\$3,419,763.33
			(Schedule A)
	Totals.	\$ 638,253.21	\$ 563,446.72 O.R.
		\$ 536,979.06	\$ 554,664.84
		\$ 772,025.22	\$ 772,025.22 O.R.

* Appropriation of research revenues, see Schedule B-3.

REPORT OF THE TREASURER

SCHEDULE A-9

AGENCY FUNDS

	<i>Balance June 30, 1950</i>	<i>Gifts and Other Receipts</i>	<i>Investment Income</i>	<i>Transferred</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance June 30, 1951</i>
ALUMNI AND CLASS FUNDS							
881 Class of 1887.....	\$ 4,694.86	.....	\$ 188.00	.....	.....	.....	\$ 4,882.86
883 Class of 1889.....	189.63	.....	8.00	.....	.....	.....	197.63
884 Class of 1900.....	15,411.00	.....	.....	\$ 15,411.00	.....	.....	.....
885 Class of 1902.....	.....	2,000.00	60.00	.....	.....	.....	2,060.00
886 Class of 1903.....	950.00	14,610.00	288.00	.....	.....	.....	15,848.00
887 Class of 1904.....	.....	800.00	4.00	.....	.....	.....	804.00
888 Class of 1905.....	.....	100.00	.....	.....	.....	.....	100.00
889 Class of 1910.....	.....	405.00	8.00	.....	.....	.....	413.00
890 Class of 1914.....	1,100.62	.....	44.00	.....	.....	.....	1,144.62
891 Class of 1917.....	3,777.00	3,364.51	152.00	.....	.....	\$ 2,749.02	4,544.49
892 Class of 1919, Special.....	3,441.00	.....	.....	.....	.....	.....	3,441.00
893 Class of 1920.....	4,147.25	.....	.....	.....	.....	.....	4,147.25
894 Class of 1921.....	6,989.75	10.00	280.00	.....	.....	.....	7,279.75
903 Class of 1926.....	50,044.87	12,513.77	2,136.00	64,694.64	.....	.....	.....
905 Class of 1927.....	25,542.56	.....	1,020.00	.....	.....	.....	26,562.56
906 Class of 1927, Joseph W. Hammond Memorial.....	30.00	20.00	.....	.....	.....	.....	50.00
907 Class of 1928.....	51,506.22	25.00	2,060.00	.....	.....	.....	53,591.22
909 Class of 1929.....	20,590.66	4.20	824.00	.....	.....	.....	21,418.86
911 Class of 1930.....	17,006.38	.....	680.00	.....	.....	.....	17,686.38
912 Class of 1933.....	21.88	513.62	.....	.....	.....	512.68	22.82

REPORT OF THE TREASURER

AGENCY FUNDS (Continued)

STUDENT ACTIVITIES	Balance June 30, 1950	Gifts and Other Receipts	Investment Income	Transferred	Expense	Other Charges	Balance June 30, 1951
951 Alpha Chi Sigma House.....	\$ 6,102.85	.....	\$ 244.00	.....	.....	.....	\$ 6,346.85
953 Major Briggs.....	36,850.40	.....	1,460.00	.....	.....	\$ 901.47	37,408.93
954 Charles Francis Park Memorial	6,153.25	.....	248.00	.....	.....	.....	6,401.25
955 Sailing Pavilion Reserve —							
New Equipment.....	..... \$	693.00 O.R.	4.00	.....	.....	.....	697.00
956 Lillie C. Smith.....	6,560.04	.....	264.00	.....	.....	7.05	6,816.99
957 Walter B. Snow.....	10,877.82	.....	436.00	.....	.....	.....	11,313.82
958 Technology Christian Assoc..	2,148.00	.....	84.00	.....	.....	.....	2,232.00
959 Technology Matrons' Teas...	9,109.62	.....	356.00	.....	.....	356.00	9,109.62
960 M. I. T. Women's Dormitory	1,599.25	{ 71.46	60.00	.....	.....	484.92	1,359.33
962 Tech Show Trust.....	545.27	{ 113.54 O.R.	24.00	.....	.....	.....	1,069.27
963 Undergraduate Activities Trust	1,576.87	208.00 O.R.	64.00	.....	.....	.....	1,848.87
965 Undergraduate Publications Trust	4,622.23	.....	184.00	.....	.....	.....	4,806.23
967 Undergraduate Dues, Athletics	21,680.87	.....	832.00	.....	.....	1,750.00	20,762.87
969 Undergraduate Dues, Reserve							
and Contingent.....	17,772.95	500.00 O.R.	724.00	.....	.....	.....	18,996.95
	\$ 125,599.42	\$ 71.46 Gifts	\$ 4,984.00	.....	.....	\$ 3,499.44	\$ 129,169.95
		2,014.54 O.R.					
Totals.....	\$ 457,101.68	\$ 38,750.55	\$ 17,800.00	\$ 80,105.64	.....	\$ 12,398.76	\$ 423,162.37
		2,014.54 O.R.					

SCHEDULE A-10

ANNUITY FUNDS

	Balance June 30, 1950	Gifts and Other Receipts	Investment Income	Transferred	Expense	Other Changes	Balance June 30, 1951
981 Anonymous Q.....	\$ 12,155.50	\$ 4,000.00	\$ 544.00	.....	.....	.....	\$ 16,699.50
983 Anonymous X.....	44,648.12	.....	828.00	24,000.00	.....	935.00	20,541.12
984 Anonymous Y.....	108.00	.....	.....	108.00	.....	.....	.....
985 Avoca.....	87,000.00	40,000.00	7,900.00	.....	.....	32.00	134,868.00
987 Joseph Hewett.....	220,115.14	375.84	12,730.21	.....	.....	8,000.00	225,221.19
988 Percival Lowell Scholarship..	23,656.64	125.00	920.00	.....	.....	1,500.00	23,201.64
989 Knight W. Wheeler.....	19,828.00	.....	760.00	.....	.....	1,760.00	18,828.00
990 George S. Witmer.....	80,999.40	{ 3,000.00 1,283.87 Gains }	4,975.94	.....	.....	4,840.15	85,419.06
Totals.....	\$ 488,510.80	\$ 47,000.00	\$ 28,658.15	\$ 24,108.00	.....	\$ 17,067.15	\$ 524,778.51

FUNDS

SCHEDULE A-11

GENERAL INVESTMENTS GAIN AND LOSS ACCOUNT

995 Endowment Reserve.....	\$3,493,036.00	\$ (173,715.79)	Net Loss	\$3,319,320.21
----------------------------	----------------	-----------------	----------	-------	-------	-------	----------------

REPORT OF THE TREASURER

SCHEDULE A-12

STUDENTS' NOTES RECEIVABLE

	<i>Notes Receivable</i> <i>June 30, 1950</i>	<i>Loans Made</i> <i>1950-51</i>	<i>Loans Repaid</i> <i>1950-51</i>	<i>Notes Receivable</i> <i>June 30, 1951</i>	<i>Interest</i> <i>Receivable</i> <i>1950-51</i>
Technology loan fund	\$427,887.47	\$162,006.00	\$69,527.61*	\$520,365.86	\$4,561.17
Bursar's fund	3,324.61	3,180.00	2,922.66	3,581.95	45.48
William B. Rogers fund . .	1,480.00	.....	150.00	1,330.00	38.68
Dean's fund	1,755.06	4,995.00	2,560.00	4,190.06	29.95
Dean's fund special	95.00	1,365.00	880.00	580.00	1.84
C. E. Summer Camp fund	460.00	1,000.00	295.00	1,165.00	12.24
Carl P. Dennett fund	1,556.10	.....	193.10	1,363.00	62.50
George Henry May fund . .	2,350.00	700.00	400.00	2,650.00	.....
Medical special fund	2,565.36	.....	.....	2,565.36	.....
Charles E. Locke Memorial fund	600.00	.....	.....	600.00	.....
William P. Ryan Memorial fund	141.69	.....	20.99	120.70	29.01
Ellen F. Loomis Foreign Student fund . . . . .	.....	150.00	50.00	100.00	.17
<i>Totals</i>	<u>\$442,215.29</u>	<u>\$173,396.00</u>	<u>\$76,999.36*</u>	<u>\$538,611.93</u>	<u>\$4,781.04</u>

(Schedule A)

* Includes notes written off.

SCHEDULE A-13

ACCOUNTS RECEIVABLE

United States Government:		
Armed services, N.A.C.A. and A.E.C. research contracts	\$2,081,885.94*	
Veterans Administration	17,208.00	
Other tuition fees	69,090.45	
Miscellaneous accounts	24,068.47	
<i>Total United States Government</i>	<u>\$2,192,252.86</u>	
Industrial corporations — research contracts	\$138,895.77*	
Others:		
Students' fees and deposits	1,157.77	
Miscellaneous accounts	38,728.82	178,782.36
<i>Total (Schedule A)</i>	<u>\$2,371,035.22</u>	

*Total under direction of Division of Industrial Cooperation \$2,220,781.71.

SCHEDULE A-14
 CONTRACTS IN PROGRESS

<i>United States Government:</i>	
Armed services, N.A.C.A. and A.E.C. research contracts . . .	\$2,139,627.43*
Weather bureau research program	<u>7,625.52</u>
<i>Total United States Government</i>	<u>\$2,147,252.95</u>
Industrial corporations research contracts	\$ 42,762.21*
Super voltage x-ray research	39,152.52
Other departmental research	1,714.23
Costs unallocated in above accounts, represented by accounts payable and accrued wages	<u>120,884.04*</u> <u>204,513.00</u>
<i>Total (Schedule A)</i>	<u><u>\$2,351,765.95</u></u>

*Total under direction of Division of Industrial Cooperation \$2,302,273.68.

SCHEDULE A-15

INVENTORIES, PREPAID EXPENSES AND DEFERRED CHARGES

Inventories:

Department of buildings and power:

Maintenance supplies	\$ 88,250.51
Oil	4,678.52

 \$ 92,929.03

Laboratory supplies	99,875.62
Dining halls, food and supplies	38,592.00
Photographic supplies and equipment	15,112.16
Dormitories, room service supplies	25,059.69
Stationery and stamps	2,375.29
Technology store, lecture notes	1,163.50
Civil Engineering summer camp	422.36

Total Inventories \$275,529.65
Prepaid Expenses and Deferred Charges:

Deposits with mutual fire insurance companies	\$123,502.54
Unexpired insurance premiums	31,621.89
Cooperative Foundation Plan — insurance premiums	22,026.19
Folding chairs, less amortization	5,151.14
Foreign Student Summer Project	7,991.22
Expenses deferred	18,289.63
Equipment — dining halls, less depreciation	13,422.31
Equipment acquired by Division of Industrial Cooperation, less depreciation	128,176.01
Division of Industrial Cooperation:	
Deferred charges to operations	\$15,076.61
Due from vendors	969.50
	<hr/>
	16,046.11
Other deferred charges (principally accounts payable and accrued wages for expenses undistributed)	69,173.97

Total Prepaid Expenses and Deferred Charges 435,401.01

Total (Schedule A) \$710,930.66

WITHHOLDINGS, DEPOSITS, AND OTHER CREDITS 281

SCHEDULE A-16

STUDENTS' ADVANCE FEES AND DEPOSITS

1951 Summer Term:		
Tuition fees	\$200,062.68	
Students' deposits	2,865.00	
Dormitory rentals	47,094.50	
Summer surveying camp	1,300.00	\$251,322.18
<hr/>		
1950-51 Students' deposits returnable		5,234.29
1951-52 Tuition fees		647.00
1951-52 Dormitory rentals		6,280.00
<hr/>		
<i>Total (Schedule A)</i>		<u>\$263,483.47</u>

SCHEDULE A-17

WITHHOLDINGS, DEPOSITS, AND OTHER CREDITS

Payroll withholdings:		
Additional group insurance	\$ 415.22	
Blue Cross hospital program	9,149.56	
Federal Insurance Contribution Act	16,499.21	
U. S. Government savings bonds	10,184.69	
U. S. Government withholding tax	155,714.04	\$191,962.72
<hr/>		
Division of Industrial Cooperation — prepaid income		210,579.88
Division of Industrial Cooperation — overhead suspense		11,758.20
Deposits for designated student expenses:		
Iraqi Educational Directorate	\$ 4,635.38	
J. N. Tata Endowment	260.00	
Ku Lee Hazen	3,625.00	
Daniel Badejo, Nigeria	1,260.00	
Severo Amagna	600.00	
Technology Associates — Mexico	120.00	10,500.38
<hr/>		
Deposits of student activities:		
Sailing account, I.C.Y.R.A.	\$ 1,112.59	
Nautical Association	334.00	
Technology Christian Association	16.00	
World Student Service Fund	268.16	1,730.75
<hr/>		
Other deposits		6,876.43
<hr/>		
<i>Total (Schedule A)</i>		<u>\$433,408.36</u>

REPORT OF THE TREASURER

SCHEDULE A-18
GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES

	Balance June 30, 1950	Gifts and Other Receipts	Transferred	Expense	Other Charges	Balance June 30, 1951
Aeronautical Engineering:						
Aerodynamic Eng. Special (Hunsaker).....	\$ 1,794.98	\$ 1,000.00		\$ 944.74		\$ 1,850.24
Aviation Week Fellowship.....	1,800.00	1,800.00		1,000.00	\$ 800.00	1,800.00
Carnegie Aerodynamics Research.....	1,500.00		\$ 1,472.72	5.06		22.22
Cascade Research.....	3,957.83	{ 17,500.00 3,704.24 O.R. }		13,016.90		12,145.17
Compressible Vortex Flow Investigation.....	2,143.69			2,024.14		119.55
Diffuser Research.....	1,895.46			278.52		1,616.94
Douglas Aircraft Co. Fellowship.....		3,000.00		700.00	800.00	1,500.00
R. C. du Pont Memorial Research.....	800.00		(800.00)			1,600.00
Elastic Research Lab. Alt. Spec. 2246.....	87.60			373.79		
Engine Auto. Control Research 2423.....	6,169.46	286.19 Approp.	(1,028.64)	5,654.83		1,543.27
Fire Control Instr. Lab.....	931.92		(2,500.00)	622.04		2,809.88
Goodyear Fellowship.....	6,036.26			1,232.28	800.00	4,003.98
Instrument Laboratory Maintenance.....	1,263.92		(5,000.00)	4,520.72		1,743.20
Prize Fund.....		100.00		50.00		50.00
Pressure Distribution — Koppen.....			(199.72)	199.72		
Rotating Wing Research.....	449.25		(1,773.00)	872.19		1,350.06
Special Apparatus Wright Tunnel.....	9,457.10			15.40		9,441.70
Special Appro. No. 1990.....	1,500.16					1,500.16
Special Appro. No. 2065.....	3,090.54					3,090.54
Sperry Gyroscope Fund.....	659.75		(3,000.00)	1,700.00	550.00	1,409.75
Structural Lab. Equipment.....		495.98 Approp.		495.98		
Wright Bros. Wind Tunnel.....	118,629.16	40,667.00 O.R.		39,216.30	41,146.75	78,933.11
Wright Bros. Tunnel, Equip.....	30,000.00					30,000.00

GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES

Architecture:								
Acoustics — Arch. Teaching Support.....	.....	.....	(1,000.00)	746.07	.....	.....	253.93	.....
City Planning Conference.....	.....	550.00 O.R.	.....	450.00	.....	.....	100.00	.....
Housing Research Special No. 1899.....	1,902.52	.....	.....	157.12	.....	.....	1,745.40	.....
Floyd Naramore.....	393.59	.....	.....	300.00	.....	.....	3.59	.....
Skidmore, Owings and Merrill Scholarship.....	.....	1,000.00	.....	.....	.....	1,000.00	.....	.....
Biology and Biological Engineering:								
American Cancer Society.....	.....	12,528.00	.....	6,721.96	.....	35.18	5,770.86	.....
American Cancer Society — Vallee.....	862.03	1,000.00	.....	437.91	.....	.....	1,424.12	.....
American Cancer Society — Fellowship Expense.....	.....	1,362.74 Approp.	.....	1,362.74	.....	.....	.....	.....
American Cancer Society — Fitzgerald.....	.....	500.00	.....	.....	.....	470.00	30.00	.....
American Cancer Society — Geren.....	447.59	.....	.....	447.59	.....	.....	.....	.....
American Cancer Society — Hoch.....	.....	500.00	.....	284.18	.....	.....	215.82	.....
American Cancer Society — Beers.....	.....	500.00	.....	.....	.....	500.00	.....	.....
American Cancer Society — Robertson.....	.....	500.00	(56.14)	.....	.....	556.14	.....	.....
American Cancer Society — Snell.....	175.00	500.00	.....	35.00	.....	640.00	.....	.....
American Cancer Society — Spectro.....	628.57	20,166.00	.....	16,104.07	.....	.....	4,690.50	.....
Armour & Co. Research — Waugh.....	.....	12,000.00	.....	10,983.51	.....	1,016.49	.....	.....
Baruch Fund.....	1,508.06	.....	(186.94)	1,695.00	.....	.....	.....	.....
Baruch Comm. on Physical Medicine Fellowship.....	186.94	.....	186.94	.....	.....	.....	.....	.....
Childrens' Medical Center.....	.....	250.00	.....	176.57	.....	.....	73.43	.....
Jane Coffin Child's Memorial.....	.....	3,375.00	.....	3,215.21	.....	.....	159.79	.....

SCHEDULE A-18 — (Continued)
GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES

	<i>Balance</i>		<i>Gifts and</i>		<i>Transferred</i>	<i>Expense</i>	<i>Other</i>	
	<i>June 30, 1950</i>	<i>June 30, 1951</i>	<i>Other Receipts</i>	<i>Balance</i>			<i>Charges</i>	<i>June 30, 1951</i>
Biology and Biological Engineering: (Continued)								
Conservation Foundation — Vallee.....	\$2,882.56					\$2,724.62		\$ 157.94
Corn Industries Research Found.....	1,438.44		\$ 3,000.00			849.86		3,588.58
Electron Microscope Research.....	553.43					339.00		214.43
Ethicon Sutures Laboratories.....			5,000.00			3,469.64		1,530.36
Gillette Safety Razor Co.....	150.00							150.00
Illuminating Engineering Soc. Research.....	1,479.35					675.17		804.18
Kettering Foundation — Vallee.....			5,000.00			909.00		4,091.00
Charles A. and Marjorie King Fund.....	12,049.12		10,000.00			10,826.23		11,222.89
Lilly P. I. Fund.....			15,000.00			7,128.49		7,871.51
National Dairy Products — Waugh.....					\$ (13,000.00)	10,931.48	\$ 144.00	1,924.52
National Public Health — Latta.....	417.03					417.03		
National Public Health — Hershey.....	463.61					463.61		
National Public Health — Hoch.....	430.42					409.66		20.76
National Public Health — Lubin.....			540.00			517.31		22.69
National Public Health — Spiro.....	540.00					540.00		
National Research Council — Vallee.....	4,622.50		6,277.50			8,130.02		2,769.98
Pepsodent Keratin Research — Bear.....	3,469.87		1,500.00			3,827.76		1,142.11
Sloan Kettering Institute.....			2,000.00			500.00		1,500.00
Mass. General Hospital — Gross.....	72.49		500.00			572.49		
Retina Foundation.....			200.00			115.61		84.39
Rocketteller Fund for Biological Eng.....	9,645.27		30,354.73		56.14	27,637.97	300.00	12,005.89
S. E. L. Maduro and Sons, Inc.....			10,000.00					10,000.00
Submarine Signal Fund.....	111.59					111.59		

GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES 285

Building Engineering and Construction:									
National Lime Association.....	11.34	7,000.00	.....	5,146.31	530.00	.....	1,335.03		
Plastic Materials Manufacturing Assoc.....	19,749.12	.....	.....	15,483.28	720.00	.....	3,545.84		
Revere Building Material Research.....	1,543.16	12,000.00	.....	5,019.88	480.00	.....	8,043.28		
Ross Francis Tucker Memorial Fund.....	62.61	.....	.....	8.88	.....	.....	53.73		
Business and Engineering Administration:									
Lemuel R. Boulware Fund.....	17.53	.....	.....	.....	.....	.....	17.53		
Alvin Brown Fund.....	11.13	.....	.....	.....	.....	.....	11.13		
H. W. Christopher.....	200.00	.....	.....	.....	.....	.....	200.00		
R. E. Gillmor.....	116.00	300.00	.....	144.65	.....	.....	271.35		
Newman M. Marsilius Fund.....	325.50	1,000.00	.....	1,028.44	.....	.....	297.06		
Earl Newson.....	150.00	100.00	.....	241.91	.....	.....	8.09		
Sloan Book Account.....	98.32	.....	.....	.....	.....	.....	98.32		
Sloan Sponsored Fellowship, Operating.....	3,173.96	75,000.00	.....	64,571.10	9,900.00	.....	3,702.86		
Sloan Sponsored Fellowship, Special.....	1,151.58	.....	.....	201.93	.....	.....	949.65		
Sloan Sponsored Fellowship, Research.....	2,373.54	2.00 O.R.	.....	.....	.....	.....	2,375.54		
Special Appro. No. 1850.....	454.47	.....	.....	.....	.....	.....	454.47		
Howard D. Williams Fund.....	.65	500.00	.....	500.65	.....	.....	.....
Chemical Engineering:									
Allied Chemical & Dye Corp. Fellowship.....	421.38	1,500.00	.....	1,200.00	300.00	.....	421.38		
American Cyanamid Co. Fellowship.....	1,133.04	2,000.00	.....	1,346.84	800.00	.....	986.20		
Bituminous Coal Research.....	8,842.43	5,000.00	.....	3,285.08	.....	.....	10,557.35		
Boiling Liquids — McAdams.....	.....	.....	.....	509.78	(509.78)	.....	.....
Dow Chemical Company Fellowship.....	.....	5,000.00	.....	1,207.77	800.00	.....	2,992.23		

REPORT OF THE TREASURER

SCHEDULE A-18 — (Continued)

GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES

	Balance		Transferred	Expense	Other Charges	Balance June 30, 1951
	June 30, 1950	Gifts and Other Receipts				
Chemical Engineering: (Continued)						
du Pont Fellowship.....	\$1,596.44	\$2,800.00	.....	\$1,890.31	\$ 300.00	\$2,206.13
Elastic Colloid Research Corp.....	2,926.69	.....	.....	2,124.01	800.00	2.68
Fuels Research.....	2,119.01	.....	.....	1,221.43	.....	897.58
General Motors Fellowship.....	.....	3,000.00	.....	1,800.00	800.00	400.00
Gottesman Foundation.....	1,904.82	2,600.00	.....	2.47	.....	4,502.35
Humble Oil & Refining Co. Fellowship.....	2,325.00	.....	.....	1,875.00	450.00	.....
S. C. Johnson & Son Colloid Chemistry Fellowship..	52.50	.....	.....	.....	.....	52.50
Kimberley Clark Corp. Fellowship.....	2,000.00	.....	.....	1,200.00	800.00	.....
Thomas Midgley, Jr. Fellowship.....	1,507.00	.....	.....	.....	.....	1,507.00
Pan American Refining Corp. Fellowship.....	2,000.00	2,000.00	.....	1,200.00	800.00	2,000.00
Procter & Gamble Fellowship.....	4,390.45	3,100.00	.....	2,136.37	1,120.00	4,234.08
Pittsburgh Consolidation Coal Co. Fellowships.....	2,615.57	3,100.00	.....	1,440.00	300.00	3,975.57
Standard Oil of Indiana Fellowship.....	227.28	4,000.00	.....	1,254.89	550.00	2,422.39
Standard Oil Co. Fellowship — Lewis.....	33.89	.....	.....	.....	.....	33.89
Standard Oil Development Co. Research.....	6,893.55	4,154.37	.....	6,017.46	.....	5,090.46
Special Research No. 1421.....	388.40	.....	\$(1,600.00)	.....	.....	1,988.40
Chemistry:						
Allied Chemical & Dye Corp. Fellowship.....	.....	2,000.00	.....	1,200.00	800.00	.....
American Academy of Arts and Sciences.....	546.08	.....	.....	.....	.....	546.08
American Society of Mech. Engineers.....	2,083.60	3,750.00	.....	2,483.69	.....	3,349.91
Abbott Laboratories.....	572.02	.....	.....	.....	120.00	452.02
American Chicle Co. Fellowship.....	1,341.41	3,000.00	.....	2,916.66	670.00	754.75

GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES 287

Bristol Laboratories Research	1,404.62	6,740.00	6,712.70	600.00	831.92
Harshaw Chemistry Fund	1,944.28	1,500.00	799.18	480.00	2,165.10
du Pont Fellowship	6,298.78	7,300.00	7,132.58	600.00	5,866.20
du Pont Peroxide Research	2,000.00		904.91		1,095.09
du Pont Fundamental Research	3,673.49	10,000.00	11,223.33		2,450.16
Eastman Kodak Fellowship	1,750.00		1,200.00	550.00	
General Motors Special — Morton	287.75	6,677.37 O.R.	6,634.36		330.76
Journal Meetings	507.20	308.00 O.R.			815.20
Kettering Foundation	8,427.98	19,496.09	22,460.87	480.00	4,983.20
Linde Air Products Research		450.00	55.00		395.00
Lucidol Corporation Research		1,000.00	111.57		888.43
Merck Fellowship	2,500.00		2,020.00	480.00	
Owens-Illinois Glass Research		5,000.00	55.00		4,945.00
Physical Chemistry Royalties	4,080.48		(125.20)		4,205.68
Polymization Research	1,665.25		1,045.00		620.25
Procter & Gamble Fund	2,684.85		1,684.85	1,000.00	
Rocketeller Research Grant 45107	4,981.77	11,142.70	13,292.56		2,831.91
Research Corp. — Amdur	5,559.53		2,400.00		3,159.53
Research Corp. Morton Fund	3,879.26		10.02		3,869.24
Research Corp. — Swain	2,669.16		1,949.16	720.00	
Research Corp. Vitamins A and D Research	2,949.56	{ 8,500.00 200.00 O.R. }	9,304.93		2,344.63
Research Special 2391 — Beattie	14,552.50		4,451.27	480.00	9,621.23
Riker Laboratories, Inc.	2,245.00	700.00	1,458.29	600.00	886.71
Sharp and Dohme, Inc.	654.80	3,600.00	3,651.00		603.80
Sugar Research Fund	832.09	1,125.00	1,133.78	360.00	
		463.31			

REPORT OF THE TREASURER

SCHEDULE A-18 — (Continued)
GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES

	Balance June 30, 1950	Gifts and Other Receipts	Transferred	Expense	Other Charges	Balance June 30, 1951
Chemistry: (Continued)						
Sugar Research — Heidt.....	.....	\$ 3,500.00	(\$463.31)	\$ 1,920.86	\$ 480.00	\$ 1,562.45
Swift Amino Acid Fund.....	\$ 170.09	5,000.00	(4,264.50)	3,463.61	480.00	5,490.98
Swift Protein Research.....	3,971.48	.....	.....	2,754.70	915.00	301.78
U. S. Rubber Co. Fellowship.....	459.50	2,800.00	.....	2,593.08	328.58	337.84
Civil Engineering:						
Concrete Structural and Dynamics Laboratory.....	.....	829.01 Approp.	.....	829.01	.....	.....
Hydraulic Demonstration Equipment.....	338.82	.....	.....	338.82	.....	.....
Freeman Hydraulic Research.....	800.00	.....	.....	.....	.....	800.00
International Soc. of Soil Mechanics.....	470.84	1,517.87	.....	1,333.22	.....	655.49
Photogrammetry Laboratory.....	2,369.31	.....	.....	528.77	.....	1,840.54
Public Works Highway.....	.....	30,000.00	.....	67.20	.....	29,932.80
Research Corporation — Ippen.....	1.17	.....	1.17	.....	.....	.....
River Hydraulic Laboratory.....	.....	{ 30.00 O.R. 2,444.70 Approp. }	(1.17)	2,475.87	.....	.....
Sanitary Engineering Lab. 2032.....	350.00	1,482.15 Approp.	.....	1,832.15	.....	.....
Sanitary Science Lab. Special No. 2087.....	110.14	3.25 Approp.	.....	113.39	.....	.....
Soil Mechanics Laboratory, 632.....	.....	{ 30.52 O.R. 984.35 Approp. }	.....	1,014.87	.....	.....
Sanitary Engineering Transportation.....	549.91	.....	.....	549.91	.....	.....
Structural Laboratory.....	.....	{ 150.00 O.R. 859.37 Approp. }	150.00	859.37	.....	.....
Structural Laboratory Donations.....	225.46	75.00 O.R.	(150.00)	.....	.....	450.46

GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES 289

Summer Camp Construction Reserve.....	142.99	.....	.....	.....	.....	142.99
Truck Account.....	.....	.....	.....	(317.42)	.....	317.42
Welding Research.....	2,194.45	2,800.00	.....	2,950.42	.....	2,044.03
Economics:						
Foundation for World Government.....	.....	8,250.00	.....	4,085.13	.....	4,164.87
Map Project.....	2,107.61	6,196.11 O.R.	.....	1,154.17	.....	7,149.55
Rockefeller Foundation Grant 45082.....	4,594.85	{ 1,000.00 }	.....	4,573.81	.....	2,976.10
Overseas Study Fund.....	.....	{ 1,955.06 }	.....	.....	.....	.....
.....	.....	3,000.00	.....	1,212.42	454.91	1,332.67
Electrical Engineering:						
Acoustics — Teaching Support.....	.....	.....	(200.00)	27.95	.....	172.05
American Cancer Society Special Trump.....	11,018.75	20,000.00	.....	30,191.14	.....	827.61
American Philosophical Society — Kopal.....	438.23	.....	.....	12.89	.....	425.34
Army Officers Aid.....	2,570.09	.....	.....	249.99	.....	2,320.10
Balsbaugh Research.....	86.29	.....	.....	32.33	.....	53.96
Celotex Corp. Fellowship.....	500.00	.....	.....	483.31	.....	16.69
Course Revision Special No. 1250.....	446.79	230.07	.....	227.25	.....	449.61
Course Six-A Travel.....	.....	1,194.39 Approp.	.....	1,194.39	.....	.....
Differential Analyzer.....	.....	1,552.42 O.R.	.....	(7,075.74)	5,123.57	3,504.59
du Pont Fellowship.....	800.00	.....	.....	.....	.....	800.00
Edgerton Film Research.....	1,664.40	1,695.23 O.R.	.....	2,783.49	.....	576.14
Equipment Special.....	.....	7,930.73 Approp.	.....	7,930.73	.....	.....
Hyams Radiation Research.....	11,269.22	{ 36,050.00 }	(300.00)	23,999.44	26,951.36	8,718.42
.....	.....	{ 11,150.00 O.R. }	.....	.....	.....	.....
Int. Tel. & Tel. Research.....	865.70	.....	.....	.....	.....	865.70
Jackson Memorial Room.....	2,647.08	.....	.....	2,647.08	.....	.....

REPORT OF THE TREASURER

SCHEDULE A-18 — (Continued)
GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES

	Balance June 30, 1950	Gifts and Other Receipts	Transferred	Expense	Other Charges	Balance June 30, 1951
Network Analyzer.....	\$ 12,499.49	\$ 7,258.75 O.R.	.....	\$4,154.10	\$ 170.00	\$15,434.14
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
S.C.A.P. Film — Hazen.....	.....	1,000.00 O.R.	.....	812.54	.....	187.46
Servomechanism Laboratory — Lathe.....	.....	.....	(\$7,350.00)	.....	.....	7,350.00
Servo Research Special.....	12,919.94	.....	.....	8,364.24	.....	4,555.70
Servos Special-Brown.....	5,456.49	.....	(27,000.00)	24,659.66	.....	7,796.83
Supervoltage X-Ray Program.....	.....	.....	.....	39,152.52	(39,152.52)	.....
English and History:						
American Iron and Steel Institute.....	.....	2,600.00	.....	2,236.49	.....	363.51
American Philosophical Society.....	2,000.00	.....	.....	2,000.00	.....	.....
Roosevelt Spec. 2356.....	631.73	.....	.....	.....	.....	631.73
Reading Technique.....	.....	{ 2,425.00 O.R. 474.28 Approp. }	.....	2,899.28	.....	.....
Roosevelt Project Expense.....	.....	226.27 O.R.	.....	286.78	(60.51)	.....
Food Technology:						
Apple Fellowship.....	1,086.36	.....	1,086.36	.....	.....	.....
Bruce's Juices Inc. Fellowship.....	1,850.00	.....	.....	.....	.....	1,850.00
Campbell Special.....	1,271.89	{ 1,183.45 45.00 O.R. }	(2,169.55)	3,476.63	.....	1,193.26
Dewey and Almy Fund.....	486.69	.....	(277.61)	764.30	.....	.....

GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES 291

Fat Research Fund.....	.....	3,964.78	(3,169.22)	7,134.00	.....	.....
Food Research.....	.....	.....	(61,225.60)	60,745.60	480.00	.....
Hoffman La Roche Fund.....	2,442.62	.....	.....	.....	.....	2,442.62
Joe Lowe Corp. Research.....	1,237.95	.....	.....	.....	.....	1,237.95
Moore, Emma B., Ration Research, Proctor.....	500.00	.....	.....	91.40	.....	408.60
Moore, Emma B., Ration Research, Harris.....	27.56	.....	.....	.....	.....	27.56
Nutrition Research.....	16.86	{ 6,200.00	4,931.38	2,097.03	.....	2,386.37
	.....	{ 2,297.92 O.R. }	.....	.....	.....	.....
Samuel C. Prescott.....	.....	1,350.00	.....	.....	.....	1,350.00
Procter and Gamble Research.....	.....	3,200.00	(568.02)	3,288.02	480.00	.....
Quaker Nutrition Fund.....	2,106.40	2,600.00	.....	3,399.96	300.00	1,006.44
Royalties Receipts Pat. 665135.....	180.56	.....	.....	40.15	.....	140.41
Shortening Institute—Harris.....	.....	10,000.00	.....	8,223.95	.....	1,776.05
Tufts Dental.....	.....	2,000.00	.....	1,434.95	.....	565.05
United Fruit Fund.....	4,817.04	185.48	.....	3,972.23	.....	1,030.29
Upjohn Co., Cathode Ray Research.....	3,101.13	.....	1,083.19	2,017.94	.....	.....
Vitamin Foundation Research.....	85.97	.....	(16.53)	102.50	.....	.....
Geology:						
American Petroleum Institute Fund.....	.....	17,900.00	.....	15,224.69	1,261.18	1,414.13
G.S.A. 466-45.....	1,741.21	.....	.....	1,741.21	.....	.....
Nova Scotia Coal Research.....	.....	4,050.00	.....	1,550.00	.....	2,500.00
Owens Illinois Glass Co. Fellowship.....	291.10	.....	.....	153.00	.....	138.10
Rockefeller — Buerger.....	.....	1,600.00	.....	1,325.11	.....	274.89

REPORT OF THE TREASURER

SCHEDULE A-18 — (Continued)
 GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES

	<i>Balance June 30, 1950</i>	<i>Gifts and Other Receipts</i>	<i>Transferred</i>	<i>Expense</i>	<i>Other Charges June 30, 1951</i>	<i>Balance June 30, 1951</i>
Graphics:						
National Research Council Grant.....	\$ 180.01					\$ 180.01
Industrial Relations:						
Social Science Research — Myers.....		\$ 2,000.00		\$ 100.00		1,900.00
Mathematics:						
Applied Mathematics Program.....	2,517.35		(7,200.00)	2,250.00	\$ 1,800.00	5,667.35
Geophone Responses — Wadsworth.....			(2,500.00)			2,500.00
Journal of Mathematics and Physics.....	5,377.24	\$ 4,379.81 O.R. { 1,800.00 Approp. }		5,350.96		6,206.09
Special Appro. No. 2260.....	3,881.52			723.01		3,158.51
Putnam Fund.....	203.35					203.35
Rockefeller Fund 47009.....	2,754.54					2,754.54
Mechanical Engineering:						
A. S. M. E. Research.....	2,285.37	8,400.00		7,385.49		3,299.88
A. S. R. E. Research.....	790.82					790.82
American Soc. of Tool Engineering.....	517.50			200.00		317.50
Bryant Chucking Grinder Co.....		10,000.00		3,689.79		6,310.21
Cavitation Research.....	527.12	275.00 O.R.		485.96		316.16
Chicopee Fellowship.....	1,300.00			500.00	800.00	
Clark Thread Fellowship.....	6,037.50	5,400.00		3,600.00	1,458.58	6,378.92
deForest Research Special 1254.....	1,932.48			415.22		1,517.26
Detonation Research 2435.....	1,035.40	1,250.00		148.16		2,137.24

GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES 293

du Pont Predoctoral Fellowship.....	2,414.77	2,800.00	.....	1,800.00	400.00	3,014.77
Dynamics Special 2319.....	1,835.93	.....	.....	.....	.....	1,835.93
Fatigue & Fracture of Metals Conference.....	371.90	.....	.....	28.54	.....	343.36
Fatigue Lab. Special No. 2224.....	140.14	.....	.....	31.18	.....	108.96
Flower Fund.....	88.00	.....	.....	10.00	.....	78.00
Gas Turbine Building and Equipment.....	1,806.29	200.00 O.R.	.....	103.50	.....	1,902.79
Kennecott Copper Corporation — Burwell.....	.....	8,000.00	.....	6,131.08	.....	1,868.92
Lab. Rev. Special No. 2095.....	1,714.17	.....	.....	46.58	.....	1,667.59
Low Temperature Research.....	300.00	.....	.....	2.90	.....	297.10
Lubrication Research — Burwell.....	.....	.....	(3,000.00)	1,999.86	.....	1,090.14
Machine Tool Lab. Spec. No. 2201.....	2,143.53	3,500.00 O.R.	100.00	300.00	.....	5,243.53
Magnaflex Research Fund.....	2,802.64	.....	.....	2,150.00	.....	652.64
Mechanics of Materials Spec. No. 2041.....	7,767.42	.....	.....	1,852.80	.....	5,914.62
N. E. Textile Foundation Fellowship.....	500.00	1,300.00	.....	1,000.00	800.00	.....
Photographic Study No. 2466.....	.....	.....	(2,000.00)	1,498.58	.....	501.42
Proprietors Locks and Canals.....	817.07	.....	.....	.....	.....	817.07
S. Slater & Sons, Inc., Fund.....	225.11	.....	.....	32.40	.....	192.71
Shell Fellowship.....	900.00	2,300.00	.....	1,321.25	800.00	1,078.75
Shell Research.....	.....	5,000.00	.....	759.96	.....	4,240.04
Shop Maintenance Account.....	6,120.96	874.35 O.R.	.....	(1,116.32)	.....	8,111.63
Sloan Engine Control Research.....	1,028.64	2,207.70 O.R.	1,028.64	.....	.....	2,207.70
Special Appro. No. 2176.....	1,042.87	.....	.....	452.82	.....	590.05
Supersonic Vortex Research.....	.....	10,000.00	.....	5,434.15	.....	4,565.85
Testing Materials Lab. Special.....	1,241.42	.....	.....	296.29	.....	945.13
Textron Fellowship.....	.....	2,600.00	.....	1,800.00	300.00	500.00

REPORT OF THE TREASURER

SCHEDULE A-18—(Continued)
GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES

	Balance June 30, 1950	Gifts and Other Receipts	Transferred	Expense	Other Charges	Balance June 30, 1951
Mechanical Engineering (Continued):						
Textile Foundation Research.....	\$ 1,752.44			\$ 135.27		\$ 1,617.17
Special Appro. 2169A.....	4,035.80			99.87		3,935.93
United Shoe Machinery — Shaw.....		\$ 3,500.00		2,497.70		1,002.30
Thermodynamic Research.....	681.81			58.15		623.66
Visking Corporation Fellowship.....		2,500.00				2,500.00
Wear Conference.....	421.66			62.99		358.67
George Westinghouse Professorship.....	17,378.39			9,936.89		7,441.50
Metallurgy:						
Alloy Casting Institute — Taylor.....		8,100.00		7,178.69		921.31
Aluminum Co. of America.....	1,953.42		\$(24,000.00)	22,148.67	\$ 3,036.01	768.74
American Brake Shoe Fellowship.....	159.54			1,622.08	800.00	2,737.46
American Brake Shoe — Operating.....	127.06			131.76		6,995.30
American Foundrymen's Society.....		5,000.00		2,269.61	60.47	2,669.92
American Smelting & Ref. Co. Grad. Fellowship.....		8,000.00				8,000.00
American Smelting & Ref. Co. Undergrad. Fell.....	214.00			1.75	1,500.00	212.25
Armour Dry Cyaniding.....	879.10			1,863.52		4,815.58
Armour Flotation Research — Gaudin.....	8,800.57			5,645.21	720.00	14,435.36
Chipman Research Special 1337.....	9,003.50	11,287.58 O.R.		11,386.14	50.00	8,854.94
Clay Research.....	392.77			154.94		237.83
Climax Molybdenum Company.....		5,000.00		.52		4,999.48
Corrosion Research.....	2,189.87		(1,000.00)	1,593.60		1,596.27
Engineering Foundation — Cohen.....		2,500.00		2,420.00		80.00
Engineering Foundation Welding Res.....	3,292.55			2,237.01	300.00	755.54

GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES 295

Metallurgy (<i>Continued</i>):									
Equipment Spec. No. 1234.....	4,314.63	441.10 O.R.	.....	2,155.29	.....	2,600.44	.....	.....	.....
Equipment Special No. 1259.....	517.67	.....	.....	(1,739.03)	.....	2,256.70	.....	.....	.....
Equipment Special No. 2422.....	3.21	.....	.....	3.21	.....	.....	.....	.....	.....
Foundry Educational Foundation — Scholarship.....	1,496.82	7,500.00	.....	2,547.13	4,400.00	2,049.69	.....	.....	.....
International Harvester Fellowship.....	.....	3,500.00	.....	774.67	400.00	2,325.33	.....	.....	.....
Mineral Dressing Research.....	.....	1,327.69 Approp.	.....	1,327.69	.....	.....	.....	.....	.....
Modernization of Processing Laboratory.....	2,415.49	.....	.....	.....	.....	2,415.49	.....	.....	.....
National Lead Fellowship.....	.....	1,800.00	.....	1,200.00	.....	600.00	.....	.....	.....
Republic Steel Corp. Fund.....	3,710.05	10,000.00	.....	6,682.74	587.50	6,439.81	.....	.....	.....
Research Corporation — Schuhmann.....	.....	.....	.....	(373.85)	361.38	12.47	.....	.....	.....
Research Corporation — Uhlig.....	101.24	.....	.....	17.20	.....	84.04	.....	.....	.....
Revere Copper and Brass Co. Res.....	13.35	.....	.....	13.35	.....	.....	.....	.....	.....
Shell Research.....	.....	5,000.00	.....	738.71	.....	4,261.29	.....	.....	.....
Special Appropriation 2297.....	401.86	.....	.....	175.49	226.37	.....	.....	.....	.....
Special Research No. 1818.....	286.41	.....	.....	263.62	22.79	.....	.....	.....	.....
Steel Founders Society — Arc Furnace.....	246.39	.....	.....	.....	.....	246.39	.....	.....	.....
Steel Founders Society — Scholarship.....	200.00	700.00	.....	700.00	.....	200.00	.....	.....	.....
Taylor Research.....	.....	2,000.00	.....	997.36	.....	1,092.64	.....	.....	.....
Timken Roller Bearing Research.....	1,819.82	10,000.00	.....	7,989.54	94.00	3,736.28	.....	.....	.....
Titanium Co. Fund.....	346.95	1,500.00	.....	2,002.49	(155.54)	.....	.....	.....	.....
Union Carbide and Carbon Fellowship.....	584.25	2,100.00	.....	1,225.63	1,000.00	458.62	.....	.....	.....
Vanadium Corp. Fund.....	409.35	2,500.00	.....	1,805.11	480.00	624.24	.....	.....	.....
Wellman, S. K. Fund.....	1,935.80	.....	.....	1,838.15	.....	87.65	.....	.....	.....
Williams, Robert Seton Fund.....	.....	106.75 Approp.	.....	106.75	.....	.....	.....	.....	.....

SCHEDULE A-18 — (Continued)
GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES

	<i>Balance</i>	<i>Gifts and</i>			<i>Other</i>	<i>Balance</i>
	<i>June 30, 1950</i>	<i>Other Receipts</i>	<i>Transferred</i>	<i>Expense</i>	<i>Charges</i>	<i>June 30, 1951</i>
Meteorology:						
American Meteorological Society.....		\$ 2,850.00		\$ 1,633.00		\$ 1,217.00
Weather Bureau Research.....		27,500.00 O.R.		23,429.88	\$ 4,070.12	
Military Science:						
Freshman Equipment Account.....	\$ 2,253.77				(3,881.71)	6,135.48
Senior Uniform — Air Force.....		13,917.48			13,820.85	96.63
Senior Uniform — Army.....		18,241.45	\$ (70.37)		18,311.82	
Senior Uniform Upkeep Account.....	72.15		70.37		1.78	
Modern Languages:						
Carnegie S.A.L. — Locke.....	1,356.64		(9,200.00)	2,809.10		7,747.54
Carnegie S.A.L. — Perry.....	3,861.08		(23,500.00)	12,259.86		15,101.22
Naval Architecture:						
American Bureau of Shipping Scholarship.....		1,000.00				1,000.00
Lima Hamilton Corp. Research.....	1,627.02					1,627.02
Propeller Tunnel Special No. 1548A.....	3,283.41	600.00 O.R.		1,402.75		2,480.66
Special Fund (Anonymous).....	485.72	{ 32.00 } { 50.00 }		405.70		162.02
Physics:						
Armstrong Cork Co. Fellowship.....	400.00	3,000.00		3,004.51		395.49
Cabot Carbon Black.....	6,000.00			2,330.00		3,670.00
Cabot X-Ray Fund.....	5,693.75			5,515.00		178.75
Crystal Research.....	1,286.82			(99.90)		1,386.72

GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES 297

du Pont Fellowship.....	2,600.00							2,600.00	
Eastman Kodak Fellowship.....	2,000.00							2,000.00	
Gulf Oil Corp. Fellowship.....	1,500.00					800.00			
Harshaw-Stockbarger.....	4,469.24			5,657.18				4,572.06	
Humble Oil and Refining Corp.....			2,000.00			400.00			
Jewett, Frank B. Fellowship.....	614.54			319.17				295.37	
Magnetic Laboratory Special No. 1222.....	295.45			.12		295.33			
Nuclear Research.....	8,895.87			13.65				42,882.22	
Radioactivity Center.....	45,690.29		3,500.00	2,098.79				42,288.11	
Shell Fellowship.....		2,300.00		1,200.00		800.00		300.00	
Shell Research.....		5,000.00		275.00				4,725.00	
Special Appro. No. 2047.....	4,133.40			424.00				3,709.40	
Zeeman Effect Program Special 1755.....	466.65							466.65	
Acoustics:									
Acoustics Lab, Special No. 2115.....			(500.00)	480.16				19.84	
Acoustics Material Association Fellow.....		3,000.00						3,400.00	
Acoustics Medical Project No. 2412.....	400.00			8,554.05				1,043.04	
Acoustics — Pittsburgh Plate Glass — Meuller.....		3,320.00		2,614.66				705.34	
Acoustics — Physics Teaching Support.....			(1,000.00)	987.46				12.54	
Acoustics — Damon Runyon.....		5,000.00		350.00				4,650.00	
Solar Energy Research:									
Solar Energy — Architecture.....			(2,303.50)	2,529.00					
Solar Energy — Chemical Engineering.....		225.50 O.R.	(4,503.91)	4,503.91					
Solar Energy — Chemistry.....			(4,474.26)	3,634.26		840.00			
Solar Energy — Elec. Eng.....	4,756.44		4,756.44						
Solar Energy — Heating.....	1,661.11		(5,729.47)	7,070.58					
Solar Energy — Metallurgy.....	1,443.31		(7,106.06)	8,549.37					

SCHEDULE A-18 — (Continued)
GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES

	<i>Balance</i>	<i>Gifts and</i>		<i>Transferred</i>	<i>Expense</i>	<i>Other</i>	<i>Balance</i>
	<i>June 30, 1950</i>	<i>Other Receipts</i>	<i>Other Receipts</i>			<i>Charges</i>	<i>June 30, 1951</i>
Spectroscopy:							
Spectroscopy Lab. Special.....	\$ 120.86	.....	.....	.....	.....	.....	\$ 120.86
Spectroscopy — Loofbournow.....	1,711.16	.....	.....	.....	\$ 123.79	\$ 780.00	807.37
Spectroscopy Research.....	12,471.05	\$10,000.00	.....	.....	14,165.70	.....	8,430.35
		{	125.00 O.R.				
Spectroscopy Special.....	6,267.58	295.00 O.R.	}	.....	534.02	.....	6,028.56
Spectroscopy-Biology — Mem. Hospital.....	1,600.18	1,147.62		.....	2,747.80	.....	.....
	\$ 770,639.19	\$969,584.71		\$(216,700.86)	\$ 997,368.27	\$129,750.10	\$ 829,806.39

Other Accounts

Industrial Grants:

Aluminum Co. of America.....	25,000.00	25,000.00	.....	.....	.....	.....	25,000.00
Anaconda Copper Mining Co.....	.....	20,000.00	.....	.....	20,000.00	.....	.....
Armco Steel Corporation.....	.....	20,000.00	.....	.....	20,000.00	.....	.....
California Research Corp.....	50,000.00	50,000.00	.....	.....	50,000.00	.....	50,000.00
Cities Service Res. & Development.....	.....	50,000.00	.....	.....	50,000.00	.....	.....
Continental Oil Company.....	.....	25,000.00	.....	.....	25,000.00	.....	.....
Continental Motors Corporation.....	.....	10,000.00	.....	.....	10,000.00	.....	.....
Anonymous C-G.....	.....	20,000.00	.....	.....	10,000.00	.....	10,000.00
Anonymous D. A.....	.....	20,000.00	.....	.....	10,000.00	.....	10,000.00
Draper Corporation.....	40,000.00	.....	.....	.....	10,000.00	.....	30,000.00
Allen B. Du Mont Laboratories, Inc.....	.....	10,000.00	.....	.....	10,000.00	.....	.....
Electrolux Corporation.....	.....	10,000.00	.....	.....	10,000.00	.....	.....
Humble Oil & Refining.....	.....	.....	(30,000.00)	.....	30,000.00	.....	.....
General Motors Corporation.....	.....	50,000.00	.....	.....	.....	.....	50,000.00
Liquid Carbonic Corp.....	10,000.00	10,000.00	.....	.....	10,000.00	.....	10,000.00

GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES 299

Hercules Powder Company.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Phelps-Dodge Corp.....	40,000.00	.....	.....	.....	.....	.....	.....	.....	30,000.00
Anonymous I.....	50,000.00	.....	.....	.....	.....	.....	.....	.....	.....
Saco-Lowell Shops, Inc.....	10,000.00	.....	.....	.....	.....	.....	.....	.....	.....
Anonymous M.C.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sperry Gyroscope Co.....	15,000.00	.....	.....	.....	.....	.....	.....	.....	.....
Merck and Company, Inc.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
A. O. Smith Corporation.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
National Dairy Research Lab., Inc.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
North American Aviation.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Standard Oil Co. of Indiana.....	50,000.00	.....	.....	.....	.....	.....	.....	.....	.....
Philco Corporation.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Anonymous S-O.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Anonymous S-R.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Texas Company.....	105,679.74	.....	.....	.....	.....	.....	.....	.....	.....
Anonymous S-E.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Anonymous U-C.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Anonymous S-J.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
United States Steel Corp.....	120,000.00	.....	.....	.....	.....	.....	.....	.....	.....
Sylvania Electric Products, Inc.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Anonymous U-O.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	<u>\$ 465,679.74</u>	<u>\$ 797,500.00</u>	<u>\$ 25,500.00</u>	<u>\$ 575,000.00</u>	<u>\$ 77,111.84</u>	<u>\$ 585,567.90</u>	<u>\$ 77,111.84</u>	<u>\$ 585,567.90</u>	

REPORT OF THE TREASURER

SCHEDULE A-18 — (Continued)
 GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES

<i>Other Accounts (Continued):</i>	<i>Balance June 30, 1950</i>	<i>Gifts and Other Receipts</i>	<i>Transferred</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance June 30, 1951</i>
Library:						
American Chemical Society Library Fellowship.....	\$ 846.69			312.19		534.50
Biology Library.....	4,488.79			2,179.00		2,309.79
Carnegie S. A. L. Center.....	2,002.77	\$ 1,765.25 O.R.	\$(16,575.00)	8,784.28		11,558.74
Clark Collection.....		700.00 Approp.		80.63		619.37
Crafts Library.....	679.33			314.99		364.34
German Chemical Documents.....	234.87			11.50		223.37
Library Growth.....	3,478.51			122.00		3,356.51
Special No. 1.....	4,149.92	1,707.83 O.R.				5,857.75
Special No. 1853.....	233.81			7.52		226.29
Special Appropriation No. 2240.....	63.73			(13.24)		76.97
Walker Memorial Library.....	1,524.20		(3,200.00)	2,801.00		1,923.20
	\$ 17,702.62	\$ 4,173.08	\$(19,775.00)	\$ 14,599.87		\$ 27,050.83
Research (other than those under Department Accounts):						
All American Aviation, Inc., Richard C. du Pont Memorial.....		1,100.00				1,100.00
Bush Research Fund.....		215.00				215.00
General Radio Company Fund.....		2,000.00				2,000.00
	\$ 3,315.00					\$ 3,315.00

GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES 301

Reserves:								
Bemis Real Estate.....	9,726.09	.....	.....	.....	.....	1,990.25	7,735.84
Division of Laboratory Supplies.....	15,865.61	5,909.47 O.R.	.....	.....	.....	.....	21,775.08
Medical Student Health.....	16,281.92	9,953.32 O.R.	.....	.....	.....	.....	25,335.24
Radar School, Harbor Building.....	1,753.25	3,620.69 O.R.	.....	.....	5,373.94	.....	.....
Special War Reserve Fund.....	8,867.91	.....	.....	.....	.....	.....	8,867.91
	\$ 52,494.78	\$ 18,583.48	.....	.....	\$ 5,373.94	\$ 1,990.25	\$ 63,714.07
Plant Operations:								
Acoustics Laboratory office Construction.....	.....	2,200.00 Approp.	.....	.....	2,200.00	.....	.....
Alterations — Prof. Hrones Office.....	.....	4,977.13 Approp.	.....	.....	4,977.13	.....	.....
Analytical Chem. Laboratory.....	8,958.43	.....	.....	.....	8,958.43	.....	.....
Biology Renovations.....	3,792.93	.....	.....	.....	1,503.31	.....	2,289.62
Building 4 Chemical Hood Alterations.....	.....	13,178.00 Approp.	.....	.....	8,147.76	.....	5,030.24
Building 5 Special 2333.....	1,301.27	.....	.....	.....	58.85	.....	1,242.42
Building 10 Dome Study.....	.....	500.00 Approp.	.....	.....	.....	.....	500.00
Building 10 Dome Repairs.....	.....	4,000.00 Approp.	.....	.....	4,000.00	.....	.....
Building 20 Painting.....	3,427.64	.....	.....	.....	883.74	.....	2,543.90
Cabinets for Room 2-190.....	113.48	.....	.....	.....	.....	113.48	.....
Civil Eng. — Room 1-155 Alterations.....	.....	2,000.00 Approp.	.....	.....	2,000.00	.....	.....
Decorating Room 2-290.....	32.22	.....	.....	.....	20.00	12.22	.....
Demonstration Special 2351.....	2,484.88	.....	.....	.....	.....	.....	2,484.88
Emergency Lighting System.....	.....	21,700.00 Approp.	.....	.....	6,213.70	.....	15,486.30
Grounds Improvement 2448.....	.....	27,500.00 Approp.	.....	.....	27,500.00	.....	.....
Hayden Library Dedication.....	832.35	375.24 Approp.	.....	.....	1,207.59	.....	.....

REPORT OF THE TREASURER

SCHEDULE A-18 — (Continued)
 GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES

<i>Other Accounts (Continued)</i>	<i>Balance June 30, 1950</i>	<i>Gifts and Other Receipts</i>	<i>Transferred</i>	<i>Expense</i>	<i>Other Charges</i>	<i>Balance June 30, 1951</i>
Plant Operations: <i>(Continued)</i>						
Install. of Arc Furnace — Bldg. 35	\$ 1,584.95			\$ 1,584.95		
Ladies' Room Improvements	\$ 3,803.93	Approp.		3,803.93		
Library Move	11,102.88			1,390.94		\$ 9,711.94
Loading Frames — Civil	10,000.00			4,069.20		5,930.80
Medical Department X-Ray	5,100.00			5,100.00		
Modernization of Lighting	2,840.29			291.78		2,548.51
Moore House Renovations				458.32	\$ (458.32)	
Parking Control Expense	8,782.11	196.10	Approp.	8,978.21		
Forris Jewett Moore Room Repairs			\$ (150.00)			150.00
Planting Expense	1,449.63			330.23		1,119.40
Painting Special				9,040.63		
Renovations City Planning Headquarters	379.56			373.27		6.29
Power Plant Special Repairs		6,300.00	Approp.	6,300.00		
Repairing Freight Elevators	4,475.00			4,475.00		
Reconditioning of Room 6-436			(3,500.00)	2,741.09		758.91
Repairing Roads West of Mass. Ave.	453.84			299.44	154.40	
Renovations of Men's Rooms		4,567.64	Approp.	4,567.64		
Space Changes 2296	359.46	35,000.00	Approp.	34,199.77		1,159.69
Repairs to Elevator — Building 8		8,000.00	Approp.	7,495.50		504.50
Telephone and Switchboard Alterations				861.87	(861.87)	
Ventilation of Room 24-407	1,200.00			1,200.00		
Whittemore Building Boiler Repairs				317.00	(317.00)	
	\$ 68,670.92	\$ 143,338.67	\$ (3,650.00)	\$ 165,549.28	\$ (1,357.09)	\$ 51,467.40

GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES 303

Miscellaneous:									
Alumni Register.....	273.64	236.85 O.R.	.....	58.25	.....	452.24	.....	.....	.....
Richard D. du Pont Mem. Special.....	388.56	.....	388.56	.....	.....	.....	.....	.....	.....
Emma Rogers Room Special.....	29.12	.....	29.12	.....	.....	.....	.....	.....	.....
New Student Program.....	5,118.65	36,898.13 Approp.	.....	42,016.78	.....	.....	.....	.....	.....
Vocational Guidance 2416.....	2,090.55	4,543.35 Approp.	.....	6,633.90	.....	.....	.....	.....	.....
Visiting Committee Reports.....	.....	16.90 Approp.	.....	16.90	.....	.....	.....	.....	.....
Westgate Survey.....	2,000.00	.....	.....	.....	.....	2,000.00	.....	.....	.....
Boat House Equipment.....	256.60	.....	.....	246.52	.....	10.08	.....	.....	.....
Building Key Account.....	4,629.55	.....	.....	(293.45)	.....	4,923.00	.....	.....	.....
Chairman's Fund.....	320.58	.....	(1,000.00)	896.72	.....	423.86	.....	.....	.....
Carnegie Corporation — Burchard.....	.....	.....	(5,000.00)	1,274.89	.....	3,725.11	.....	.....	.....
Carnegie S. A. L. — Hill.....	386.41	.....	(1,500.00)	622.26	.....	1,264.15	.....	.....	.....
Corporation K Fund.....	69.17	.....	.....	.....	.....	69.17	.....	.....	.....
Corporation Flower Fund.....	503.08	.....	25.00	31.00	.....	447.08	.....	.....	.....
Dean Baker.....	.....	789.50	.....	151.62	.....	637.88	.....	.....	.....
Dean's Fund Special.....	700.00	{ 1,075.00 1.84 O.R. }	.....	150.00	.....	1,626.84	.....	.....	.....
Eager Student Aid Fund.....	250.00	.....	.....	.....	200.00	50.00	.....	.....	.....
Faculty Flower Fund.....	464.41	.....	.....	100.00	.....	364.41	.....	.....	.....

REPORT OF THE TREASURER

SCHEDULE A-18 — (Continued)
GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES

<i>Other Accounts (Continued)</i> <i>Miscellaneous: (Continued)</i>	<i>Balance</i> <i>June 30, 1950</i>	<i>Gifts and</i> <i>Other Receipts</i>	<i>Transferred</i>	<i>Expense</i>	<i>Other</i> <i>Charges</i>	<i>Balance</i> <i>June 30, 1951</i>
Foreign Student Project 1950-51.....	.....	{ \$29,187.91 18,410.00 O.R. }	.....	\$ 40,844.35	\$ 6,753.56	.....
Foreign Student Air Travel Dept.....	\$ 109.27	.....	.....	90.74	.....	\$ 18.53
Freshman Advisors.....	.....	.....	\$ (1,200.00)	1,150.00	.....	50.00
Graduate Student Fund.....	136.82	475.00	.....	150.00	400.00	61.82
Greer Rowing Equipment.....	200.50	600.00	.....	.....	.....	800.50
Haynes Student Aid Fund.....	725.00	.....	.....	675.00	.....	50.00
Dard Hunter Museum.....	4,002.05	2,003.85	.....	1,860.70	.....	4,205.20
Kasch Fellowships.....	180.00	.....	.....	.....	.....	180.00
William S. Knudsen Fellowship.....	1,325.00	2,500.00	.....	2,925.00	800.00	100.00
Lecture Fund.....	.....	.....	(2,400.00)	1,971.42	.....	428.58
Thurman Lee Fund.....	1,500.00	.....	.....	.....	642.00	858.00
Otto G. Lindberg — Burchard.....	.....	2,000.00	.....	1,585.33	.....	414.67
A. D. Little Fellowship.....	650.00	.....	(7,500.00)	5,900.00	1,600.00	650.00
Ellen F. Loomis Foreign Students.....	.....	{ 3,500.00 .17 O.R. }	.....	850.00	.....	2,650.17
Melvin Trust Scholarships.....	11,962.00	11,200.00	.....	.....	9,775.00	13,387.00
Micro Reproduction Service.....	.....	.....	.....	(1,519.83)	.....	1,519.83
Miscellaneous Gifts.....	.....	165.00	.....	165.00	.....	.....
National Assoc. of Engine and Boat Mfrs.	.....	600.00	.....	.....	600.00	.....
Parking Fines.....	.....	190.00 O.R.	.....	10.00	.....	180.00
Photographic Service.....	360.05	.....	360.05	(482.09)	.....	482.09

GIFTS AND OTHER RECEIPTS FOR CURRENT EXPENSES 305

President's Fund.....	498.42	498.42	.....	.....	.....
President's Special Fund L.....	12,250.00	123.94	.....	.....	17,126.06
Emma Rogers Room — Social.....	30.79	(38.97)	.....	.....	69.76
George Scher Scholarship Fund.....	1,000.00	.....	.....	.....	1,000.00
Science Teachers Fellowship.....	12,518.75	19,690.00	.....	1,960.00	3,368.75
Statistical Services Operating.....	.....	299.14	.....	(299.14)	.....
Teagle Foundation.....	926.00	.....	.....	17,650.00	926.00
Technology Press.....	.....	(29,933.58)	.....	23,267.84	6,665.74
Undergraduate Policy Committee — Whitman.....	.....	174.75	.....	.....	.....
Undergrad. Scholarship Award Spec.....	500.00	500.00	.....	1,500.00	1,750.00
Herman E. Wehmiller.....	702.40	.....	.....	.....	702.40
Granger Whitney Fund.....	213.50	.....	.....	200.00	13.50
<i>Total</i>	\$ 67,330.87	\$ 129,328.29	\$ 129,328.29	\$ 65,049.26	\$ 73,652.42
	\$1,445,833.12	\$1,887,219.65	\$272,544.36	\$1,634,574.01	
Deduct appropriated income expense.....	.....	\$ 220,724.32	.....	.....	.....
Balance per summary of funds.....	\$1,445,833.12	\$1,666,495.33	\$286,015.30	\$1,634,574.01	

(Schedule A)

SCHEDULE A-19

EDUCATIONAL PLANT ASSETS¹

Land in Cambridge:		
Campus — east of Massachusetts Avenue	\$1,176,102.37	
Campus — west of Massachusetts Avenue	<u>850,014.82</u>	\$2,026,117.19
Educational Buildings, Cambridge:		
Main Group.....	\$5,655,949.64	
Charles Hayden Memorial Library.....	3,880,441.86	
Sloan Building.....	2,504,317.85	
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..	258,653.00	
Magnetic Substation.....	76,272.73	
Gas Turbine Laboratory.....	545,892.45	
Sloan Automotive Laboratories.....	549,936.81	
Mechanic Arts Building.....	83,658.89	
Metals Processing Laboratory (Under Construction).....	603,433.32	
Nuclear Research Laboratory.....	42,891.27	
Cyclotron Laboratory.....	20,247.92	
Solar Energy Laboratory.....	10,500.00	
Hyams Radiation Laboratory.....	39,551.36	
Research Building (Servo-mechanisms)....	104,589.55	
Biology and Food Tech. Bldg. (Under Construction).....	816,558.62	
Hydraulic Laboratory (Building 21).....	11,000.00	
Hydrodynamics Laboratory and Towing Tank.....	600,037.19	
Chemical Engineering Laboratory (Bldg.38)	31,000.00	
Building Twenty-Four.....	318,049.27	
Building Eighteen.....	44,158.93	
Twelve M.E.V. Bldg.....	<u>278,255.58</u>	19,205,372.97
Educational Equipment.....		2,039,953.60
Undergraduate Dormitories.....	\$1,487,423.79	
Everett Moore Baker House.....	<u>500,000.00²</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 and Squash Courts..	84,042.54	
Sailing Pavilion.....	28,849.09	
Briggs Field House and Track.....	121,197.99	
Rockwell Cage.....	<u>216,902.14</u>	1,786,257.44
Summer Camp: East Machias, Maine.....		120,558.00
Round Hill, Dartmouth, Massachusetts.....		175,000.00
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>481,626.86</u>	1,236,856.09
Total, June 30, 1951 (Schedule A).....		<u>\$28,577,539.08</u>

¹Not including properties devoted to Institute use included in Real Estate in General Investments, page 243.²Additional Construction Cost provided for by Investment Funds (see Investments, page 243).

EDUCATIONAL PLANT

307

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; Use of Facili- ties, \$50,335.70.....	85,588.02	\$1,496,525.69

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*	
Campbell Soup Co. for Biology and Food Technology Labs.....	816,558.62	
T. C. and P. S. duPont, Charles Hayden, Arthur Winslow for Mining Engineering Building.....	225,000.00	
Maria A. Evans Fund.....	100,000.00	
C. A. Stone and E. S. Webster.....	187,500.00	
Sale of Land and Building in Boston (1938)	972,283.33	
Pratt Fund, for School of Naval Architecture	675,150.00	
Guggenheim Fund, for Aeronautical Labora- tory.....	230,000.00	
Appropriations for Aeronautical Laboratory—		
From Funds: Perkins, \$12,508.02; Hayden, \$42,700.76; Frisbie, \$7,614.98.....	62,823.76	
Alfred P. Sloan Foundation:		
For School of Industrial Management..	2,504,317.85	
For Metals Processing Laboratory.....	582,830.50	
For Sloan Automotive Laboratory.....	367,533.01	
Appropriation for Automotive Laboratory—		
From Current Income and Wind Tunnel Account.....	160,000.00	
Edmund D. Barbour Fund for:		
Nuclear Laboratory.....	32,341.27	
Magnetic Laboratory.....	40,772.73	
Power Plant.....	90,006.59	

* Includes Mr. Eastman's original gift of \$3,500,000 together with appropriations from the \$2,500,000 Building Fund which he established.

SCHEDULE A-20 — (Continued)

For Educational Buildings (Continued)		
Miscellaneous Contributions and Appropriations from Funds for: Magnetic Lab., \$5,500; Nuclear Research Lab., \$2,500; Cyclotron, \$20,247.92; Hyams Radiation Lab., \$39,551.36; and Solar Energy Lab., \$10,500; Anonymous, \$1,000, Bldg. 6; Industrial Fund for Bldg. 32, \$27,753.67; Hydrodynamics Lab., \$600,037.19; Gas Turbine Lab., \$530,699.10; Bldg. 24, \$318,049.27; Metals Processing Lab., \$20,602.82; Twelve M.E.V. Bldg., \$121,432.10	\$1,697,873.43	
Subscriptions to Wright Brothers Memorial Wind Tunnel	95,795.00*	
Wind Tunnel Fund	41,146.75	
Appropriation for Wind Tunnel — Current Income	9,000.00	
Miscellaneous Appropriations from Current Income for: Compression Lab., \$31,000; Tractor Garage, \$6,400; Gas Turbine Lab., \$15,193.35; Bldg. 18, \$44,158.93; Twelve M.E.V. Bldg., \$156,823.48	<u>253,575.76</u>	\$14,953,261.48
For Charles Hayden Memorial Library:		
Charles Hayden Foundation Fund	\$2,505,771.75	
Alumni Fund	250,000.00	
Boston Stein Club	20,054.12	
Development Fund	1,027,661.40	
New Library Fund	1,185.50	
Use of Facilities	<u>75,769.09</u>	3,880,441.86
For Educational Equipment:		
Emma Rogers Fund	\$528,077.06	
F. W. Emery Fund	126,423.80	
C. L. W. French Fund	100,843.34	
Equipment moved from Boston (1916) Est. Alumni Fund	500,000.00	
	82,119.38	
Appropriations from Funds — Drew, \$305,171.52; Peabody, \$52,238.89; duPont, \$12,500; Tuttle, \$50,000; Thayer, \$25,000; Dorr, \$49,573.47	494,483.88	
Appropriations from Current Income	193,576.34	
Miscellaneous Contributions	<u>14,429.80</u>	2,039,953.60
For Dormitories:		
Maria A. Evans Fund	\$261,192.55	
T. C. duPont	100,000.00	
Alumni Dormitory Fund	566,945.66	
Alumni Fund 1947 — Baker House	500,000.00	
Edmund D. Barbour Fund	258,599.40	
Erastus C. Gaffield Fund	120,000.00	
Appropriations from Funds — Robb, \$28,750; Thorndike, \$15,000; Hodges, \$57,316.26; Wood, \$28,750; Miscellaneous Funds, \$28,500	158,316.26	
Appropriated, Current Income	<u>22,369.92</u>	1,987,423.79
*Otherwise paid for from Eastman Building Fund		

EDUCATIONAL PLANT

309

SCHEDULE A-20 — (Continued)

For Summer Camp:		
Edward Cunningham Fund	\$15,000.00	
Charles W. Eaton Fund	15,501.45	
Appropriations from Current Income	<u>90,056.55</u>	\$120,558.00
For Infirmary, Recreational and Athletic Buildings:		
Julius Rosenwald and family — Homberg Infirmary	\$110,225.00	
Appropriations from Funds — Homberg Infirmary —		
Chase, \$4,090.09; A.H. Munsell, \$7,908.28; M. A. Munsell, \$1,105.32; Industrial, \$41,137.61; A. F. Estabrook, \$10,000; I.F. Estabrook, \$2,157.51; Perkins, \$764.66	67,163.47	
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 Alumni Fund, for Swimming Pool	55,000.00	
Stephen Bartlett Fund, for Swimming Pool	228,479.15	
Class of 1923, Sun Garden	117,071.64	
Alumni Fund, for Briggs Field House and Track	10,000.00	
Edmund D. Barbour Fund, Sailing Pavilion	156,169.13	
Anonymous for Boat House	13,363.89	
Misc. funds for Rockwell Cage	30,000.00	
Misc. funds for Rockwell Cage	216,902.14	
Appropriations from Current Income for:		
Boat House	6,500.00	
Sailing Pavilion	15,485.20	
Squash Courts	29,042.54	
Rifle Range	<u>1,500.00</u>	
		1,750,197.46
Miscellaneous:		
From Sale of Land and Buildings in Boston 1916	\$656,919.45	
Mrs. Wilks, Round Hill	175,000.00	
Other Contributions, Appropriations, etc.	<u>1,517,257.75</u>	2,349,177.20
<i>Total June 30, 1951 (Schedule A)</i>		<u><u>\$28,577,539.08</u></u>

SCHEDULE B-1
STUDENTS' FEES

TUITION		
Students' payments	\$2,519,707.00	
Veterans administration	656,555.58	
Other government contracts	191,417.00	
Scholarship awards	418,438.05	
Student loan awards	121,171.90	
	\$3,907,289.53	
Locker, examination and other fees		7,002.18
<i>Total (Schedule B)</i>		\$3,914,291.71

SCHEDULE B-2

ALLOCATION OF INVESTMENT INCOME AND GIFTS
AND OTHER RECEIPTS FOR CURRENT EXPENSE

<i>Department</i>	<i>Gifts and Other Receipts</i>	<i>Investment Income</i>	<i>Total</i>
Aero Engineering	\$ 102,602.84	.....	\$ 102,602.84
Architecture	1,803.19	\$ 2,067.68	3,870.87
Biology	138,007.54	.....	138,007.54
Building Engineering and Construction	26,158.35	.....	26,158.35
Business Engineering and Administration	88,349.34	13,520.46	101,869.80
Chemical Engineering	141,889.26	72,620.00	214,509.26
Chemical Engineering Practice School	47,538.99	.....	47,538.99
Chemistry	261,277.71	52,840.00	314,117.71
Civil Engineering	7,552.63	9,200.00	16,752.63
Economics	21,025.53	.....	21,025.53
Industrial Relations	30,777.36	.....	30,777.36
Electrical Engineering	213,867.58	948.00	214,815.58
English and History	7,392.61	450.00	7,842.61
Food Technology	97,788.66	5,000.00	102,788.66
Geology	37,494.01	2,742.59	40,236.60
Mathematics	6,523.97	3,000.00	9,523.97
Mechanical Engineering	122,661.56	80.00	122,741.56
Metallurgy	207,141.20	.....	207,141.20
Meteorology	25,062.88	.....	25,062.88
Modern Languages	15,068.96	.....	15,068.96
Naval Architecture	1,808.45	15,828.00	17,636.45
Physics	97,087.40	12,040.00	109,127.40
Acoustics Laboratory	12,986.33	.....	12,986.33
Bemis Research . . . . .	.....	14,696.99	14,696.99
Nuclear Science and Engineering	6,500.00	.....	6,500.00
Solar Energy Research	26,287.12	1,000.00	27,287.12
Spectroscopy Laboratory	22,571.31	.....	22,571.31
Unallocated to Departments	64,048.00	5,036.00	69,084.00
Staff Scholarships . . . . .	.....	17,000.00	17,000.00
<i>Sub-Totals</i>	<u>\$1,831,272.78</u>	<u>\$ 228,069.72</u>	<u>\$2,059,342.50</u>
Library and Museums	\$14,549.24	\$4,805.48	\$19,354.72
Medical	1,328.34	3,400.00	4,728.34
General Expense	190,534.81	27,306.76	217,841.57
Plant	68,615.94	.....	68,615.94
Undergraduate Budget Board	300.00	.....	300.00
General Purposes	76,270.10	1,162,852.85	1,239,122.95
<i>Total</i>	<u>\$2,182,871.21</u>	<u>\$1,426,434.81</u>	<u>\$3,609,306.02</u>
	(Schedule B)	(Schedule B)	

SCHEDULE B-3

RESEARCH CONTRACTS

DIVISION OF INDUSTRIAL COOPERATION

Revenues from research contracts.....		\$15,020,443.68
Less appropriations therefrom:		
Reserve for use of facilities.....	\$ 454,370.00	
Industrial fund.....	62,685.00	
Investment income for use of funds and amortization of facilities.....	84,431.00	601,486.00
Net revenues (Schedule B).....		<u>\$14,418,957.68</u>
Direct expenses on research contracts:		
Salaries and wages.....	\$7,471,908.77	
Materials and services.....	3,344,146.33	
Subcontracts.....	587,248.71	
Construction of major facilities.....	54,068.97	
Travel.....	392,972.08	
Other.....	124,781.15	11,975,126.01
Direct expenses of Division of Industrial Cooperation:		
Salaries and wages.....	\$ 176,390.76	
Materials and services.....	32,737.86	
Travel.....	7,737.65	
Vacation accrual — hourly employees... .	90,000.00	
Depreciation on equipment.....	33,621.82	
Insurance.....	19,909.22	
Auditing and professional services.....	8,339.78	
Outside rentals.....	9,055.17	
Instrumentation laboratory — indirect expenses.....	18,203.74	
Servomechanisms laboratory — indirect expenses.....	17,250.57	
Health physics program.....	39,402.49	
Unallowable contract expense.....	7,406.51	
Other.....	5,288.00	465,343.57
Total Direct Expenses (Schedule B).....		\$12,440,469.58
Allowance for Institute's expenses of administration and plant operation.....		1,978,488.10
Total.....		<u>\$14,418,957.68</u>

SCHEDULE B-4
OTHER INCOME

Land rentals	\$ 5,887.30
Recoveries and miscellaneous	6,620.04
Sponsored courses:	
American Gas & Electric Co.	\$2,500
Boston Edison Company	1,200
General Electric Company	7,000
General Radio Company	1,200
Philco Corporation	7,000
	<u>18,900.00</u>
U. S. Land Grant Aid	21,780.03
Veterans book income	2,482.71
<i>Total</i> (Schedule B)	<u><u>\$55,670.08</u></u>

SCHEDULE B-5
SALARIES AND WAGES

	STAFF SALARIES			
	<i>Academic</i>	<i>Department Research</i>	<i>Transferred to D.I.C.</i>	<i>Net Salaries</i>
Aeronautical Engineering	\$ 209,810.40	\$ 21,554.92	\$ 79,769.01	\$ 151,596.31
Architecture	67,569.30	157.12	. . . . .	67,726.42
Biology	106,243.53	38,657.11	16,431.51	128,469.13
Building Eng. and Construction .	47,468.79	14,185.37	5,879.06	55,775.10
Business and Eng. Administration	112,262.48	24,450.02	1,737.50	134,975.00
Chemical Engineering	176,800.53	8,445.79	52,663.29	132,583.03
Chemical Eng. Practice School . .	33,612.48	. . . . .	. . . . .	33,612.48
Chemistry	332,968.36	57,768.83	105,042.93	285,694.26
City Planning	31,607.16	. . . . .	1,178.60	30,428.56
Civil Engineering	220,447.96	1,800.00	85,138.49	137,109.47
Economics	159,200.73	5,180.00	15,707.89	148,672.84
Industrial Relations	3,200.00	5,916.70	. . . . .	9,116.70
Electrical Engineering	745,490.05	8,562.76	426,738.43	327,314.38
English and History	181,657.92	. . . . .	1,243.12	180,414.80
Food Technology	26,179.53	53,898.06	1,805.64	78,271.95
General Science	5,000.00	. . . . .	. . . . .	5,000.00
Geology	84,339.98	11,537.54	11,838.72	84,038.80
Graphics	48,441.69	. . . . .	(570.00)	49,011.69
Mathematics	226,340.47	492.00	21,906.27	204,926.20
Mechanical Engineering	437,324.04	30,634.98	74,712.99	393,246.03
Metallurgy	327,621.51	24,600.60	200,939.53	151,282.58
Meteorology	76,322.37	12,828.86	34,419.69	54,731.54
Military Science	18,153.75	. . . . .	. . . . .	18,153.75
Modern Languages	36,615.02	10,927.66	. . . . .	47,542.68
Naval Architecture	74,571.26	. . . . .	. . . . .	74,571.26
Physics	448,301.26	525.00	239,295.18	209,531.08
Acoustics Laboratory . . . . .	. . . . .	10,695.81	3,084.38	7,611.43
Bemis Research	5,669.30	. . . . .	. . . . .	5,669.30
Nuclear Science	10,500.00	. . . . .	8,750.01	1,749.99
Oak Ridge Practice School	10,129.14	. . . . .	. . . . .	10,129.14
Solar Energy . . . . .	. . . . .	14,278.59	. . . . .	14,278.59
Spectro Labs . . . . .	. . . . .	11,151.89	. . . . .	11,151.89
<i>Total Staff Salaries</i>	<u>\$4,263,849.01</u>	<u>\$368,249.61</u>	<u>\$1,387,712.24</u>	<u>\$3,244,386.38</u>

(Continued)

SCHEDULE B-5 — (Continued)

SALARIES AND WAGES

WAGES LABORATORY SERVICE

	<i>Academic</i>	<i>Department Research</i>	<i>Transferred to D.I.C.</i>	<i>Net Salaries</i>
Aeronautical Engineering	\$ 14,332.76	\$14,336.66	\$(1,497.92)	\$ 30,167.34
Architecture	3,753.86	.....	.....	3,753.86
Biology	12,261.82	16,238.39	2,047.18	26,453.03
Building Engr. and Construction	2,469.02	6,544.45	1,354.44	7,659.03
Business and Engr. Admin. . . . .	.....	.....	.....	.....
Chemical Engineering	21,353.72	153.00	.....	21,506.72
Chem. Engr. Prac. School . . . . .	.....	.....	.....	.....
Chemistry	34,863.15	5,843.39	1,013.19	39,693.35
City Planning . . . . .	.....	.....	.....	.....
Civil Engineering	12,759.55	268.15	2,962.62	10,065.08
Economics . . . . .	.....	.....	.....	.....
Industrial Relations . . . . .	.....	.....	.....	.....
Electrical Engineering	53,739.74	4,908.16	5,619.56	53,028.34
English and History . . . . .	.....	.....	.....	.....
Food Technology	2,023.93	3,863.18	649.91	5,237.20
General Science . . . . .	.....	.....	.....	.....
Geology	4,085.95	2,130.92	.....	6,216.87
Graphics . . . . .	.....	.....	.....	.....
Mathematics . . . . .	.....	.....	.....	.....
Mechanical Engineering	60,422.53	7,981.08	8,772.57	59,631.04
Metallurgy	28,558.55	8,411.38	4,864.17	32,105.76
Meteorology . . . . .	.....	968.18	.....	968.18
Military Science . . . . .	.....	.....	.....	.....
Modern Languages . . . . .	.....	.....	.....	.....
Naval Architecture	7,919.26	121.00	53.71	7,986.55
Physics	59,776.37	4,392.56	1,857.23	62,311.70
Acoustics Laboratory . . . . .	.....	2,571.10	.....	2,571.10
Bemis Foundation . . . . .	.....	.....	.....	.....
Nuclear Science . . . . .	.....	.....	.....	.....
Oak Ridge Prac. School . . . . .	.....	.....	.....	.....
Solar Energy . . . . .	.....	5,051.56	.....	5,051.56
Spectroscopy Laboratory . . . . .	.....	7,044.79	2,405.49	4,639.30
<i>Total wages laboratory service</i>	<u>\$318,320.21</u>	<u>\$90,827.95</u>	<u>\$30,102.15</u>	<u>\$379,046.01</u>

(Continued)

REPORT OF THE TREASURER

SCHEDULE B-5 — (Continued)

SALARIES AND WAGES

WAGES ACCESSORY TO TEACHING

	<i>Academic</i>	<i>Department Research</i>	<i>Transferred to D.I.C.</i>	<i>Net Salaries</i>
Aeronautical Engineering	\$ 7,134.17	\$ 6,899.50	\$ (40.00)	\$ 14,073.67
Architecture	5,440.40	47.25	.....	5,487.65
Biology	4,290.00	10,196.24	.....	14,486.24
Building Engr. and Constr.	2,190.00	2,466.43	.....	4,656.43
Business and Eng. Admin.	18,590.83	4,205.45	.....	22,796.28
Chemical Engineering	16,586.44	.....	4,003.15	12,583.29
Chem. Engr. Prac. School . . . . .	.....	.....	.....	.....
Chemistry	19,086.33	3,190.90	2,251.02	20,026.21
City Planning	2,208.00	.....	.....	2,208.00
Civil Engineering	9,007.86	.....	.....	9,007.86
Economics	11,255.39	678.59	.....	11,933.98
Industrial Relations	4,187.78	652.00	.....	4,839.78
Electrical Engineering	39,559.56	3,875.83	(129.14)	43,564.53
English and History	9,510.48	1,801.28	.....	11,311.76
Food Technology . . . . .	.....	9,911.79	.....	9,911.79
General Science	2,190.05	.....	.....	2,190.05
Geology	4,680.00	257.00	.....	4,937.00
Graphics	1,944.90	.....	.....	1,944.90
Mathematics	8,729.87	.....	151.84	8,578.03
Mechanical Engineering	26,288.02	3,641.08	2,133.32	27,795.78
Metallurgy	18,878.91	2,437.85	8,746.73	12,570.03
Meteorology	8,349.21	9,921.68	25.50	18,245.39
Military Science	4,356.00	.....	.....	4,356.00
Modern Languages	3,383.28	4,184.95	3,654.74	3,913.49
Naval Architecture	6,420.30	5.00	.....	6,425.30
Physics	19,553.31	79.30	2,007.80	17,624.81
Acoustics Laboratory . . . . .	.....	1,222.58	.....	1,222.58
Bemis Foundation	2,213.67	.....	.....	2,213.67
Nuclear Science . . . . .	.....	.....	.....	.....
Oak Ridge Practice School . . . . .	.....	.....	.....	.....
Solar Energy . . . . .	.....	1,030.00	.....	1,030.00
Spectroscopy Laboratories . . . . .	.....	1,685.40	(317.50)	2,002.90
Total wages accessory to teaching	\$ 256,034.76	\$ 68,390.10	\$ 22,487.46	\$ 301,937.40
Wages laboratory service	318,320.21	90,827.95	30,102.15	379,046.01
Staff salaries	4,263,849.01	368,249.61	1,387,712.24	3,244,386.38
Total Salaries and Wages	\$4,838,203.98	\$527,467.66	\$1,440,301.85	\$3,925,369.79

(Schedule B)

EXPENSES

317

SCHEDULE B-6

DEPARTMENTAL EXPENSES

	<i>General</i>	<i>Staff Scholarships</i>	<i>Departmental Research</i>	<i>Total</i>
Aeronautical Engineering.	\$ 2,492.08	\$ 1,410.00	\$ 30,883.61	\$ 34,785.69
Architecture	5,086.10	.....	2,516.50	7,602.60
Biology	7,344.13	3,120.00	57,747.72	68,211.85
Building Eng. and Constr..	6,270.32	725.00	3,816.54	10,811.86
Business and Eng. Admin..	10,118.21	.....	53,214.33	63,332.54
Chemical Engineering	15,536.70	11,205.02	21,277.64	48,019.36
Chemical Eng. Practice . . .	13,926.51	.....	.....	13,926.51
Chemistry	35,614.38	20,790.00	48,199.81	104,604.19
City Planning	300.00	.....	.....	300.00
Civil Engineering	4,909.12	2,100.00	10,537.31	17,546.43
Civil Engineering Camp . . .	15,179.23	.....	.....	15,179.23
Economics	8,644.60	5,075.00	5,166.94	18,886.54
Industrial Relations	10,654.61	.....	4,833.72	15,488.33
Electrical Engineering	28,760.95	9,714.89	115,462.74	153,938.58
English and History	7,121.16	.....	5,621.27	12,742.43
Food Technology	2,000.00	.....	29,765.54	31,765.54
General Science	294.16	.....	.....	294.16
Geology	9,689.27	3,120.00	6,253.14	19,062.41
Geology Camp	3,496.80	.....	.....	3,496.80
Graphics	1,259.57	.....	.....	1,259.57
Mathematics	4,889.76	9,431.67	7,600.96	21,922.39
Mechanical Engineering . . .	36,388.80	7,529.10	15,556.45	59,474.35
Mechanical Metallurgy	3,141.43	.....	.....	3,141.43
Metallurgy	16,748.58	6,597.50	57,581.28	80,927.36
Meteorology	3,515.49	780.00	1,344.16	5,639.65
Military Science	2,219.06	.....	.....	2,219.06
Modern Languages	1,594.56	.....	3,611.09	5,205.65
Naval Architecture	4,390.61	960.00	1,682.45	7,033.06
Physics	16,418.55	12,128.69	16,484.66	45,031.90
Acoustics Laboratory . . . . .	.....	.....	1,581.22	1,581.22
Bemis Research	4,814.02	.....	.....	4,814.02
Nuclear Science	5,742.63	.....	.....	5,742.63
Oak Ridge	1,357.55	.....	.....	1,357.55
Solar Energy . . . . .	.....	.....	5,926.97	5,926.97
Spectroscopy Laboratory . . .	.....	.....	4,777.22	4,777.22
Summer Session	14,425.62	.....	.....	14,425.62
<i>Totals</i>	<u>\$304,344.56</u>	<u>\$94,686.87</u>	<u>\$511,443.27</u>	<u>\$910,474.70</u>

(Schedule B)

SCHEDULE B-7
LIBRARY AND MUSEUM EXPENSES

Library:		
Salaries — staff	\$60,690.83	
Salaries — other	91,051.09	
Expenses:		
Books, periodicals and binding	37,457.07	
Other	25,769.21	\$214,968.20
Museums:		
Salaries	\$10,819.55	
Expenses	5,798.36	16,617.91
<i>Total</i> (Schedule B)		<u>\$231,586.11</u>

SCHEDULE B-8
CLERICAL SALARIES AND ADMINISTRATIVE
OFFICE EXPENSE

	<i>Salaries</i>	<i>Expense</i>	<i>Total</i>
President	\$ 15,930.33	\$ 15,459.93	\$ 31,390.26
Dean of Architecture	464.40	112.92	577.32
Dean of Engineering	3,090.00	1,148.64	4,238.64
Dean of Science	2,088.66	473.29	2,561.95
Dean of Humanities .....	.....	543.07	543.07
Dean of Students	9,040.10	2,096.74	11,136.84
Dean of Graduate School	3,006.29	711.27	3,717.56
Dean of School of Industrial Management .....	.....	730.80	730.80
Registrar	62,281.41	30,610.93	92,892.34
Director of Admissions	34,315.81	15,513.36	49,829.17
Treasurer and Bursar	92,831.78	34,090.08	126,921.86
Superintendent	28,554.03	2,640.55	31,194.58
Director of Business Administration	987.10	886.74	1,873.84
News service	4,047.90	5,049.15	9,097.05
Undergraduate scholarship and loan fund board	8,315.32	3,921.84	12,237.16
Military Service Information ..	.....	6,721.91	6,721.91
Placement Bureau	15,744.94	3,923.45	19,668.39
Register of former students ..	.....	10,054.14	10,054.14
Personnel Office	17,586.67	5,191.02	22,777.69
Publications Office .....	.....	3.38	3.38
Industrial Liaison Office	7,740.55	18,366.67	26,107.22
Provost	2,790.00	293.17	3,083.17
Summer Sessions Office	3,631.68	6,781.92	10,413.60
Statistical Service machine expense .....	.....	16,517.24	16,517.24
Student Aid and Personnel	630.00	59.26	689.26
Secretary .....	.....	17.99	17.99
Office of Laboratory Supplies ..	40,522.64	.....	40,522.64
<i>Totals</i>	<u>\$353,599.61</u>	<u>\$181,919.46</u>	<u>\$535,519.07</u>
	(Schedule B-9)	(Schedule B-9)	

SCHEDULE B-9

GENERAL AND ADMINISTRATIVE EXPENSES

Salaries of officers of administration	\$	396,699.58	
Clerical salaries (schedule B-8)		353,599.61	
Administrative office expenses (schedule B-8)		181,919.46	
Staff and employee benefits and allowances		612,896.71	
Development program expense		339,910.51	
Other administrative expenses:			
Telephone (net)	\$	120,640.70	
Bulletins and publicity		47,100.65	
New student publicity		42,016.78	
Travel		26,802.24	
Commencement		22,325.38	
Professional services		21,833.26	
Deans' Funds		7,882.24	
Taxes (net)		6,545.48	
President's and Chairman's funds		4,994.33	
Services (net)		1,298.24	
Miscellaneous		11,920.86	313,360.16
<hr/>			
General Expenses:			
Fellowships, prizes and awards	\$	53,936.47	
Foreign student summer project		40,935.09	
Riverside Apartments operating expense		23,767.33	
Photographic and dining equipment		16,891.40	
Vocational guidance		6,633.90	
Hobby shop		6,286.65	
Lowell Institute cooperative broadcasting		6,250.00	
Lectures		4,673.03	
Staff subscriptions to <i>The Tech</i>		3,733.95	
Alumni conferences		3,364.51	
Society of Arts		1,958.96	
Miscellaneous		30,378.91	198,810.20
<hr/>			
<i>Total</i> (Schedule B)	\$	2,397,196.23	
<hr/>			

SCHEDULE B-10

PLANT OPERATION

Building Services:

Janitors.....	\$157,116.44	
Night Cleaners.....	132,002.53	
Watchmen.....	38,440.50	
Window Cleaning.....	20,919.45	
Heating and Ventilating.....	44,968.41	
Mail Clerks and Elevator Operators.....	18,241.60	
Shipping, Stock Room, Matron and Messenger Supplies.....	34,084.24	
Police protection.....	32,341.26	
Industrial Management School.....	18,453.17	
Shop Foreman (Net).....	13,000.84	
	6,115.65	\$ 515,684.09

Repairs, Alterations and Maintenance:

Buildings.....	\$189,899.55	
Grounds, Roads, etc.....	72,192.44	
Mains and Conduits.....	28,273.29	
Water and Gas.....	29,541.64	
Misc. (Net).....	33,553.25	353,460.17

Fire Insurance..... 18,043.61

Safety Engineer Expense..... 2,168.14

Power Rate Investigation..... 199.00

Power Plant and Electric Power:

Fuel Oil.....	\$163,081.74	
Power (Cambridge Electric Light Co.).....	159,091.02	
Salaries.....	58,073.42	
Repairs.....	20,029.38	
Amortization of replacement.....	33,600.00	
Water, Supplies, etc.....	7,624.70	

Total Operating Cost..... \$441,500.26

Less Credits for Power Sold:¹

Electric Power.....	\$30,797.00	
Steam.....	73,040.89	103,837.89
		337,662.37
		\$1,227,217.38

Special Alterations, Maintenance and Construction:

Buildings.....	\$129,227.57	
Grounds.....	37,107.88	
Space Changes.....	42,767.84	
Off Campus Buildings — Maintenance:		
Round Hill — Dartmouth.....	\$30,634.01	
Watertown Arsenal.....	11,788.01	
Servomechanisms.....	11,146.59	
Hood & Whittemore.....	74,209.76	
Barta Building.....	31,947.39	
Supersonic Wind Tunnel.....	37,779.29	
Lexington Station.....	10,308.35	207,813.40
		416,916.69

Total (Schedule B)..... \$1,644,134.07

¹ Including Dormitories, Walker Memorial and Bexley Hall.

EXPENSES

321

SCHEDULE B-11

MEDICAL DEPARTMENT

Salaries, staff.....		\$ 72,496.71
Expense of clinic:		
Salaries.....	\$25,552.27	
Supplies, etc.....	11,465.47	
X-Ray Operation.....	6,006.92	
Physical Examinations.....	5,358.32	48,382.98
Expense of infirmary:		
Salaries.....	\$36,971.13	
Supplies, etc.....	7,981.55	
Food.....	12,481.90	
Laundry.....	4,059.03	61,493.61
Expense of dental, eye, nose and throat clinics.....		9,250.12
Maintenance and repairs.....		1,836.23
		<u>\$193,459.65</u>
Less — Services billed.....	\$40,072.32	
Student Health Insurance.....	10,000.00	50,072.32
<i>Total</i> (Schedule B).....		<u><u>\$143,387.33</u></u>

SCHEDULE B-12

UNDERGRADUATE BUDGET BOARD

Athletic coaches' salaries.....	\$53,844.21	
Director's office expense.....	1,056.59	
Non-staff salaries.....	5,700.36	
Student activities appropriation.....	49,600.00	
Cambridge armory, rental of.....	1,950.00	
Walker Memorial (excluding Dining Service) (Net)	37,106.23	
Walker-Memorial games (Loss).....	2,839.52	
Athletic fields, maintenance.....	25,640.61	
Sailing pavilion and activities (Net).....	12,939.39	
Rockwell Cage, maintenance.....	3,220.57	
Boat house and launches, maintenance.....	16,011.78	
Musical clubs, equipment and supplies.....	1,554.34	
Swimming pool (including wages).....	37,962.63	
Equipment for freshman athletics.....	1,000.84	
Publications advertising.....	423.88	
<i>Total</i> (Schedule B).....		<u><u>\$250,850.95</u></u>

SCHEDULE B-13
AUXILIARY ACTIVITIES

Revenues:	<i>Dining Services</i>	<i>Dormitories*</i>	<i>Housing Projects</i>	<i>Total</i>
Rentals or receipts	\$678,745.74	\$637,397.94	\$143,910.33	\$1,460,054.01
Miscellaneous . . . . .	. . . . .	10,303.39	210.10	10,513.49
<i>Total</i>	<u>\$678,745.74</u>	<u>\$647,701.33</u>	<u>\$144,120.43</u>	<u>\$1,470,567.50</u>

(Schedule B)

Expenses:	<i>Dining Services</i>	<i>Dormitories*</i>	<i>Housing Projects</i>	<i>Total</i>
Food	\$359,012.89	. . . . .	. . . . .	\$ 359,012.89
Salaries	244,802.88	\$314,675.19	. . . . .	559,478.07
Supplies	12,889.26	30,943.37	\$ 336.92	44,169.55
Utilities	18,521.65	90,249.00	9,753.06	118,523.71
Laundry	9,538.62	14,108.26	. . . . .	23,646.88
Repairs and maintenance . .	12,239.98	70,193.94	37,407.01	119,840.93
Equipment	9,071.73	6,118.41	. . . . .	15,190.14
Misc. Operating Expense . .	. . . . .	5,585.42	870.45	6,455.87
Administration	16,435.01	23,696.91	12,150.22	52,282.14
Insurance	4,338.70	8,483.14	2,696.00	15,517.84
House Tax Allowance . . . . .	. . . . .	8,540.00	. . . . .	8,540.00
Real Estate taxes . . . . .	. . . . .	13,592.07	27,512.10	41,104.17
Occupancy	4,000.00	. . . . .	. . . . .	4,000.00
Amortization . . . . .	. . . . .	118,181.64	42,962.18	161,143.82
Investment income . . . . .	. . . . .	451.12	10,432.49	10,883.61
<i>Total</i>	<u>\$690,850.72</u>	<u>\$704,818.47</u>	<u>\$144,120.43</u>	<u>\$1,539,789.62</u>

(Schedule B)

* *Note:* The amortization provided during the year from operations of dormitories was equivalent to 2.60% of the investment of the funds of the Institute in these buildings on June 30, 1951. The income on the average book value of General Investments for 1950-51 was 5.02%. Applied to the investments in dormitories this rate of return would be \$220,000.00 on the investment in dormitories on June 30, 1951 as compared with the actual allocation from dormitory operation to investment income of \$451. Certain administrative costs included in the Statement of Income and Expenses on page 234 are not in the above Revenue and Expense statement on dormitories and no provision has been made in the expenses of the year for future operating losses or the replacement of buildings and equipment.

GIFTS, GRANTS AND BEQUESTS RECEIVED
DURING THE YEAR ENDED JUNE 30, 1951

GIFTS FOR ENDOWMENT

The income of the following gifts and bequests is for General Purposes:

HAL L. BEMIS	
To create the Henry Ellsworth Bemis Memorial Fund in memory of his father	\$ 1,825.00
EDWARD E. BROWN	
For General Endowment	2,550.00
ESTATE OF CAROLINE L. W. FRENCH	
Additional distribution for Jonathan French Fund	12.72
CHARLES C. LADD FUND	
Gift of Charles C. Ladd, Jr., Richard Swan Ladd, and Elizabeth S. Ladd	100.00
MR. AND MRS. THEODORE MAIN	
Additional for the Charles T. Main Fund	250.00
ESTATE OF HARRIETTE A. NEVINS	
Additional for George Blackburn Memorial Fund	62,860.55
PARAGON GEAR WORKS, INC.	
For Richard Westcoat Memorial Fund	2,500.00
BENJAMIN W. PEPPER	
Class of 1909 Fund	1,075.95
HOMER E. SARGENT	
Additional for the Homer E. Sargent Fund	2,575.00
GEORGE E. WALLIS	
Class of 1909 Fund	500.00
ESTATE OF ETHEL M. WATT	
In full payment of residuary bequest in memory of her husband, Arthur P. Watt, Class of 1906	5,212.28
ESTATE OF EVERETT WESTCOTT	
Additional distribution of residuary bequest	3,800.00
ESTATE OF MARION WESTCOTT	
Additional distribution of residuary bequest	1,324.25
MRS. RICHALIE WASTCOAT WYATT	
For Richard Westcoat Memorial Fund	2,000.00
	<hr/>
	\$86,585.75

The income of the following gifts and bequests is for Designated Purposes:

PHILIP L. ALGER	
For Dugald Caleb Jackson Professorship Fund	\$ 1,000.00
ANONYMOUS	
For Anonymous Y Fund	5,743.39
JULIAN M. AVERY	
Assignment of royalties to be accumulated to \$25,000, present balance \$19,134. Income for research	6,184.20
DEAN EVERETT M. BAKER FUND	
Contributions in memory of Dean Baker to endow the Baker Foundation	11,454.28

GORDON Y. BILLARD	
To be accumulated until donor designates purpose	\$ 978.99
ESTATE OF WILLIAM FELTON BROWN	
Bequest for the Department of Architecture	20,000.00
VANNEVAR BUSH TRUST	
Income for use of Senior Class President	10,000.00
GODFREY L. CABOT CHARITABLE TRUST	
For Godfrey L. Cabot Scholarships	5,000.00
GODFREY L. CABOT, Inc.	
For Godfrey L. Cabot Scholarships	25,000.00
CLASS OF 1922	
Additional contribution of Class member	5.00
KARL T. COMPTON PRIZE FUND	
Contributions of members of the Boston Stein Club	11,025.66
JOHN G. CRANE	
To provide undergraduate scholarship aid	13,100.00
ESTATE OF EUNICE McLELLAN CRUFT	
Additional distribution on legacy for scholarships	3,279.90
BRADLEY DEWEY	
For Davis R. Dewey Library	2,275.00
FABRIC RESEARCH LABORATORIES, Inc.	
For Dorothy B. Schwarz Memorial Fund, income only to be used, preferably for Textile Technology	1,000.00
BARNETT D. GORDON	
Additional gift for scholarships	4,000.00
DUGALD C. JACKSON, JR.	
For the Dugald Caleb Jackson Professorship	30.00
FAMILY OF ELLEN A. KING	
To establish Ellen A. King Prize Fund (see <i>infra</i> , Other Gifts)	1,200.00
THE KRESGE FOUNDATION	
For Auditorium-Chapel (see <i>infra</i> , Gift for buildings) . .	250,000.00
S. C. LYONS	
For Kurrelmeyer Fund	100.00
ALICE MACLAURIN SCHOLARSHIP FUND	
Contributions to establish the fund	498.00
ESTATE OF GEORGE J. MEAD	
Distribution of a residuary bequest for a prize fund (see <i>infra</i> , Loan Funds)	56,314.02
ESTATE OF ALEXANDER G. MERCER	
Additional distribution for Hall-Mercer Scholarship Fund	109.15
GILBERT MONET	
For the Kurrelmeyer Fund	120.00
HERBERT D. NEWELL	
Gift for endowment, credited to the Charles E. Locke Memorial Scholarship Fund, formerly the Class of 1896 Fund	200.00
HAROLD S. OSBORNE	
For the Dugald Caleb Jackson Professorship	1,600.00
ESTATE OF CHARLES H. PRAY	
Residuary bequest for aid to needy students	26,498.03
ESTATE OF HELEN BARTLETT PRAY	
Residuary bequest for aid to needy students	21,148.26

GIFTS AND BEQUESTS

325

ROBBINS FOUNDATION

To create the Karl Robbins Scholarship Fund for aid to undergraduate or graduate students in field of textile technology. \$25,000.00

ESTATE OF MARY O. RUSSELL
For the Henry Darwin Rogers Fund 2,723.00

ESTATE OF GRACE J. F. SMITH
Legacy in memory of her husband, H. Hilliard Smith, '96, for purpose of assisting young men contemplating the profession of Architecture. 5,000.00

ESTATE OF JULIA HOWE STOCKWELL SMITH
Final payment of interest in a deed of trust creating the Elias Howe, Jr. Scholarships 6,600.00

ESTATE OF ELIZABETH R. STEVENS
Additional for the A. G. Boyden Fund. 37.10

ESTATE OF EDITH C. WILDER
For the Stephen H. Wilder Fund. 1,174.53

WILBUR T. WILSON
For Class of 1904 Prize Fund 200.00

WUNSCH FOUNDATION, INC.

To establish the Silent Hoist and Crane Company Materials Handling Award for best papers or theses submitted on subjects in the fields of production, materials handling, or machine design related to materials handling equipment 5,000.00

\$ 523,598.51

GIFTS FOR STUDENT LOANS

HERBERT FRYER

Gift to establish the Ethel I. Fryer Scholarship Loan Fund for students from the states of Washington, Oregon and California. \$ 2,500.00

ESTATE OF GEORGE J. MEAD
Distribution of a residuary bequest for a loan fund (see supra, Gifts for Designated Endowment). 225,256.07

\$ 227,756.07

GIFTS FOR BUILDINGS

BIRMINGHAM ICE & COLD STORAGE Co.
For Low Temperature Refrigeration Laboratory. \$ 100.00

CRANE Co.
For Hydrodynamics Laboratory and Towing Tank. 20,632.42

FACULTY CLUB
Contributions. 280.00

FULTON MARKET COLD STORAGE Co.
For Low Temperature Refrigeration Laboratory. 1,000.00

ELMER C. INGRAHAM
For Electronics Laboratory Building. 100.00

THE KRESGE FOUNDATION
For an Auditorium and Chapel (see supra, Gifts for Designated Endowment). 500,000.00

QUAKER CITY COLD STORAGE Co., INC.		
For Low Temperature Refrigeration Laboratory	\$	100.00
QUINCY MARKET COLD STORAGE & WAREHOUSE Co.		
For Low Temperature Refrigeration Laboratory		10,000.00
ALFRED P. SLOAN FOUNDATION, INC.		
For the School of Industrial Management		2,500,000.00
For the Metals Processing Laboratory		750,000.00
BEAUCHAMP E. SMITH		
For the Hydrodynamics Laboratory and Towing Tank		9,000.00
TERMINAL ICE & COLD STORAGE Co.		
For Low Temperature Refrigeration Laboratory		1,000.00
WHITIN MACHINE WORKS		
For the Metals Processing Laboratory		5,000.00
		<hr/>
		\$3,797,212.42

OTHER GIFTS — PRINCIPAL AVAILABLE

The following gifts are added to The Unexpended Endowment Income for Designated Purposes:

LUIS DE FLOREZ		
For Silent Hoist and Crane Award	\$	25.00
DRAPER CORPORATION		
For Silent Hoist and Crane Award		25.00
CHARLES HAYDEN FOUNDATION		
For current use of Hayden Memorial Scholarships		5,000.00
FAMILY OF ELLEN A. KING		
For Ellen A. King Prize Fund, expendable portion of gift		300.00
M. I. T. CLUB OF CHICAGO		
For current use as scholarships		425.00
		<hr/>
	\$	5,775.00

The following gifts are for General Purposes:

ANONYMOUS		
Additional for Anonymous J Fund	\$	3,200.00
ANONYMOUS		
Additional for Anonymous L E Fund		15,000.00
ANONYMOUS		
Additional for Anonymous M Fund		5,000.00
CLASS OF 1901		
Contributions of class members on the occasion of their 50th Reunion		69,736.55
ESTATE OF ARTHUR J. CONNER		
Residuary interest in income of a trust created by will		8,246.25
DEVELOPMENT FUND		
Contributions for undesignated purposes received during the current year under the Development Program		1,768,823.01
FORD MOTOR Co.		
Payment on subscription for unrestricted use		166,665.00
ESTATE OF GEORGE L. GILMORE		
Legacy "to be known as the 'Class of 1890 Fund'"		25,000.00
ESTATE OF EDWARD C. HALL		
A distribution under a residuary bequest		7,151.69

GIFTS AND BEQUESTS

327

WILLIAM T. HENRY TRUST	
Income of a trust held outside of M. I. T.	\$ 26,430.00
ESTATE OF ALICE G. MARTIN	
Final payment on residuary bequest	3,890.54
M. I. T. LITTLE TRUST	
Rental income on machinery received as beneficiary of the trust	4,941.67
ESTATE OF ALICE METCALF	
Final distribution on residuary bequest in memory of her brother, Leonard Metcalf '92	93,752.93
TRUST INDENTURE UNDER THE WILL OF LEONARD METCALF	
Balance of trust income after payments to life beneficiaries	2,979.17
E. MORTIMER NEWLIN TRUST	
Income of a trust, available for operating expenses	64.49
RICHARD P. PRICE	
For Class of 1925 Fund	500.00
ESTATE OF GRANT WALKER	
Final distribution of a residuary interest in a trust created under will of Grant Walker	4,982.93
	<hr/>
	\$2,206,364.23

The following gifts are for Designated Purposes:

ALUMNI FUND	
Contributions	\$ 87.00
ANONYMOUS	
For establishment of a faculty club	38,950.00
ANONYMOUS	
For support of student house	6,000.00
ANONYMOUS	
For "Tubby" Rogers Fund	25.00
SAMUEL BERKE	
For special programs in the field of Humanities	5,000.00
BOSTON STEIN CLUB	
Contribution of club member for Map Room Fund	300.00
CARNEGIE CORPORATION	
For five-year program in Humanities	150,000.00
CLASS OF 1898	
Contributions of class members	900.00
ESTATE OF ARTHUR DAVIS DEAN	
For Arthur Dean Fund for direct student aid other than tuition	82,104.10
THEODORE M. EDISON	
For research	90,000.00
GOODYEAR TIRE & RUBBER Co.	
For Industrial Economics Graduate Fellowships	2,500.00
HAFFENREFFER FOUNDATION	
For unrestricted use or implementing the Herreshoff Collection	25,000.00
INDUSTRIAL RELATIONS FUND	
Contributions from industrial concerns	14,900.00

REPORT OF THE TREASURER

INTERNATIONAL BUSINESS MACHINES Co.	
For Industrial Economics Fellowship	\$ 1,000.00
ARTHUR D. LITTLE INC.	
For low temperature research	11,600.00
For Lectures	5,000.00
JOHN R. MACOMBER	
Additional for Macomber Fund	3,383.57
C. LILLIAN MOORE TRUST	
Income of trust for the J. A. Grimmons Fund for electrical engineering	3,915.17
ESTATE OF EMMA B. MOORE	
Gift of her home on Memorial Drive for Institute use	75,000.00
RADIO CORPORATION OF AMERICA	
For Industrial Electronics fellowships	10,000.00
SOCONY VACUUM OIL Co.	
For Industrial Electronics fellowships	5,000.00
SWIFT AND COMPANY	
For research in Amino Acids in Chemistry	10,000.00
ESTATE OF CHARLES W. TUCKER	
For books for the Eastman Library	500.00
WESTINGHOUSE EDUCATIONAL FOUNDATION	
For an Industrial Fellowship in Economics	2,500.00
ALBERT H. AND JESSIE D. WIGGIN FOUNDATION	
For an Industrial Fellowship in Economics	1,000.00
WILSON AND COMPANY	
In support of the program of food research	10,000.00
	<hr/>
	\$554,664.84

UNINVESTED FUNDS

GRANTS UNDER THE INDUSTRIAL LIAISON PROGRAM	\$797,500.00
<i>A partial list of companies making payments in 1950-51:</i>	
Aluminum Company of America	
Anaconda Copper Mining Company	
Armco Steel Corporation	
Cities Service Research and Development Company	
Continental Motors Corporation	
Continental Oil Company	
Allen B. Du Mont Laboratories, Incorporated	
Electrolux Corporation	
General Motors Corporation	
Hercules Powder Company	
Liquid Carbonic Corporation	
Merck and Company	
National Dairy Products Corporation	
North American Aviation, Incorporated	
Philco Corporation	
A. O. Smith Corporation	
Standard Oil Company of California	
Standard Oil Company (Indiana)	
Sylvania Electric Products, Incorporated	
Texas Company	

GIFTS AND BEQUESTS

329

The following gifts are for Designated Purposes:

PENNELL N. ABORN	
For the Dean's Special Fund	\$ 75.00
ACOUSTICAL MATERIALS ASSOCIATION	
For fellowships in Physics	3,000.00
AERO PRIZE FUND	
Contributions for prizes	50.00
AIR RESEARCH CORPORATION	
Supersonic Vortex research	10,000.00
ALLIED CHEMICAL AND DYE CORPORATION	
For fellowships in Chemistry and Chemical Engineering	3,500.00
ALLOY CASTING INSTITUTE	
For research in alloy casting in Metallurgy	6,000.00
ALUMNI CLUB OF DETROIT	
For scholarship aid	750.00
AMERICAN BRAKE SHOE COMPANY	
For fellowships in Metallurgy	5,000.00
For research in Metallurgy	7,000.00
AMERICAN BUREAU OF SHIPPING	
For a scholarship in Naval Architecture	1,000.00
AMERICAN CANCER SOCIETY	
Several research grants and fellowships in Biology	56,194.00
AMERICAN CHICLE COMPANY	
For fellowship in Chemistry	3,000.00
AMERICAN CYANAMID CORP.	
For fellowship in Chemical Engineering	2,000.00
AMERICAN FOUNDRYMEN'S SOCIETY	
For fellowships in Metallurgy	5,000.00
AMERICAN IRON AND STEEL INSTITUTE	
For fellowship in English and History	2,600.00
AMERICAN METEOROLOGICAL SOCIETY	
Research grant	2,850.00
AMERICAN PETROLEUM INSTITUTE	
Research grant in Geology	17,900.00
AMERICAN SMELTING AND REFINING COMPANY	
For undergraduate fellowships	9,500.00
AMERICAN SOCIETY OF MECHANICAL ENGINEERS	
For fellowships and research	12,150.00
ANONYMOUS	
For the President's Fund	5,000.00
ANONYMOUS	
For Graduate Student Aid Fund	400.00
ANONYMOUS	
For Anonymous Special Fund in Naval Architecture	32.00
ARMOUR AND COMPANY	
For research in Biology and Metallurgy	29,800.00
ARMSTRONG CORK COMPANY	
For fellowship in Acoustics	3,000.00
AVIATION WEEK	
For fellowship in Aeronautical Engineering	1,800.00
DEAN EVERETT M. BAKER FUND	
Contributions for Foreign Student Summer Project	789.50

BITUMINOUS COAL RESEARCH, INC. For research in Chemical Engineering	\$ 5,000.00
BRISTOL LABORATORIES, INC. For research in Chemistry	6,740.00
JULIUS BRODY For Campbell Special Fund in Food Technology	30.00
BRYANT CHUCKING GRINDER CO. For research in Mechanical Engineering	10,000.00
CHILDREN'S MEDICAL CENTER For research in Biology	250.00
JANE COFFIN CHILDS MEMORIAL For fellowship in Biology	3,375.00
CLIMAX MOLYBDENUM CO. For research in Metallurgy	5,000.00
COMMONWEALTH OF MASSACHUSETTS Grant for public works projects	30,000.00
CONTINENTAL CAN COMPANY For research in Spectroscopy Laboratory	10,000.00
WILLIAM A. COOLIDGE For overseas study fund	1,000.00
COORDINATING RESEARCH COUNCIL For research in Mechanical Engineering	1,250.00
CORN INDUSTRIES RESEARCH FOUNDATION For research in Biology	3,000.00
J. P. DEN HARTOG For the Graduate Student Aid Fund	75.00
J. H. DOOLITTLE Aeronautical Engineering Prize Fund	50.00
DOUGLAS AIRCRAFT COMPANY For scholarships in Aeronautical Engineering	3,000.00
DOW CHEMICAL COMPANY For fellowships in Chemical Engineering	5,000.00
E. I. DU PONT DE NEMOURS & Co., INC. For fundamental research	10,000.00
For fellowships in Chemistry, Chemical Engineering and Mechanical Engineering	12,900.00
MELVILLE EASTHAM For overseas study program	1,000.00
ENGINEERING FOUNDATION For research in Metallurgy	2,500.00
ETHICON SUTURE LABORATORIES For research in Biology	5,000.00
FARRELL BIRMINGHAM COMPANY For research in Metallurgy	2,100.00
FOREIGN STUDENT SUMMER PROJECT Contributions in support of the project	7,661.25
FOUNDATION FOR WORLD GOVERNMENT Grant for research in Economics	8,250.00
FOUNDRY EDUCATIONAL FOUNDATION For scholarships in Metallurgy	7,500.00
GENERAL ELECTRIC COMPANY For Cascade Research in Aeronautical Engineering	7,500.00

GIFTS AND BEQUESTS

331

GENERAL MOTORS CORPORATION	
For fellowship in Chemical Engineering	\$ 3,000.00
R. E. GILLMOR	
For Gillmor Fund in Business and Engineering Adminis- tration	300.00
D. S. & R. H. GOTTESMAN FOUNDATION	
For fellowship in Chemical Engineering	2,600.00
MILLARD M. GREER	
For Greer Rowing Equipment Fund	600.00
PAUL B. GULDEN	
For the Dean's Fund	1,000.00
GULF OIL CORPORATION	
For fellowship in Physics	1,500.00
HARSHAW CHEMICAL COMPANY	
For fellowship in Chemistry	1,500.00
For the Harshaw-Stockbarger Fund in Physics	5,760.00
HOTCHKIN COMPANY	
For the Dard Hunter Museum	2,003.85
HOUSTON ENDOWMENT, INC.	
For the William S. Knudsen fellowships	2,500.00
HUMBLE OIL AND REFINING COMPANY	
For fellowship in Physics	2,000.00
JEROME C. HUNSAKER	
For Aeronautical Engineering	1,000.00
GODFREY M. HYAMS TRUST	
For high-voltage x-ray research	35,000.00
KENNECOTT COPPER CORPORATION	
For research in Mechanical Engineering	8,000.00
CHARLES F. KETTERING FOUNDATION	
For research in Chemistry and Chemical Engineering	24,496.09
ESTATES OF CHARLES A. AND MARJORIE KING	
For the Charles A. and Marjorie King Fund in Biology	10,000.00
HARRY A. KULJIAN	
For prize undergraduate scholarships	1,000.00
LEVER BROTHERS CO.	
For the Pepsodent Keratin research fund	1,500.00
ELI LILLY AND COMPANY	
For research in Biology	15,000.00
OTTO LINDBERG	
For use by School of Humanities	2,000.00
LINDE AIR PRODUCTS COMPANY	
For research in Chemistry	450.00
ARTHUR D. LITTLE, INC.	
For high-voltage x-ray research	1,050.00
ELLEN F. LOOMIS	
For student aid	3,500.00
LUCIDOL DIVISION	
For research in Chemistry	1,000.00
S. E. L. MADURO AND SONS, INC. OF CURACAO	
For research	10,000.00
LESLIE H. MARSHALL	
For undergraduate scholarships	1,000.00

NEWMAN MARSILIUS For Marsilius Fund in Business Engineering and Adminis- tration	\$ 1,000.00
MASSACHUSETTS GENERAL HOSPITAL For research in Biology	500.00
MASSACHUSETTS SOCIETY OF UNIVERSITY EDUCATION FOR WOMEN For scholarships	500.00
JAMES C. MELVIN TRUST For scholarships	11,200.00
MEMORIAL HOSPITAL, NEW YORK For spectroscopy research	1,147.62
MISCELLANEOUS GIFTS For various purposes	165.00
NATIONAL ACADEMY OF SCIENCES Grant for research in Biology	6,277.50
NATIONAL ASSOCIATION OF ENGINE AND BOAT MANUFACTURERS For an undergraduate scholarship	600.00
NATIONAL LEAD COMPANY For a fellowship	1,800.00
NATIONAL LIME ASSOCIATION For research in Building Engineering and Construction . .	7,000.00
NATIONAL INSTITUTES OF HEALTH, FEDERAL SECURITY AGENCY For a fellowship in Biology	540.00
NEW ENGLAND TEXTILE FOUNDATION For textile research	1,300.00
NOVA SCOTIA RESEARCH FOUNDATION For research in Geology	4,050.00
THE NUTRITION FOUNDATION, INC. For nutrition research in Food Technology	4,000.00
OWENS-ILLINOIS GLASS COMPANY For research in Chemistry	5,000.00
FRED PALMER For Earl Newsom Fund in Business Engineering and Administration	100.00
PAN AMERICAN REFINING CORP. For fellowship in Chemical Engineering	2,000.00
PITTSBURGH CONSOLIDATION COAL COMPANY For fellowship in Chemical Engineering	3,100.00
PITTSBURGH PLATE GLASS COMPANY For research in Acoustics	3,320.00
SAMUEL CATE PRESCOTT LABORATORIES FUND Contributions for purchase of equipment	1,350.00
PROCTER AND GAMBLE COMPANY For fellowships and research in Chemical Engineering and Food Technology	10,264.78
QUAKER OATS COMPANY For Quaker Nutrition Fund	2,600.00
REFRIGERATION RESEARCH FOUNDATION For Campbell Special Fund in Food Technology	1,153.45
REPUBLIC STEEL COMPANY For fellowships in Metallurgy	10,000.00
RESEARCH CORPORATION For research in Chemistry and Food Technology	10,700.00

GIFTS AND BEQUESTS

333

RETINA FOUNDATION	
For research in Biology	\$ 200.00
REVERE COPPER AND BRASS COMPANY	
For research in Building Engineering and Construction . .	12,000.00
RIKER LABORATORIES, INC.	
For research in Chemistry	700.00
ROCKEFELLER FOUNDATION	
Grants to the departments of Biology, Chemistry, Eco- nomics and Geology for research projects	44,097.43
DAMON RUNYON MEMORIAL FUND	
For research in use of ultrasonics in diagnosis of brain tumors	5,000.00
SHARP AND DOHME, INC.	
For research in Chemistry	3,600.00
SHELL FELLOWSHIP COMMITTEE	
For research in Mechanical Engineering, Metallurgy and Physics	19,600.00
SHORTENING INSTITUTE	
For research in Food Technology	10,000.00
SKIDMORE, OWINGS AND MERRILL	
For scholarships in Architecture	1,000.00
ALFRED P. SLOAN FOUNDATION	
For the Sloan fellowships in Business and Engineering Administration	75,000.00
The Foreign Student Summer Project	21,526.66
SLOAN-KETTERING INSTITUTE	
For research in Biology	2,000.00
SOCIAL SCIENCE RESEARCH COUNCIL	
For research in Industrial Relations	2,000.00
SPOOL COTTON COMPANY	
For fellowships in Mechanical Engineering	5,400.00
STANDARD OIL COMPANY (INDIANA)	
For fellowships in Chemical Engineering	4,000.00
SUGAR RESEARCH FOUNDATION, INC.	
For research in Chemistry	4,625.00
SWIFT AND COMPANY	
For research on Amino Acids in Chemistry	5,000.00
HOWARD F. TAYLOR	
For research in Metallurgy	2,000.00
TEAGLE FOUNDATION, INC.	
For scholarships	17,650.00
TEXTRON, INCORPORATED	
For fellowship in Mechanical Engineering	2,600.00
TIMKEN ROLLER BEARING CO.	
For research in Metallurgy	10,000.00
TITANIUM ALLOY MANUFACTURING CO.	
For research in Metallurgy	1,500.00
TUFTS COLLEGE DENTAL SCHOOL	
For research in Food Technology	2,000.00
UNION CARBIDE AND CARBON CORP.	
For fellowship in Metallurgy	2,100.00
UNITCAST CORPORATION	
For fellowship in Metallurgy	700.00

UNITED ENGINEERING TRUSTEES, INC.		
For welding research in Civil Engineering	\$	2,800.00
For fellowship in Metallurgy		3,500.00
UNITED SHOE MACHINERY CORP.		
For research in Mechanical Engineering		3,500.00
UNITED STATES RUBBER COMPANY		
For fellowship in Chemistry		2,800.00
VANADIUM ALLOYS STEEL COMPANY		
For research in Metallurgy		2,500.00
VINGO TRUST		
For overseas study fund		1,000.00
VISKING CORPORATION		
For fellowship in Mechanical Engineering		2,500.00
WESTINGHOUSE EDUCATIONAL FOUNDATION		
For Science Teachers fellowships		12,500.00
WESTINGHOUSE ELECTRIC CORP.		
For Cascade research in Aeronautical Engineering		10,000.00
HOWARD D. WILLIAMS		
For Business and Engineering Administration		500.00
		<hr/>
		\$1,657,399.13

MISCELLANEOUS GIFTS

The following gifts are added to Agency Funds held by the Institute for investment purposes.

CLASS OF 1902		
Contributions of class members	\$	2,000.00
CLASS OF 1903		
Contributions of class members		14,610.00
CLASS OF 1904		
Contributions of class members		800.00
CLASS OF 1905		
Contributions of class members		100.00
CLASS OF 1910		
Contributions of class members		405.00
CLASS OF 1917		
Contributions of class members		3,364.51
CLASS OF 1921		
Contributions of class members		10.00
CLASS OF 1926		
Contributions of class members		12,513.77
CLASS OF 1927, HAMMOND MEMORIAL		
Contributions of class members		20.00
CLASS OF 1928		
Contributions of class members		25.00
CLASS OF 1929		
Contributions of class members		4.20
CLASS OF 1933		
Contributions of class members		513.62
CLASS OF 1934		
Contributions of class members		60.59

GIFTS AND BEQUESTS

335

CLASS OF 1935	
Contributions of class members	\$ 70.82
CLASS OF 1936	
Contributions of class members	2,035.00
CLASS OF 1937	
Contributions of class members	610.11
CLASS OF 1944	
Contributions of class members	1,117.25
CLASS OF 1948	
Contributions of class members	11.05
CLASS OF 1949	
Contributions of class members	343.95
CLASS OF 1950	
Contributions of class members	64.22
M. I. T. WOMEN'S DORMITORIES	
Contributions for women's dormitories	71.46
	<hr/>
	\$38,750.55

The following gifts are added to Annuity Funds:

ANONYMOUS	
For Avoca Fund, subject to annuity provisions	\$40,000.00
ANONYMOUS	
Addition to Anonymous Q Fund, subject to annuity provisions	4,000.00
GEORGE S. WITMER	
Additional, subject to annuity provisions	3,000.00
	<hr/>
	\$47,000.00

SUMMARY OF GIFTS, GRANTS AND BEQUESTS RECEIVED

	1951	1950	1949	1948	1947
Gifts for Endowment					
Funds for General Purposes	\$ 86,586	\$1,030,511	\$ 193,255	\$ 379,560	\$ 977
Funds for Designated Purposes	523,599	382,069	106,114	105,919	327,397
Gift of Plant	.....	.....	175,000	.....	.....
Gifts for Student Loans	227,756	10	115	7,360	3,650
Gifts for Building Funds	3,797,212	1,268,266	91,666	316,974	1,110,334
Other Gifts					
Unexpended balances of					
Endowment Fund Income	5,775	2,525	9,180	13,800	.....
Funds for General Purposes					
— Invested	2,206,364	2,066,934	482,730	101,899	125,122
Funds for Designated Purposes — Invested	554,665	245,454	316,441	396,770	356,377
Funds for Designated Purposes — Not Invested	1,657,399	1,463,763	1,106,065	810,494	437,384
	<u>\$9,059,356</u>	<u>\$6,459,532</u>	<u>\$2,480,566</u>	<u>\$2,132,776</u>	<u>\$2,361,241</u>
Miscellaneous Gifts					
Agency Funds	\$ 38,751	\$ 18,247	\$ 22,436	\$ 54,747	\$ 7,244
Annuity Funds	47,000	50,310	33,800	4,300	14,197
	<u>\$ 85,751</u>	<u>\$ 68,557</u>	<u>\$ 56,236</u>	<u>\$ 59,047</u>	<u>\$ 21,441</u>
Total	<u><u>\$9,145,107</u></u>	<u><u>\$6,528,089</u></u>	<u><u>\$2,536,802</u></u>	<u><u>\$2,191,823</u></u>	<u><u>\$2,382,682</u></u>

A BRIEF DESCRIPTION OF THE ENDOWMENT
AND OTHER INVESTED FUNDS OF THE INSTITUTE

Including funds which have been wholly expended since 1916 for plant, equipment, facilities, and special projects. The reference numbers correspond with the active funds, listed by groups on pp. 252-273, Schedules A-3 to A-11.

- 801 ALBERT, 1930-51. Gifts from anonymous donor covering more than twenty years' operation (approximately \$2,000 per annum) of M. I. T. Student House on Bay State Road, Boston.
- 951 ALPHA CHI SIGMA HOUSE (Alpha Zeta Chapter), 1935-1949. Deposited for investment purposes only.
- 850 AMORTIZATION OF DORMITORIES, 1950. Provision from operating income for major charges or write-offs of housing units in the general investments.
- 623 ANONYMOUS (H), 1942-43, \$10,000. For general purposes of the Institute.
- 625 ANONYMOUS (J), 1944-50, \$7,200. Gift for unrestricted purposes.
- 626 ANONYMOUS (LE), 1950, \$25,000. For general purposes of the Institute.
- 627 ANONYMOUS (M), 1941, \$6,500. For general purposes of the Institute.
- 802 ANONYMOUS (P), 1950-51, \$100,000. Gift for establishment of a faculty club.
- 981 ANONYMOUS (Q), 1945-50. Balance \$16,700. Subject to special annuity provisions.
- 629 ANONYMOUS (R), 1946, \$67,150. Principal and income for general purposes of the Institute.
- 701 ANONYMOUS (S), 1946, \$500,000. For research.
- 983 ANONYMOUS (X), 1944-50, \$20,488.12. Subject to special annuity provisions.
- 571 ANONYMOUS (Y), 1948-51, \$30,290. For general purposes or a possible Faculty Fund.
- ANONYMOUS CLASS OF 1924. Gift of member of Class of 1924 to accumulate until twenty-fifth reunion of Class in 1949. Balance \$3,115.22 transferred to Class of 1924.
- 351 APPLEBEE, Louie G., 1941-42, \$400. Bequest for assisting deserving students.
- 703 APPLIED MATHEMATICS, 1943. Balance \$6,065. Appropriated from surplus to provide support for postwar program.

- 101 ARMSTRONG, George Robert, 1902, \$5,000. Bequest of George W. Armstrong in honor of son. Income available for general purposes of the Institute.
ARMY AND NAVY TRAINING RESERVE, 1943-1944. Balance \$28,779.80 used for new construction, 1947.
- 932 ASSOCIATION OF CLASS SECRETARIES, 1940-45. Balance \$3,368. Held for investment purposes only.
- 803 ATHLETIC FIELDS SPECIAL, 1948-50, \$4,500. Gift for improvements.
- 353 ATKINS, Elisha, SCHOLARSHIP, 1894, \$5,000. Bequest of Mary E. Atkins. For undergraduate scholarship.
- 201 ATKINSON, William Parsons, 1918, \$13,082. Bequest of Charles F. Atkinson as a memorial to father — for English Department of the Institute.
- 301 AUSTIN, Edward, 1899, \$360,000. Bequest. Interest paid to needy, meritorious students and teachers to assist in payment of studies.
- 202 AVERY, Julian M., 1949-50, balance \$19,134. Income for special research, after fund has accumulated \$25,000.
- 985 AVOCA, 1946, \$116,200. In trust, subject to life annuities.
- 551 BABSON, 1938, \$10,000. Gift of Babson's Statistical Organization Inc. Income to be applied at intervals of not more than three years as prizes for one or more persons for certain studies and research in Economics.
- BADGER, E. B., AND SONS Co., 1944, \$10,000. Gift. Used for new construction 1947.
- 705 BADGER, E. B. & SONS Co., 1945, \$20,000. Gift for use of Chemical Engineering Department.
- 357 BAILEY, Thomas Wendell, 1914, \$2,172. Bequest. Income used for rendering assistance to needy students in Department of Architecture.
- 359 BAKER, Charles Tidd, 1922, \$20,000. Bequest. One-half of net income for assistance of poor and worthy students and one-half to principal. Present balance \$39,932.
- 572 BAKER, Everett Moore, MEMORIAL, 1951, \$11,454. Contributions in memory of Dean Baker for the Everett Moore Baker Foundation.
- 633 BARBOUR, Edmund Dana, 1926, \$847,000. Bequest. Principal and income for general purposes of Institute. Over \$826,000 used for buildings and equipment. Balance \$20,736.94.
- 261 BARKER, Walter S., 1927, \$10,000. Bequest. Income only available for purposes of the Library.
- BARTLETT, Sidney, 1889, \$10,000. Bequest. Appropriated for new dormitories, 1924.
- 635 BARTLETT, Stephen L., 1939-46, \$375,210.63. Bequest. Principal and income unrestricted, appropriated for educational plant, including swimming pool and current purposes.
- 203 BEMIS, Albert Farwell, 1938, \$270,000. Bequest. To establish and maintain the Albert Farwell Bemis Foundation for research on housing. Increased in 1941-46 through proceeds of sale of land. Present balance \$308,941.88.

- 709 BEMIS, Albert Farwell — LAND ACCOUNT, 1938, \$119,450. Estimated book value of land in Wellesley, Newton, and Dedham received under bequest. Proceeds of sales carried to No. 203.
BEMIS, Albert Farwell, 1923, \$100,000. Gift. Used for new dormitory unit, 1923.
- 102 BEMIS, Henry Ellsworth, MEMORIAL FUND, 1951. Gift of Hal L. Bemis '35 in memory of his father. Income only to be used for general purposes.
- 710 BERKE, Samuel — HUMANITIES, 1951, \$5,000. Gift for expenses in connection with certain phases of the Humanities program.
- 263 BERKE, Samuel, 1943-46, \$20,000. Gifts. Income for general purposes of the Institute Library.
- 804 BIGELOW, Bess, 1936-38, \$25,000. Anonymous donation for special purposes as suggested by donor, but subject to approval of President.
- 573 BILLIARD, Gordon Y., 1951, \$978. Gift, income to be added to principal until some purpose is designated by donor.
- 361 BILLINGS STUDENT, 1900, \$50,000. Bequest of Robert C. Billings. Students receiving benefit are expected to abstain from use of alcohol or tobacco in any form.
- 103 BLACKBURN, George, MEMORIAL, 1931-51, \$1,025,104. Bequest of Harriette A. Nevins. Income for general purposes.
BLAKE, Stanton, 1889, \$5,000. Bequest. Used for educational plant, 1926.
- 363 BLANCHARD, Huse Templeton, 1947, \$6,551. Bequest. For undergraduate scholarships.
- 553 BOIT, Robert A., 1921, \$5,000. Bequest. Income to stimulate students' interest in best use of English language through annual prizes or scholarships.
- 205 BOLES, Frank Walter, MEMORIAL, 1915, \$25,200. Under agreement between Harriet A. Henshaw and M. I. T., income paid to committee of Department of Architecture, to purchase fine arts material to supplement and strengthen instruction in architectural design and for the care and preservation of such material.
- 365 BOLES, Levi, 1915, \$10,000. Bequest of Frank W. Boles in memory of father. Income for assistance of needy and deserving students.
- 303 BOLLES, William Sumner 1924, \$25,000. Bequest of William P. Bolles in memory of son, to maintain either fellowship, traveling scholarship, or resident scholarship. Recipient to have character, ability, or promise.
- 791 BOSTON STEIN CLUB, 1945-50, \$27,857. Contributions for equipment of Map Room in Charles Hayden Memorial Library.
- 367 BOURNE, Jonathan, 1915, \$10,000. Bequest of Hannah B. Abbe. Income to aid deserving students.
- 369 BOYDEN, Albert G., 1931-50. Balance \$571,759. Bequest. Estate of Elizabeth R. Stevens. Income for scholarships. Preference to students from Fall River and Swansea, Mass.

- 105 BRIGGS, Clara H., 1941, \$12,514.55. Bequest. Income for general purposes.
- 953 BRIGGS, Major, 1940-42, \$32,969.71. Bequest under will of Frank Harrison Briggs, the principal and/or income to be used as Advisory Council in Athletics may decide. No part of either principal or income is to be used to defray living expense or tuition fees of any student.
- 371 BROWN, Harriet L., 1922, \$6,024. Bequest. Income to needy and deserving young women students, as would otherwise be unable to attend. In case of two or more applicants of equal merit, preference given to native of either Massachusetts or New Hampshire.
- 305 BROWN, Malcolm Cotton, 1919, \$1,506. Under agreement between Caroline Cotton Brown, Charles A. Brown, and M. I. T., to establish memorial to son, Lieutenant Brown, R. A. F., for advanced study and research in Physics.
- 206 BROWN, William Felton, 1951, \$20,000. Bequest for the Architecture department.
BRUSH, Matthew C., 1946, \$31,395.74. Bequest. Used for construction of Campus Room at Graduate House.
- 583 BURSAR'S, 1907, \$6,000. Bequest of Lyman S. Rhoads. Income and repayments used for loans to students in discretion of Bursar, subject to approval of President and Treasurer. Balance \$40,240.
- 574 BUSH, Vennevar, TRUST, 1951, \$10,000. Gift, the income from which may be used for certain purposes by the senior class president.
- 207 CABOT, Godfrey L., 1950, \$10,000. Income to be used for Chemical Engineering.
- 372 CABOT, Godfrey L., SCHOLARSHIP, 1951. Gifts of \$5,000 from Godfrey L. Cabot Charitable Trust and \$20,000 from Godfrey L. Cabot, Inc., income of which is to be used annually for scholarships with preference to students of Chemistry or Chemical Engineering.
- 208 CABOT, Samuel, 1912, \$50,000. Gift of Helen N. Cabot in honor of husband. Income for purchase of apparatus and supplies required in conduct of research in Industrial Chemistry.
- 600 CAMPBELL SOUP COMPANY, 1950, \$1,000,000. For Biology and Food Technology. Used for laboratory construction, 1950-51.
CARLETON, Mary A., 1946, \$14,456.48. Bequest for general purposes of the Institute. Appropriated for buildings, 1947.
- 715 CARNEGIE CORPORATION, 1951, \$150,000. Grant for a five-year program in the Humanities.
- 792 CARNEGIE S. A. L. CENTER, 1948-50, \$100,000. Gift toward the support of a Center for Scientific Aids to Learning.
- 107 CARNEY, James A., 1944-45, \$17,170.01. Bequest. Income for general purposes.
CARSON, Howard A., 1932, \$1,000. Bequest. Used for new equipment.
- 373 CASE, Mabel Blake, 1920, \$25,000. Bequest of Caroline S. Freeman. Income to aid deserving students (preferably women) who are in need of assistance.

- 375 CATLIN, Nino Teshler, 1926-48, \$12,265. Gift and bequest 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.
- 209 CHAMBERLAIN, William E., 1917-19, \$7,309. Bequest. Income used for Department of Architecture.
- 307 CHANDLER, Francis W., 1927-36, \$4,511. Originally a gift from Architectural Society and used as a loan fund to be administered by Head of Architectural Department. Increased by \$5,000 in 1939, gift of Mr. and Mrs. William Emerson and income to be used for Travelling Fellowship in City Planning. Present balance \$7,988.
- CHASE, William L., 1925, \$11,590.09. Bequest. \$7,500 appropriated for Homberg Infirmary, 1927. Balance used for educational plant, 1928.
- 717 CHEMICAL ENGINEERING PRACTICE, 1915-16, \$300,000. Gift of George Eastman for Chemical Engineering Stations provided Institute has carried forward this plan of education for a reasonable period.
- 575 CHENEY, Ednah Dow, 1905-06, \$13,965. Bequest. Income for maintenance and care of Margaret Cheney Room for women students.
- 109 CHOATE, Charles, 1906-21, \$35,858.15. Bequest. Income for general purposes.
- 793 CILLEY, Frank Harvey, 1913, \$57,700. Bequest. Income and such part of principal as necessary for purchase of suitable books, photographs, statuary, etc., for library and gymnasium of Walker Memorial.
- 377 CLAPP, Lucius, 1905, \$4,900. Bequest. Income to worthy students who may not be able to complete their studies without help.
- 378 CLARKE, A. V., SCHOLARSHIP, 1948, \$1,462.50. Gift. Income for student aid.
- 795 CLASS OF 1874, 1934, \$291.67. For purposes of the Library.
- 881 CLASS OF 1887, 1941-46. Balance \$4,883. Held for use of Class and for final distribution as provided in Declaration of Trust.
- 883 CLASS OF 1889, 1947. Balance \$198. Held for special purposes.
- 636 CLASS OF 1890 FUND, 1951, \$25,000. Bequest of George L. Gilmore for general use of the Institute.
- 379 CLASS OF 1895 MEMORIAL, 1945-46. Balance \$25,000. Gift of the Class on fiftieth anniversary, income only to be used to provide scholarships to suitably qualified descendants of members of the Class. Balance of unexpended income in any year to be added to Technology Loan Fund.
- CLASS OF '06, 1923-46. Gift. Preference to descendants of members of Class. Scholarships to be considered a loan to be repaid when and if able. Renamed 1951 to Charles E. Locke Memorial Fund.
- 806 CLASS OF 1898, 1927-51. Gifts to provide annual contribution to Alumni Fund from earned income.
- 637 CLASS OF 1899, 1949-50, \$15,621. Contributions from members of the Class. For general purposes.
- 638 CLASS OF 1900, 1949-51, \$15,411. Contributions by members of Class for Fifty Year Fund.

- 639 CLASS OF 1901, 1951, \$69,736. Contributions by members of Class for Fifty Year Fund.
- 886 CLASS OF 1903, 1950, \$15,560. Contributions by members of Class for Fifty Year Fund.
- 555 CLASS OF 1904, 1925, \$647. Contributions received by Professor Gardner for Architectural Department prizes.
- 110 CLASS OF 1909, 1934-51. Balance \$19,737. Accumulated through contributions and from proceeds of life insurance policies. By vote of the Class the fund was made a General Endowment Fund, the income for the general purposes of the Institute.
- 890 CLASS OF 1914. Balance \$1,145. Held for investment purposes only.
- 807 CLASS OF 1917. Present balance \$1,368. For special purposes.
- 891 CLASS OF 1917, 1949-51. Contributions by members of Class for Fifty Year Fund. Present balance \$4,544.
- 808 CLASS OF 1918 (ORGAN). Balance \$110.88. Subscriptions by Class members toward purchase of an organ for Walker Memorial, purchased in 1948.
- 892 CLASS OF 1919, SPECIAL, 1944. Balance \$3,441. Contributions from Class members toward gift to M. I. T. on the occasion of the twenty-fifth reunion of Class.
- 893 CLASS OF 1920, 1945-47. Balance \$4,147.25. Gift of U. S. Savings "F" Bonds and cash on the twenty-fifth reunion of the Class.
- 894 CLASS OF 1921, 1946-50. Balance \$7,280. Contributed for Class Twenty-Fifth Year Memorial Fund.
- 385 CLASS OF 1922 SCHOLARSHIP, 1942-50. Balance \$20,515. For scholarships.
- 640 CLASS OF 1923, 1949, \$63,319.67. Twenty-Five Year Gift of Class for general purposes.
- 641 CLASS OF 1924, 1949-50, \$81,328.28. Twenty-Five Year Gift of Class for general purposes.
- 642 CLASS OF 1925, 1950, \$43,611. Twenty-Five Year Gift of Class for general purposes.
- 643 CLASS OF 1926, 1951, \$64,695. Twenty-Five Year Gift of Class for general purposes.
- 906 CLASS OF 1927, JOSEPH W. HAMMOND MEMORIAL, 1950, \$50. Contributions in memory of Joseph W. Hammond.
- 389 CLASS OF 1938 SCHOLARSHIP, 1938-50. Balance \$1,529. Gift of Class of 1938. Income for scholarships.
- 885-893 CLASS REUNION FUNDS. Gifts by class members, principally under the Development program, credited to Class funds in anticipation of further designation of purpose by the Class at a future reunion.
- 895-931 inc.

CLASS ENDOWMENT FUNDS (see pages 272-273).

Note: These funds are being accumulated for the several classes whose members took out life insurance or are otherwise accumulating contributions toward a gift to the Institute on the occasion of their

Twenty-Fifth Reunions. From certain of these, a portion may be applied in accordance with the terms of the several plans toward keeping alive policies that might lapse on account of nonpayment or as otherwise designated.

- 928 CLASS OF 1948 ATHLETIC AWARD, 1949, \$682.84. For purchase of Trophy to be awarded annually to outstanding athlete.
- 281 COBB, Samuel C., 1916, \$36,551. Bequest. Income for salaries of President and professors.
- 393 COBURN, Fred L. and Florence L., 1932, \$5,000. Bequest. Income to aid needy and worthy students, preference being given to those residing in Somerville, Mass.
- 397 COFFIN MEMORIAL, \$35,000. Gift of the Estate of Charles A. Coffin. For loans or other aid to students as determined by Executive Committee. Present balance, \$36,019.
- 309 COLLAMORE, 1916, \$10,100. Bequest of Helen Collamore. Income primarily to aid women students in post graduate courses, and, secondarily, for purchase of instruments for Chemical Laboratory.
HELEN COLLAMORE, 1917, \$12,384.97. Bequest. Used for new dormitories, 1924.
COLLAMORE, Helen, 1947, \$49,500. Bequest. For unrestricted use. Used in 1948-49.
- 718 COLLINS HELIUM CRYOSTAT, 1949, \$2,905. For special research.
- COLT, Samuel P., 1920-22, \$20,000. Bequest. Used for new dormitories, 1924.
- 556 COMPTON, Karl Taylor, PRIZE, 1949-51, \$23,785. Gifts from members and friends of the Boston Stein Club. Income for prizes and grants in recognition and encouragement of outstanding contributions in promoting high standards of performance and good citizenship within the Institute community.
- 576 COMPTON, Margaret, 1949, \$1,510. Gifts from Technology Matrons to be expended on authorization by Mrs. Compton.
- 399 CONANT, William A., 1943-49, \$153,415.61. Bequest. The income to provide for scholarship carrying annual stipend of \$800 for New England Protestant boy of Protestant parents, preference to be given to graduates of the public schools of Brookline.
- 601 CONNER, Arthur J., DORMITORY, 1941-50. Balance \$246,962. The total of gifts and the residue of two trusts for construction of a dormitory.
- 644 CONNER, Arthur J., 1950, \$101,245.54. Bequest for general purposes of the Institute.
- 401 CONRO, Albert, 1943, \$25,000. Bequest for scholarship.
- 403 COOKE, George R., 1939-40, \$3,500. Gift of George R. Cooke, Jr. Income to be awarded, preferably in Civil Engineering or related field, to student preparing for Public Service and Government.
- 645 COOPERATIVE FOUNDATION, 1945, \$1,577.44. Cash surrender value of first insurance policy taken under Plan. Use of fund not yet determined.
CRANE AUTOMOTIVE, 1928, \$5,000. Gift of Henry M. Crane. Used for purchase of equipment for Aeronautical Laboratory, 1928-40.

- 404 CRANE, John G., 1951, \$13,100. Gift for undergraduate awards.
- 405 CROCKER, Lucretia, 1916, \$50,551. Bequest of Matilda H. Crocker. Income for establishment of scholarships for women in memory of sister.
- 211 CROSBY HONORARY, 1916, \$1,633. Contributions in honor of William Otis Crosby (Professor Emeritus). Income for upbuilding of the Geology Department, especially its collections.
- 406 CRUFT, Eunice M., 1950-51, \$4,529.90. Bequest. Income to assist students of insufficient means.
CUNNINGHAM, Edward, 1917, \$15,000. Gift. For new building and equipment at Civil Engineering Summer Camp, Maine.
- 311 DALTON GRADUATE CHEMICAL, 1896, \$5,000. Gift of Charles H. Dalton. Income for scholarships for American male graduates of M. I. T., for advanced chemical study and research — preference given to chemical research especially applicable to textile industries.
DANA, William S. B., 1946, \$500. Bequest for general purposes. Used for construction, 1947.
- 407 DANFORTH, Isaac W., 1903, \$5,000. Bequest of James H. Danforth. Income for scholarship purposes as a memorial to brother.
DANFORTH, N. Loring, 1937, \$5,000. Bequest. Principal and income for general purposes. Appropriated for educational plant, 1940.
- 585 DEAN'S, 1924, \$3,350. Contributions. To be loaned by Dean to needy students. Present balance \$13,300.
- 809 DEAN, Arthur Davis, 1951, \$82,104. Bequest to directly aid worthy students other than for buildings, equipment, salaries or tuition. Fund to be spent by November 1959.
- 587 DENNETT, Carl P., 1926, \$500. Gift. To be loaned to students, preferably Freshmen, at discretion of President. Present balance \$2,140.
- 646 DEVELOPMENT FUND, 1949-50. Contributions under the Development Program for undesignated purposes. Present balance \$31,339.
- 408 DEVELOPMENT FUND SCHOLARSHIPS, 1950, \$500,000. Established by transfer from Development Fund.
- 602 DEVELOPMENT BUILDING FUND, 1951, \$1,500,000. Transferred from unrestricted development funds for completion of buildings under construction.
- 265 DEWEY, Davis R., LIBRARY FUND, 1951, \$2,275. Gift of Bradley Dewey established as an endowment fund with income to be used for the Davis R. Dewey Library.
- 810 DEWEY, Davis R., MEMORIAL, 1943, \$500. To provide a suitable memorial for the late Professor Dewey.
- 409 DICKINSON, Ann White, 1898, \$40,000. Bequest. Income used to establish free scholarships. Such persons enjoying benefit shall be worthy young men of American origin.
- 411 DORMITORY, 1903, \$2,857. Contributions. Income for scholarship purposes.
DORR, George B., 1890, \$49,573.47. Bequest. Appropriated for educational plant, 1918.

- 213 DORR, Susan E., 1914, \$95,955. Bequest. Income for use and benefit of Rogers Physical Laboratory.
- 811 DRAMA CLUB THEATRE, 1938, \$400. Deposited by Drama Club of M. I. T. toward future purchase of theatrical equipment.
- 111 DRAPER, Eben S., 1915, \$100,000. Bequest. Specially invested. Income used for general purposes of the Institute. Present balance \$107,618.75.
- DREW, Charles C., 1920, \$305,171.52. Bequest. Appropriation to educational plant, 1921-24.
- 413 DROWN, Thomas Messinger, 1928, \$50,000. Bequest of Mary Frances Drown. Income to establish scholarships for deserving undergraduate students.
- DUBBS, Carbon P., 1943, \$5,000. Gift. For general purposes. Used for new construction, 1947.
- 113 DU PONT, Coleman, 1931-38, \$221,325. Bequest. Income for support and maintenance of the Institute.
- DU PONT, Pierre, 1938, \$25,000. Gift. Used for new equipment.
- 313 DU PONT, Richard Chichester, MEMORIAL FUND, 1946, \$108,772. Contributions by members of his family to establish Memorial Fellowship in Aerodynamics or Meteorology.
- 647 EAMES, Charles H., 1950, \$20,000. Bequest for general purposes of the Institute.
- 115 EASTMAN CONTRACT, 1924, \$9,498,869. Gift of George Eastman. Income for general purposes of the Institute.
- 603 EASTMAN, George, BUILDING, 1916-17, \$2,500,000. Gift of George Eastman on condition that \$1,500,000 be raised by alumni and others. Balance to be used as needed for new educational buildings. \$1,225,000 used for George Eastman Research Laboratories in 1932, \$725,000 for Rogers Building and Wind Tunnel in 1939, \$268,700 for one-half of building No. 12 in 1943, \$80,000 for Medical Department alterations in 1943.
- 215 EASTMAN, George, 1918, \$400,000. Gift of George Eastman. Income for Chemistry and Physics. Principal available for addition to EASTMAN BUILDING FUND after latter is exhausted.
- The total of the gifts of GEORGE EASTMAN to the Institute for both buildings and endowment was \$20,500,000.
- 117 EATON, Charles W., 1929-43, \$261,148. Bequest. Income for advancement of general purposes of Institute. (From 1911 to 1923 Mr. Eaton gave \$15,501.45 for Civil Engineering Summer Camp in Maine.)
- 720 EDISON, Theodore M., 1951, \$90,000. Grant in aid of the Institute's program of education and research.
- 119 EDUCATIONAL ENDOWMENT, 1920-21, \$7,574,000. \$4,000,000 gift from George Eastman and balance contributed by alumni and others. Income for current educational expenses.
- 121 EDWARDS, Martha Ann, 1890, \$30,000. Bequest. Income for general purposes.

- 722 ELECTRONICS, INDUSTRIAL FELLOWSHIPS IN, 1946-49, \$101,200. Contributions for Fellowships.
- 721 ELECTRONICS, RESEARCH LABORATORY OF, 1943-50. Balance \$74,637. Appropriations from surplus for postwar research.
- 604 ELECTRONICS LABORATORY BUILDING, 1950. Gift \$200. For Electronics Laboratory Building.
- 797 ELSON, Arthur, 1944, \$500. For the purpose of special book purchases for the Library.
- 415 EMERSON, Frances and William, 1930, \$100,000. Gift. Income for aid of regular and special students in Department of Architecture.
- 557 EMERSON, William, PRIZE, 1939, \$2,145. Contributed by friends as a fund for prizes to architectural students.
- EMERY, F. W., 1916, \$120,000. Bequest. Used for buildings and equipment.
- 123 ENDICOTT, William, 1916, \$25,000. Bequest. Income for general purposes.
- 995 ENDOWMENT RESERVE, 1924-1951. Created and otherwise increased by gains from sales or maturities of investments and decreased by losses and charges from sales or maturities. Belongs to all funds sharing general investments.
- ESTABROOK, Arthur F., 1923-38, \$100,800. Bequest. Used for purchase of land and equipment.
- ESTABROOK, Ida F., 1926-37, \$22,157.51. Bequest. Used for educational plant.
- 605 FACULTY CLUB, 1951, \$280. Contributions under the development program designated for a faculty club.
- 124 FACULTY SALARY ENDOWMENT, 1951, \$1,000,000. Appropriation to fund a part of salary increases.
- 417 FARNSWORTH, 1889, \$5,000. Bequest of Mary E. Atkins. Income for scholarships.
- FITZ, Henrietta G., 1930, \$10,000. Bequest. For general purposes. Appropriated for educational plant, 1940.
- 217 FLETCHER, Harold H., 1942, \$10,000. Bequest under will of Herbert H. Fletcher. To endow a bed in the Institute's Infirmary.
- 419 FLINT, Charles Lewis, 1889, \$5,000. Bequest. Income for support of worthy student, preference given graduate of English High School, Boston.
- 267 FLINT, Charles Lewis, 1889, \$5,000. Bequest. Income for purchase of books and scientific publications for Library.
- 723 FOOD TECHNOLOGY, 1945-51, \$300,000. Contribution for research.
- 283 FORBES, Sarah H., 1901, \$500. Gift of Malcolm Forbes as memorial to mother. Income for salaries.

- 421 FORBES, Sarah S., 1913, \$3,455. Gift of Sarah S. Forbes, William B. Rogers, and Henry S. Russell. Income for maintenance and education of scholar at M. I. T.
- 648 FORD MOTOR COMPANY, 1951, \$166,665. Payment on subscription.
- 724 FORD MOTOR COMPANY, 1949, \$25,000. For special research in the field of Industrial Relations.
- 125 FOSTER, Francis Appleton, 1922, \$1,000,000. Bequest. Income for purposes of Institute.
- 127 FOSTER, John W., 1938, \$299,926. Bequest. Income for purposes of the Institute.
- 606 FRASER, Matilda A., 1942, \$859.89. Bequest. Towards construction of a women's dormitory.
- 129 FRENCH, Alexis H., 1930, \$5,000. Bequest. Income for general purposes of Institute.
FRENCH, Caroline L. W., 1916, \$100,843.34. Bequest. Used for new equipment, 1928.
- 131 FRENCH, Jonathan, 1915-51, \$91,009. Bequest of Caroline L. W. French. For purposes of the Institute.
- 133 FRICK, Henry Clay, 1925-48, \$2,208,482.92. Bequest. Institute received ten shares of a total of one hundred shares of his residuary estate. Income for general purposes.
- 423 FRIEDLANDER, Philip Jacob, 1945, \$1,000. Gift. Income to be used to aid qualified students in need of assistance.
FRISBIE, Walter L., 1923, \$7,614.98. Bequest. Used for educational plant, 1928.
- 588 FRYER, Ethel I., SCHOLARSHIP LOAN, 1951, \$2,500. Gift of Herbert Fryer for loans to students from the states of Washington, Oregon and California.
- 649 GAFFIELD, Erastus C., 1944-45, \$387,854. Bequest. Principal and income available for general purposes. In 1945, \$120,000 was applied to retirement of Dormitory mortgages. In 1947, \$158,000 was applied toward the purchase from the U. S. Government of Building 24 and \$108,100 appropriated for miscellaneous purposes. Present balance \$1,796.58.
- 285 GARDNER, George A., 1898, \$20,000. Gift. Income for salaries of instructors.
GAS TURBINE LABORATORY, 1946, \$500,000. Contributions from five industrial corporations for construction and operation of new laboratory. Used for construction 1946-48.
- 135 GENERAL ENDOWMENT, 1921, \$1,529,999. Contributions by alumni and others to meet George Eastman's condition relative to gift of \$2,500,000, his building fund.
- 589 GEORGE, Nathan R., 1943, \$29,197.37. Bequest. Income to be loaned to undergraduates under certain administrative conditions.
- 425 GEORGE, Norman H., 1919-25, \$89,453. Bequest. Income for assistance of worthy and needy students.

- 427 GILMORE, Arthur B., \$10,000, 1941. Bequest. Net income to assist needy students, members of Beta Theta Pi — not more than two students in any one year.
GOODALE, Charles W., 1929, \$50,000. Bequest. Used for new dormitory, 1930.
- 558 GOODWIN, Harry A., 1950, \$9,824. Gift to create a Goodwin medal to award to graduate students.
- 429 GORDON, Barnett D., 1942-51, \$14,000. The income to be used as scholarships for deserving students.
- 137 GRANGER, Eliot, 1936, \$21,568.43. Bequest under will of Mary Granger in memory of deceased son. Income for the general purposes of the Institute.
- 725 GRIMMONS, John A., 1930-50. Balance \$7,672. 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.
- 812 HAFFENREFFER FAMILY FOUNDATION, 1951, \$25,000. Gift for unrestricted use, but sensitive to the Haffenreffer family interest in implementing and handling of the Herreshoff Collection.
- 650 HALL, Edward C., 1951, \$7,151. Residuary bequest for general use.
- 431 HALL, Lucia G., SCHOLARSHIP, 1945-46. Balance \$54,413. Bequest of Louise K. Gunn. The income only used for aid of worthy students.
- 433 HALL-MERCER SCHOLARSHIP, 1940-51. Balance \$76,924. Bequest under will of Alexander G. Mercer. The income to be used for tuition and other necessary expenses of students.
HAMILTON, George Wyman, 1935, \$54,414.15. Appropriated for new equipment, 1937-39.
- 729 HARVEY NONFERROUS FORGING, 1946, \$10,000. For research.
- 435 HASTE, James H., 1930-45. Balance \$241,074. Bequest. Income for aid of deserving students of insufficient means.
- 139 HAYDEN, Charles, 1937, \$1,000,000. Bequest of Charles Hayden. Income for general educational purposes of the Institute.
HAYDEN, Charles, 1925, \$42,700.76. Gift. Used for educational plant.
HAYDEN, Charles, 1927, \$100,000. Gift for new dormitories.
HAYDEN, Charles, MEMORIAL LIBRARY, 1945-47, \$2,200,000. Gift of Charles Hayden Foundation for new library. Used in 1948, 1949 and 1950 for library construction.
- 437 HAYDEN, Charles, MEMORIAL SCHOLARSHIP, 1940-43, \$100,000. From the Charles Hayden Foundation. For entrance scholarships. Preference given to students from Boston and New York.
- 439 HAYDEN, Charles, MEMORIAL SCHOLARSHIP, SPECIAL 1947, \$11,078.36. Accumulation of income of Scholarship Fund (No. 437).
- 731 HAYDEN, Charles, FOUNDATION DENTAL CLINIC, 1940, \$10,000. To assist in establishment of and necessary equipment for a Dental Clinic available to entire student body, faculty and employees.

- 287 HAYWARD, James, 1866, \$18,800. Bequest. Income for salaries.
HENRY, James W., 1935, \$8,407. Bequest. Used for new equipment.
- 651 HENRY, William T., 1943-51. Present balance \$70,044. Income from Trust Fund held outside M. I. T. Fund for general purposes.
- 987 HEWETT, Joseph, 1921-24, \$200,000. In trust subject to special annuity provisions.
- 315 HICKS, Clarence J., MEMORIAL, 1946, \$20,000. For fellowship in Industrial Relations.
- 141 HILLS, John Marshall, 1941-42, \$366,430.96. Bequest. Income for general purposes of M. I. T.
- 268 HOBBS, Edith Morrill, 1948, \$5,000. Bequest. Income for purchase of books on Architecture.
- 316 HOBBS, Edith Morrill, 1948, \$5,000. Bequest. Income for aid to graduate students in Architecture.
HODGES, Frederick S., 1928, \$57,316.26. Bequest. Appropriated for new dormitories.
- 142 HODGES, Walter W., 1946, \$36,809.70. Bequest. Income only for general purposes.
HOLLINGSWORTH, Ellis, 1940, \$10,000. Bequest for unrestricted use. Used for new construction, 1947.
- 440 HOLLINGSWORTH, George, 1916, \$5,000. Bequest of Rose Hollingsworth. Income used for scholarship.
- 441 HOLM, Loren C., 1950, \$5,956. Bequest from the estate of Marie Holm in memory of her father. Income for scholarships.
- 813 HOROVITZ, Oscar H., 1947-49, \$1,500. Gift for special purposes.
- 653 HOSBACH, Ernest R. MEMORIAL, 1948, \$1,000. Gift of Frederick W. Hosbach in memory of his son. For general purposes of Institute.
- 442 HOWE, Elias, Jr., 1950-51, \$24,200. Bequest from the estate of Julia Howe Stockwell Smith. Income for aiding students of mechanics as recommended by the faculty.
- 559 HUNNEMAN, Roger Defriez, PRIZE, 1927, \$1,050. Gift of W. C. Hunneman in memory of Roger Defriez Hunneman, '23. Income paid as annual award to most meritorious student in Chemical Engineering who has shown most outstanding originality in his work as determined by that Department.
HUNT, Abby W., 1936-44, \$79,400. Bequest. For general purposes. \$60,000 used for alterations, 1937. \$16,000 for new equipment, 1938. Balance \$3,400, for new construction 1947.
- 443 HUNT, Samuel P., 1946, \$7,496. Gift. For undergraduate scholarships.
- 445 HUNT, T. Sterry, 1894, \$3,000. Bequest. Income to a student in Chemistry.
- 447 HUNTINGTON, William F., 1892, \$5,000. Gift of Susan E. Covell. Income to deserving students. Preference to be given to students in Civil Engineering.

- 611 HYDRODYNAMICS LABORATORY AND TOWING TANK, 1946-50. Gifts used for construction of new building 1950-51.
- 733 INDUSTRIAL ECONOMICS, 1940-50. Balance \$36,604. Contributions in support of Graduate Program in Economics.
- 737 INDUSTRIAL, 1924-51. This fund succeeded "Tech Plan" Contracts, payments under which went to the Educational Endowment Fund. Now receives surplus from industrially sponsored operations of Division of Industrial Cooperation and Research. Used for purchase of new equipment and support of special research.
- 739 INDUSTRIAL RELATIONS SECTION, 1938-51. Balance \$152,164. Contributions in support of the Industrial Relations Section of the Department of Economics.
- 741 INSTRUMENTATION, 1943-45. Balance \$174,524. For research in the field of instrument design.
- INSURANCE ENGINEERING, 1944, \$835.13. Established by private subscriptions and donated to M.I.T. through the Boston Manufacturers Mutual Fire Insurance Co. Used for new construction 1947.
- JACKSON, Charles C., 1912, \$25,000. Gift. Used for purchase of new site.
- 288 JACKSON, Dugald Caleb, PROFESSORSHIP, 1951, \$3,130. Gifts of various donors to create a professorship in Electrical Engineering.
- 143 JAMES, 1898-99, \$163,654. Bequest of Julia B. H. James. Income for development of M.I.T.
- 449 JEWELL, David L., 1928, \$25,000. Bequest. Income for tuition of five young men who are worthy of assistance and who, were it not for such assistance, might be unable to pursue their studies at M.I.T.
- 451 JONES, Edward A., 1947, \$41,254. Bequest for scholarships.
- 317 JOSLIN, Rebecca R., 1924-36, \$6,540. Gift and Bequest. Income awarded as a loan to advanced student in Chemical Engineering on recommendation of that Department — restricted to native and resident of Massachusetts. Beneficiary is expected to abstain from using tobacco in any form.
- 453 JOY SCHOLARSHIPS, 1886, \$7,500. Gift of Nabby Joy. Income for scholarships for one or more women studying natural science at M.I.T.
- 219 KALES, William R., 1944, \$75,001.48. Gift of Mrs. Kales and family. To establish and maintain Eye Clinic in Medical Department.
- KALES, William R., 1925-27, \$11,000. Gift for new dormitories.
- 659 KELLER, 1948, \$100. Gift of Carl T. Keller. For expenditures under the direction of Doctor Tate. Present balance \$54.27.
- 221 KENNELLY, Arthur E., 1940-44, \$67,058. Bequest. Income only to be used for the study of mathematics directed toward physics or physical applications
- KENNEY, Carrie Belle, 1945, \$1,000. Bequest. Used for new construction, 1947.
- 743 KENT, A. Norton, 1944-49, \$700. Gift. For research in Physics. \$500 appropriated, 1947.

- 269 KERR, William Hall, 1896, \$2,000. Gift of Alice M. Kerr. Income for the annual purchase of books and drawings in machine design.
- 145 KILBURN, Dale G., 1949, \$68,894. Bequest. Income for general purposes.
- KIMBALL, David P., 1924, \$10,000. Bequest. Used for educational plant, 1926.
- 560 KING, Ellen A., MEMORIAL PRIZE, 1951, \$1,510. Gift of members of family and friends for an annual prize. (\$300 is expendable for book-plate, etc.)
- 454 KNEISNER, Amelia S., SCHOLARSHIP, 1945-49, \$18,000. Gift of the family. Income to provide scholarship aid to meritorious or needy students — preference to students from Danbury (Connecticut).
- 222 and 612 KRESGE FOUNDATION, 1951, \$750,000. For an auditorium and chapel.
- 815 KRUEGER, Llorra Culver. Balance \$543. Principal and interest for scholarship to needy student from Schenectady, N. Y. and vicinity.
- 456 KURRELMAYER, 1945-46, principal \$2,220. Income for undergraduate scholarship.
- 146 LADD, Charles C., '30 FUND, 1951, \$600. Gift of Charles C. Ladd, Jr., Richard Swan Ladd, Elizabeth S. Ladd, and Mary Elizabeth Ladd. The income only to be used for general purposes.
- 590 LAMSON-VIRGIN LOAN, 1946-48, \$10,600. Bequest. Income to be used in aiding worthy students, with provision for repayment.
- 816 LEVER BROS. CO. 1949, \$2,500. Income or principal to be used on recommendation of M. I. T. and Lever Bros. Co. presidents.
- 661 LEWIS, Edwin J., Jr., 1950, \$24,303.54. Bequest for general purposes of the Institute.
- 319 LEWIS, Wilfred, 1930, \$5,000. Gift of Emily Sargent Lewis. Income for maintenance of graduate student in Mechanical Engineering.
- 613 LIBRARY BUILDING, 1946, \$1,000. Gift used for Hayden Library building.
- 799 LIBRARY GROWTH, 1943-47. Balance \$5,317. For investment purposes.
- 457 LICHTER, Jacob and Jennie, 1944-48, \$10,475. Gift. Income for scholarship on approval of donor.
- 458 LITCHFIELD, William, 1910, \$5,000. Bequest. Income for scholarship on competitive examination.
- 223 LITTLE, Arthur Dehon, MEMORIAL, 1937. Balance \$158,675.53. Bequest under will of Dr. Arthur D. Little. Income to be used in Departments of Chemistry and Chemical Engineering. (The unexpended 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 \$3,310 at June 30, 1951.)
- 746 LITTLE, Arthur D., Inc., 1951, \$11,600. Grant for low temperature research.

- 817 LITTLE, Arthur D., MEMORIAL LECTURESHIP, 1944-50, \$16,600. Gift of Arthur D. Little, Inc., for purpose indicated.
- 459 LOCKE, Charles E., MEMORIAL, 1951, \$10,000. Reclassification of Class of 1896 fund on basis of a class resolution.
- LOGAN, Hiram H., 1933-46, \$44,195.79. Bequest. Principal and income for general purposes of M.I.T. \$19,455 appropriated for educational plant, 1940. Balance for new construction, 1947.
- LONGYEAR, John M., 1915-16, \$30,000. Gift. Used for land and equipment, 1916.
- 460 LORING, Elisha T., 1890, \$5,000. Bequest. Income for assistance of needy and deserving pupils.
- 614 LOW TEMPERATURE REFRIGERATION LABORATORY, 1951, \$12,200. Gifts of several concerns interested in this laboratory.
- 461 LOWELL INSTITUTE, 1923, \$2,000. Gift from alumni of Lowell Institute to establish scholarships for its graduates.
- 225 LOWELL, Katharine Bigelow, 1895, \$5,000. Gift of Augustus Lowell in honor of Mrs. Lowell. Income for purchase of books and apparatus for Department of Physics.
- 988 LOWELL, Percival, SCHOLARSHIP, 1949, \$30,000. Fund created by gift of real estate to be sold and proceeds to be used for special fund, to pay annuity to donor and on her death to create a scholarship fund.
- LYMAN, Arthur T., 1913, \$5,000. Bequest. Used for educational plant, 1926.
- McGREGOR, James, 1913, \$2,500. Bequest. Used for educational plant, 1926.
- 818 MACOMBER, John R., 1948-51, \$7,163. Gift. For general expenses.
- 462 MACLAURIN, Alice, 1951, \$523. Gifts to create scholarship in memory of Mrs. Richard C. Maclaurin.
- 148 MAIN, Charles F. and Charles R., MEMORIAL FUND, 1951, \$5,150. Gift of the family and of the Associates of Chas. T. Main, Inc. Income for general purposes.
- 463 MARDEN, Rupert A., 1933, \$2,000. Gift (anonymous). Income to aid worthy student — Protestant and of American origin — preference to student taking Cooperative Course in Electrical Engineering (Course VI-A).
- 663 MARTIN, Augustus B., Jr., 1950, \$64,890. Bequest of Alice G. Martin in memory of her brother, for the general purposes of the Institute. Bequest includes land at Boothbay Harbor, Maine, carried at no value.
- 464 MARTIN, Waldo A., 1950, \$10,000. Gift. Income for freshman scholarship with restrictions until 1975, and then with preference to graduates of Milton High School, Milton Academy, or residents of Milton.
- 289 MASON, William P., 1868, \$18,800. Bequest. Income to support a professorship in the Institute.
- M.I.T. ALUMNI, 1907. Total subscriptions of alumni to 1924, \$632,500. \$632,000 appropriated for new equipment, Walker Memorial, 1916 Reunion, and Dormitories.
- M.I.T. ALUMNI GYMNASIUM, 1938-42. Total subscription \$400,000. Appropriated for Briggs Field House, for Athletic Field, and for swimming pool.

- M.I.T. ALUMNI, 1940-49. Plan adopted by the alumni of the Institute for the annual raising of funds for support of the Alumni Association and the *Technology Review* — the balance to be applied toward specific purposes other than operating expenses of the Institute. Total \$695,508. In 1947, \$500,000 was applied to the new Senior Dormitory construction, and \$10,000 toward new Tennis Courts. In 1949-50 the balance was applied toward Hayden Library.
- 820 M.I.T. ALUMNI, 1949-50. Net subscriptions of the tenth year of operation. Balance \$80,667.
- 821 M.I.T. ALUMNI 1950-51. Net subscription \$1,349.
- 933 M.I.T. ALUMNI ASSOCIATION PERMANENT, 1929-49. Balance \$109,102. Deposited with M.I.T. for investment purposes only.
- 465 M.I.T. CLUB OF CHICAGO, 1944-49, \$6,750. Gift. For scholarships.
- 664 M.I.T. LITTLE TRUST, 1951, \$4,941. Rental income on machinery received as beneficiary of the trust, for general use.
- 822 M.I.T. TEACHERS' INSURANCE. Refund of premiums paid on Group Insurance under M.I.T. Pension and Insurance Plan held at interest and accumulated, plus unused part of 2% M.I.T. appropriation for Group Insurance annual premium. Appropriated for special pension purposes only. Balance \$285,859.
- 960 M.I.T. WOMEN'S DORMITORY, 1948-50. Contributions for additional equipment and replacements. Present balance \$1,359.
- 467 MATHEWS, Margaret A., 1947, \$111,682. Bequest. For scholarship. For women students who expect to become teachers.
- 749 MAURAN, John Lawrence, 1934, \$10,000. Bequest. Principal and income for benefit of Department of Architecture. Used, in part, toward house projects in Wellesley and Wakefield, 1937-40.
- 227 MAY, George Henry, 1914, \$4,250. Gift. Income for benefit of Chemistry Department.
- 469 MAY, George Henry, 1914, \$5,000. Gift. Income to assist graduates of Newton High School recommended as eligible by superintendent and head masters of Newton High School. Beneficiary to issue a note payable without interest.
- 147 McCAMMON, Thomas, 1930, \$15,000. Bequest in honor of father, James Elder McCammon. Income available for general purposes.
- 561 and 591 MEAD, George J., 1951, \$281,570. Bequest, 80% for Loan Fund for outstanding students in field of power plants for airplane propulsion, and 20% as a prize fund to stimulate all students in the aeronautical field to their best possible efforts.
- 562 MEANS, James, 1925, \$2,700. Gift of Dr. James H. Means as a memorial to father. Income for annual prize for essay on an aeronautical subject.
- 592 MEDICAL DEPARTMENT NEEDY STUDENT. Appropriation by M.I.T. to assist needy students in payment of medical and hospital bills.
- MERRILL, Charles E., 1943, \$2,300. Used for new construction, 1947.
- 750 MERRILL FOUNDATION, 1949, \$25,000. For special research in the field of Industrial Relations.

- 615 METALS PROCESSING LABORATORY, 1947-49. Contributions for construction and equipment. Present balance \$16,923.97.
METALLURGY, SPECIAL, 1938, \$10,000. Subscription (anonymous) used for special equipment for Department of Metallurgy.
- 665 METCALF, Alice Butts, 1945, \$100,000. Bequest for unrestricted use. \$50,000 used for new construction, 1947.
- 666 METCALF, Leonard, MEMORIAL, 1950-51, \$99,305. Bequest of Alice Metcalf in memory of her brother for the general use of the Institute.
- 579 MILLER, Edward F. and Mary R., 1941, \$10,000. Bequest. To be used at discretion of Bursar as a fund in assisting needy students who have been found by the medical director to require special medical or surgical treatment.
MILLS, Hiram F., 1923, \$10,175. Bequest. Appropriated for educational plant, 1937.
- 471 MILNE, Robert W., 1943, \$75,856. Bequest. Income for assistance of worthy and needy students.
- 751 MINNS, Susan, 1930. Gift of Miss Susan Minns — tract of land on Memorial Drive for use in any way deemed best for benefit of plan regarding construction and maintenance of an hydraulic laboratory. Carried at \$40,000.
- 473 MIRRLEES, James H., 1886, \$2,500. Gift of James Buchanan Mirrlees. Income to such student in third or fourth year Mechanical Engineering most deserving pecuniary assistance.
- 823 MITSCH, John D., MEMORIAL, 1946. Balance \$3079. Contributions toward memorial to the late Professor Mitsch and education of his children.
- 753 MOORE, Forris Jewett, 1927-31, \$32,000. Gift of Mrs. F. Jewett Moore as a memorial to husband. Income or principal (under special conditions) expendible subject to approval of Executive Committee by a committee of three members of the Department of Chemistry — to make the study of Chemistry more interesting and surroundings of such study more attractive.
MOORE, Mrs. Forris Jewett, 1951, \$75,000. Bequest of her home on Memorial Drive refurnished for Dean's House.
- 321 MOORE, 1914-28-29, \$24,200. Gift of Mrs. F. Jewett Moore. Income to help some Institute graduate to continue studies in Europe, especially organic chemistry. Preference to student who has distinguished himself in this subject while an undergraduate. Present balance \$37,137.
- 475 MORRILL, FRED W., 1941, \$2,000. Bequest. Income for financial assistance to students.
- 149 MORSE, Kate M., 1925, \$25,000. Bequest. Income for general purposes of M.I.T.
- 151 MORSS, Everett, 1934, \$25,000. Bequest. Income for general purposes of M.I.T.
MORSS, Everett, 1916, 1921-25, \$35,000. Gifts. For Walker Memorial murals by E. H. Blashfield.

- 825 MORSS, Henry A., NAUTICAL FUND 1937, \$3,500. Gift for maintenance of sailing activities and sailing pavilion.
- 667 MORSS, John Wells, 1940, \$50,000. Bequest. Principal and income for general purposes.
- 152 Munch, Samuel, MEMORIAL, 1950, \$1,200. Gift of Benjamin S. Munch for memorial to his father, income to be used for general educational purposes.
- MUNSELL, Albert H., 1920, \$7,908.28. Bequest. Used for educational plant, 1928.
- MUNSELL, Margaret A., 1920, \$1,105.32. Bequest. Used for educational plant, 1928.
- NASH, Nathaniel C., 1881, \$10,000. Bequest. Appropriated for new dormitories, 1924.
- 669 NEWLIN, E. Mortimer, 1951. Income of a trust available for operating expenses, with preference for teaching salaries. Principal, when received, to be added to general endowment.
- 477 NICHOLS, 1895, \$5,000. Bequest of Betsy F. W. Nichols. Income for scholarship to student in Chemistry.
- 479 NICHOLS, Charles C., 1904, \$5,000. Bequest. Income for scholarship.
- 478 NICKERSON, William E., 1949-50, \$35,378. Bequest. Income for undergraduate scholarships.
- 670 NICKERSON, William E., 1949-50, \$35,379. Bequest for general purposes.
- NICKERSON, William E., 1928, \$50,000. Gift. Principal and income used to finance chair in Humanics, 1928-40.
- 323 NORRIS, James F., 1949-50, \$59,592. Bequest. Income for graduate fellowships.
- 755 NUCLEAR SCIENCE AND ENGINEERING, 1947-50, \$67,000. For research.
- OLIVER, Moses W., 1921, \$12,870.49. Used for educational plant, 1938.
- ORVIS, Christel, 1942, \$539.42. Bequest. Used for new construction, 1947.
- 271 OSBORNE, George A., 1928, \$10,000. Bequest. Income for benefit of mathematical library.
- 481 OSGOOD, John Felt, 1909, \$5,000. Bequest of Elizabeth P. Osgood in memory of husband. Income for scholarship in Electricity.
- 757 PAINE, F. Ward, 1944, \$10,000. Bequest. For special research in Geology.
- 954 PARK, Charles Francis, MEMORIAL, 1947, \$5,500. For investment purposes.
- 758 PARKER, Theodore B., MEMORIAL, 1945-46, \$3,000. For special graduate scholarships.
- 483 PARMELEE, George L., 1921, \$17,641. Bequest. Income for tuition of either special or regular worthy students.

- PATCH, Emerette O., 1935-38, \$8,240.84. Bequest. \$5,964 used for special expenditures, 1938-40. Balance for new construction, 1947.
- PEABODY, Frank E., 1920, \$51,467.35. Bequest. Used for educational plant, 1921 and 1926.
- 484 PECKER, Frank Stetson, SCHOLARSHIP, 1948, \$59,731.18. Bequest.
- PERKINS, Frances M., 1912, \$122,569.67. Bequest. Used for educational plant.
- PERKINS, H. B., 1940 and 1949, \$354. Bequest. Used for new equipment in 1940 and development program in 1949.
- 153 PERKINS, Richard, 1887, \$50,000. Bequest. Income for general purposes.
- 485 PERKINS, Richard, 1887, \$50,000. Bequest. Income for scholarships.
- 325 PERKINS, Willard B., 1898, \$6,000. Bequest. Income to be expended every fourth year for traveling scholarships in architecture.
- 231 PETERS, Edward D., 1924, \$5,000. Bequest of Elizabeth W. Peters. Income for the Department of Mineralogy.
- PHILBRICK, E. S., 1922, \$36,213.92. Bequest. Used for educational plant, 1926.
- 861 PHOTO SERVICE RESERVE, 1945-49. For equipment and maintenance of Photo Service.
- PLAYER, Preston, 1933, \$20,000. Bequest. Used for educational plant, 1938.
- 233 PRATT NAVAL ARCHITECTURAL, 1916, \$1,071,000. Bequest of Charles H. Pratt to endow the Department of Naval Architecture and Marine Engineering to be called forever Pratt School of Naval Architecture and Marine Engineering — to erect a building — remainder \$395,676, held in trust. Income to support said school.
- 759 PRATT SPECTROSCOPY, 1950, \$42,000. Gift of John L. Pratt for Spectroscopy Laboratory.
- 486 PRAY, Charles H. and Helen Bartlett, 1951, \$47,646.29. Bequests from their estates to be used for scholarships for needy students.
- PRESCOTT, Charles O., 1935, \$30,640.78. Principal and income used for educational plant, 1938.
- 829 PRESIDENT'S SPECIAL, 1941-44, \$10,500. Gifts. Principal and/or income to be used by President as desired.
- 234 PRICE, Raymond B. MEMORIAL, 1948-50, \$12,000. Gift. Income for research in chemistry or related sciences.
- 487 PRINCE, Florence E., 1943, \$7,689.28. Bequest. Income for aid to worthy students.
- 760 RADIOACTIVITY CENTER, 1945. Balance \$35,347. Appropriation for postwar research.
- 155 RANDALL, J. W. & B. L., 1897, \$83,452. Bequest of Belinda L. Randall as a permanent fund or in erecting a building with those names.

- 489 READ, Thomas Adelbert, 1934-35, \$21,117. Bequest of Julia A. Read to establish scholarship in memory of her brother and their father and mother. Income to be awarded to some worthy and needy student, preferably resident of Fall River, Mass.
- 491 REEVES, Willis Ward, 1946-49, \$2,850. For undergraduate scholarships.
- 493 RICHARDS, Charles A., 1939, \$31,719.32. Bequest. Income only to be used for assistance of poor Protestant students in the Institute.
- 235 RICHARDS, Ellen H., 1912, \$15,076. Income for promotion of research in Sanitary Chemistry, for fellowships to advanced students, for employment of research assistants, and in such other ways as will best promote investigation in that field.
- 761 RICHARDS MEMORIAL, 1929. Balance of subscriptions from friends for portrait of Professor Robert Hallowell Richards available for the Department of Metallurgy.
- 237 RICHARDSON, Charlotte B., 1891, \$30,000. Bequest. Income to support of Industrial Chemical School.
- 494 ROACH, John, SCHOLARSHIP, 1937. Balance \$6,290. Bequest under will of Emeline Roach, income to provide annual scholarship to needy and deserving student in Naval Architecture and Marine Engineering.
- ROBB, Russell, 1928, \$28,750. Bequest. Appropriated for new dormitories, 1930.
- 495 ROBBINS, Karl, 1951, \$25,000. Gift of Robbins Foundation. Income for scholarship or fellowship in field of textile technology with some preference to students from southern states.
- ROCKEFELLER FOUNDATION RESEARCH, 1931-36, \$170,000. Contributed and expended for Research in Science Departments over period of five years.
- 156 ROCKEFELLER, John D., Jr., 1950 \$1,021,475. Unrestricted gift, but functioning as endowment with income for continuing operating needs of the Institute.
- 291 ROGERS, Henry B., 1873, \$25,000. Gift. Income for salaries of one or more professors or instructors.
- 327 ROGERS, Henry Bromfield, 1921, \$20,057. Bequest of Anna Perkins Rogers. Income to establish fellowship or scholarship for women graduates of M.I.T. or other colleges whose graduate work is carried on at M.I.T.
- 239 ROGERS, Henry Darwin, 1951, \$2,723. Bequest under will of Mary Otis Russell in memory of her father. Income to be used annually for research.
- 593 ROGERS, Minnie Hempel, 1945, \$1,195.04. Bequest for student loans.
- ROGERS, Robert E., 1886, \$7,600. Bequest in memory of his brother, William B. Rogers. Used for new equipment, 1940.
- 830 ROGERS, "Tubby," 1949-51, \$1,323. Contributions for special fund as a memorial to Professor Rogers.

- 496 ROGERS, William Barton. Present balance \$36,505. Established by subscriptions of members of Alumni Association through Prof. R. H. Richards for loans to students. By vote of Executive Committee in March 1935, approved by Alumni Council, the income, not now needed for loans, is made available for special scholarship aid in the discretion of the President and Treasurer.
- 157 ROGERS, William Barton, MEMORIAL, 1883-85, \$250,225. Contributions from 91 persons. Income for support of Institute.
- 241 ROGERS, William Barton and Emma Savage, 1937, \$102,064.18. Bequest of Dr. Francis H. Williams including unvalued land at Truro, Mass. Income to be added to principal for twenty years — after which 80 per cent of income may be used for research in pure science — balance to be added to fund. Present balance \$208,408.
- 243 ROPER, Francis E., 1936, \$2,000. Bequest. Income for use in Department of Mechanical Engineering.
- 273 ROTCH, Arthur, ARCHITECTURAL, 1895, \$5,000. Bequest. Income for Library or collection for Department of Architecture.
- 245 ROTCH, Arthur, 1895, \$25,000. Bequest. Income for general purposes of Department of Architecture.
- 565 ROTCH, Arthur, 1895, \$5,000. Bequest. Income for annual prize to student in regular course in Architecture graduating highest in class.
- 567 ROTCH, Arthur, SPECIAL, 1895, \$5,000. Bequest. Income for annual prize to student who shall be ranked highest at end of two years' special course in Architecture.
- 329 RUSSEL, Richard Lee, 1904, \$2,000. Gift of Theodore E. Russel. Income to assist worthy student of high standing in Department of Civil Engineering either undergraduate or postgraduate.
- 497 RYAN, William Patrick, MEMORIAL, 1935, \$3,557. Contributed by friends of Professor Ryan. Income for scholarship in Chemical Engineering.
- 831 RYAN, William Patrick, SPECIAL, 1933. Appropriation. Educational fund for three children of late Prof. W. P. Ryan.
- 955 SAILING PAVILION RESERVE — New Equipment, 1951, \$693.00. Amount reserved from membership dues for future replacement of equipment.
- 568 SALISBURY, Henry Webb, 1941, \$1,000. Gift. Income for award to outstanding student in Aeronautics — initially in form of reference books in Aeronautics. (\$100 of gift to be considered as income.)
- 159 SALTONSTALL, 1901, \$40,000. Bequest of Henry Saltonstall. One-fourth income each year added to principal and remaining three-fourths expended for benefit of Institute. Present balance \$70,303.87.
- 331 SALTONSTALL, Henry, 1901, \$10,000. Bequest. Income to aid one or more needy students.
- 160 SARGENT, Homer E., Class of 1898, 1950-51, \$4,990. Gift. Income for general purposes.

- 333 SAVAGE, James, 1873, \$10,000. Bequest. Income for scholarships in institution "where my son-in-law, William B. Rogers, is President."
- 161 SAWYER, Samuel E., 1895, \$4,764. Bequest. Income to be used in such a manner as will best promote interests of M.I.T.
- 499 SCHENKL, John P., 1922, \$43,821. Bequest of Johanna Pauline Schenkl in memory of father. Income for scholarships in Department of Mechanical Engineering.
- 248 SCHWARZ, Dorothy B., MEMORIAL, 1951, \$1,000. Gift of Fabric Research Laboratories, Inc., Walter J. Hamburger, Ernest R. Kaswell and Kenneth R. Fox. Income only to be used preferably for Textile Technology.
SCHWARZ, Theodore Edward, MEMORIAL, 1937-38, \$4,391.86. Gift. Used for equipment of a room for map collection.
- 833 SEDGWICK MEMORIAL LECTURE, 1930-49. Bequest of Mary Katrine Sedgwick in memory of husband. Proceeds of interest in copyrights and from contracts with publishers for benefit of Department of Biology.
- 763 SEDGWICK, W. T., 1928, \$69,500. Received from Trustees of the Estate of W. T. Sedgwick under Agreement and Declaration of Trust following decease of Mary Katrine Sedgwick for Department of Biology.
- 500 SEGHERS, Paul D., Jr., SCHOLARSHIP, 1948, \$4,800. Bequest. Income for annual scholarship.
SENIOR HOUSE, 1947, \$500,000. Gift of Alumni Association from accumulated Alumni Fund, for new dormitory unit. Used for new dormitory, 1948.
- 765 SERVOMECHANISMS LABORATORY, 1943. Appropriation from Industrial Fund for postwar research.
- 767 SERVOMECHANISMS RESEARCH. Proceeds from royalties for research.
SEWALL, Richard B., 1919, \$30,000. Bequest. Used for educational plant, 1924.
- 501 SHERMAN, Frank Arnold, 1947, \$10,000. Bequest. For scholarships with preference to Westerly, R. I., students.
- 503 SHERWIN, Thomas, 1871, \$5,000. Gift of Committee on Sherwin Memorial Fund for free scholarship to graduate of English High School.
- 569 SILENT HOIST & CRANE Co., Material Handling Award, 1951, \$5,000. Gift of the Wunsch Foundation to provide annual prizes for the best paper or theses submitted on subjects in the fields of production, materials handling, or machine design related to materials handling equipment.
- 293 SLOAN, Alfred P., PROFESSORSHIP, 1945-49, \$350,000. For endowment of Professorship in Industrial Management.
- 619 SLOAN, Alfred P., Metals Processing Laboratory 1950, \$1,000,000. Gift for building and equipment.
- 769 SLOAN AUTOMOTIVE LABORATORY, 1929-48, \$165,000. Gift. Expended for automotive laboratory.
SLOAN FOUNDATION, 1946-49, \$215,000. Expended for Automotive Laboratory.

- 617 SLOAN FOUNDATION, 1951, \$2,500,000. Gift for the School of Industrial Management.
SLOAN, George A., 1945, \$500. Gift. Used for new construction, 1947.
SMITH, Ellen Vose, 1930, \$25,000. Bequest. Used for new equipment.
- 505 SMITH, G. H. Miller, 1946, \$10,000. For undergraduate scholarships.
- 506 SMITH, H. Hilliard, 1951, \$5,000. Bequest of Mrs. Grace J. F. Smith in memory of her husband, H. Hilliard Smith. Class of 1896, for purpose of assisting young men contemplating the profession of architecture.
- 507 SMITH, Horace T., 1930, \$33,019. Bequest. Income for scholarships. Preference to graduates of East Bridgewater (Mass.) and Bridgeport (Conn.) High Schools.
- 956 SMITH, Lillie C., 1937, \$4,800. Bequest to M. I. T. Women's Association for purposes of the Association.
- 957 SNOW, Walter B., 1938-49. Reserve funds of Technology Christian Association Advisory Board. Deposited for investment purposes.
- 251 SOLAR ENERGY, 1938, \$643,511.63. Gift of Dr. Godfrey L. Cabot. Principal to be held for fifty years — income to be used in development of the art of converting energy of the sun to use of man by mechanical, electrical, or chemical means. After fifty years, fund becomes part of general unrestricted endowment of the Institute.
- 509 SONS AND DAUGHTERS OF NEW ENGLAND PURITAN COLONY SCHOLARSHIP, 1931, \$600. Gift. Income for scholarship aid to a boy of New England ancestry.
- 771 SPECIAL RESEARCH (PADELFORD). Balance \$3,070. For research.
- 511 SPOONER, Anna, 1939-41, \$10,896. Bequest. Income to be used in assisting meritorious students.
- 163 SPRING, Andrew Hastings, 1921, \$50,000. Bequest of Charlotte A. Spring in memory of nephew as a permanent fund. Income for general purposes.
STONE, Charles A., 1912-24, \$15,000. Gift for land. 1928, \$25,023.59. Gift for dormitories.
STONE, Galen L., 1912, \$10,000. Gift for land. 1916, \$10,000. Gift for Mining Building.
- 165 STONE, George G., 1939, \$4,677.35. Bequest by will of Eliza A. Stone as memorial to brother, a graduate in Mining Engineering in 1889. Income to be used in manner most useful to Institute as well as a most fitting memorial.
- 571 STRATTON, Samuel W., PRIZE, 1933, \$1,880. Contributed by friends of the late Dr. S. W. Stratton for competitive prizes in the presentation of scientific papers.
- 595 SUMMER SURVEYING CAMP LOAN, 1927, \$500. Gift of Lamot du Pont as a revolving loan fund to help students in Civil Engineering attend summer surveying camp. Present balance \$3,350.
- 671 SUMNER, Edward A., 1950, \$10,694.44. Bequest for general purposes of the Institute.

- 775 SWEET, Henry N., 1936, \$8,036.50. Bequest. For industrial research.
- 167 SWEETSER, Seth K., 1915, \$25,061. Bequest as a permanent fund. Income for general purposes.
- 335 SWETT, Susan H., 1888, \$10,000. Bequest. Income to support a graduate scholarship.
- 777 SWIFT AMINO ACID, 1947. Balance \$10,200. For research.
- 337 SWOPE, Gerard, GRADUATE FELLOWSHIPS, 1945, \$100,050. Gift. Income annually or from time to time to be granted as Gerard Swope Fellowships under certain conditions and with certain preferences. Principal to be maintained except under conditions presented.
- 673 TAMKIN, Herman W., 1948-49, \$14,860.13. Bequest. For general purposes.
- 168 TALBOT, Henry P., 1949, \$45,243. Bequest. Income for general purposes.
- 835 TAU BETA PI MEMORIAL SCHOLARSHIP, 1948-49, \$2,589.85. Contributions. For special scholarship purposes.
- 580 TEACHERS', 1899-1900. Gifts of \$50,000 each from Augustus Lowell and A. Lawrence Lowell to establish fund, the income of which is for use in case of retirement, disability, or death of members of instructing staff.
- 958 TECHNOLOGY CHRISTIAN ASSOCIATION, 1949. Deposited for investment purposes.
- 597 TECHNOLOGY LOAN, 1930-41. Present balance \$2,151,191. Contributed by eighteen alumni to provide loans for students.
- 959 TECHNOLOGY MATRONS' TEAS, 1916-22-31, \$8,500. Gifts of Mrs. F. Jewett Moore. Income for social activities of Technology Matrons.
- 839 TECHNOLOGY PRESS, 1946-49. Royalties on books published. For special expense.
- 962 TECH SHOW TRUST, 1950. Deposit for investment.
- THAYER, NATHANIEL, 1906, \$25,000. Gift. Used for educational plant.
- 295 THAYER, Nathaniel, 1868, \$25,000. Gift. Income for professorship of Physics.
- 581 THOMAS, W. B. S., 1935-50, \$4,002.50. Gift of parents of W. B. S. Thomas '29, the income only to be expended, one-half for the benefit of the M. I. T. Crew and one-half to other activities of the M. I. T. A. A.
- 297 THOMSON, Elihu, 1933-49, \$23,700. Contributed toward fund for Professorship in Electrical Engineering.
- THOMSON, Elihu, 1912, \$25,000; 1924, \$5,000. Gift. Used for purchase of land.
- THORNDIKE, Sturgis H., 1928, \$15,000. Bequest. Appropriated for new dormitories, 1930.
- 339 THORP, Frank Hall, 1932, \$10,000. Anonymous gift. Income for fellowship in Industrial Chemistry.

- 340 TILLOTSON FELLOWSHIP, 1948, \$1,900. Gift. For Graduate Fellowship in Electrical Engineering.
- 598 TIMBIE, William H., LOAN, 1948, \$4,860.50. Contributions to assist needy students in the Cooperative Course in Electrical Engineering.
- 513 TINKHAM, Samuel E., 1924, \$2,338. Gift of Boston Society of Civil Engineers. Income to assist worthy student in Civil Engineering.
- 275 TOD, John Hume, 1913, \$2,500. Gift of Mrs. F. Jewett Moore. Income for purchase of books of a humanistic character for General Library.
- 515 TOUGH, F. B., 1924, \$465. Gift to extend financial assistance to worthy students in mining or oil production.
- 675 TOWLE, 1944-46, \$10,500. Gift. For general purposes.
- 841 TOWLE LECTURE, 1947, \$1,000. Gift. For special lectures.
- 781 TREAT, Nellie Florence, 1944, \$609. Bequest. For use in the field of Food Technology.
- 677 TRIPP, Charles A., 1943, \$100,000. Bequest. For dormitory construction — or such other use of all or part as may seem advisable.
- 800 TUCKER, Charles W., 1951, \$500. Bequest for purchase of books for the Eastman Library.
- 255 TURNER, Edmund K., 1915-41, \$206,814. Bequest. Income, three-quarters for Department of Civil Engineering and one-quarter to be added annually to principal. Present balance \$297,138.
- TUTTLE, Lucius, 1916, \$50,000. Bequest. Used for educational plant, 1918.
- 783 TWENTIETH-CENTURY-FOX FILM RESEARCH CORPORATION, 1947, \$2,500. For research.
- 582 TYLER, Alice Brown, 1937-41, \$1,559.64. Gift of Prof. and Mrs. H. W. Tyler. Income to be used for benefit of women students at the Institute.
- 963 UNDERGRADUATE ACTIVITIES TRUST, 1935. Established by 1915 Technique Board from which recognized student activities may borrow, if deemed necessary and desirable, at a low rate.
- 967 UNDERGRADUATE DUES RESERVE, ATHLETICS. Transferred from Undergraduate Dues (current operating account) to secure investment income.
- 969 UNDERGRADUATE DUES RESERVE, CONTINGENT. Transferred from Undergraduate Dues (current operating account) to secure investment income.
- 965 UNDERGRADUATE PUBLICATIONS TRUST, 1935. Deposited by Alumni Advisory Council on Publications for investment purposes only.
- 785 UNDERWOOD, William Lyman, 1932, \$16,252. Bequest. For benefit of Biology Department or otherwise for general purposes.
- 256 UNITED FRUIT COMPANY, 1950, \$250,000. Grant functioning as endowment.
- 517 UPHAM, Susan, 1892, \$1,000. Gift. Income to assist students deserving financial aid.

- 341 UPHAM, Thomas, 1939-46. Balance \$409,019. Bequest of Marcella B. Upham. Principal to be held as a permanent trust fund, the income to be used in assisting poor and deserving students or graduates of the Institute.
- 519 URBINO, Samson R., 1927, \$1,000. Bequest. Income for students who need assistance, Germans preferred.
- 863 USE OF FACILITIES RESERVE, 1945-51. Appropriated from research contract overhead revenues as applicable to use of physical plant and equipment.
- 277 VAIL, Theodore N., 1925-49, \$68,072.34. Bequest. For benefit of Vail Library.
- 343 VERGES, Luis Francisco, 1924, \$10,000. Gift from Caroline A. Verges. Income for graduate students doing research work in sugar industry or, if no such candidate, undergraduate student in Civil Engineering.
- 521 VERMONT SCHOLARSHIP, 1924-37, \$25,000. Gift of Redfield Proctor, '02, in memory of Vermonters who, having received their education at the Institute, served as engineers in the armies of the Allies in the first World War. Income to students preferably from Vermont. Mr. Proctor reserves right to designate recipients as long as he lives.
- 523 VOSE, Ann White, 1896, \$60,718. Bequest. Income for free scholarships for young men of American origin.
- WADLEIGH, Horace W., 1916-20, \$22,143.14. Bequest. Appropriated for new buildings, 1924.
- 525 WAITT, Arthur M., 1925, \$9,761. Bequest. Income for deserving students in second-, third-, and fourth-year classes in Mechanical Engineering.
- 679 WALKER, Grant, 1943-47, \$80,500. Bequest. For general purposes. \$50,000 used 1949. Present balance \$35,482.
- 527 WALKER, Grant, 1944, \$50,000. Bequest. Income for scholarships.
- 169 WALKER, William J., 1915-17, \$23,613. Bequest. Income for general purposes.
- 865 WALKER MEMORIAL RESERVE. For purposes of repair and renovation of the building.
- 867 WALKER MEMORIAL DINING SERVICE RESERVE. For repair and replacement of Dining Service Equipment.
- 257 WARE, William R., 1939, \$15,000. Gift of Mr. and Mrs. William Emerson, the income to be at the disposal of the Dean of the Architectural School for extra budgetary purposes.
- 170 WASTCOAT, Richard, MEMORIAL FUND, 1951, \$4,500. Gift of family and of Paragon Gear Works, Inc. Income only to be used for general purposes.
- 621 WATERBURY, Charles D., 1941. Present balance \$19,389. Bequest. For erection of a building as a memorial to above-named at such time as M. I. T. shall decide.

- 171 WATSON, Horace Herbert, 1930-48, \$36,057.19. Bequest of Elizabeth Watson Cutter as a permanent fund. Income for general purposes.
- 172 WATT, Arthur P., MEMORIAL, 1949-51, \$6,712. Bequest. Income for general purposes.
- 529 WATT, James, SCHOLARSHIP, 1942, \$13,259.72. Bequest under will of Jennie A. Douglas. For scholarships in Mechanical Engineering.
- 681 WEBSTER, Edwin S., 1950, \$25,217.50. Gift for unrestricted use of the Institute.
 WEBSTER, Edwin S., 1912-24, \$15,000. Gift. Used toward purchase of land.
 WEBSTER, FRANK G., 1931, \$25,000. Bequest. Used for new construction, 1947.
- 531 WEISBEIN, Louis, 1915, \$4,000. Bequest. Income for scholarship for student in Architectural Department, preference to be given to a Jewish boy.
- 173 WELCH, Albion B. K., 1871, \$5,000. Bequest as a permanent fund. Income for general purposes.
 WELD, Charles G., 1907, \$15,000. Gift. Used for educational plant, 1924.
- 175 WESTCOTT, Everett, 1935-51, \$175,994. Bequest as a permanent fund. Income for general purposes.
- 177 WESTCOTT, Marion, 1938-51, \$248,305. Bequest for endowment. Income for general purposes.
- 533 WESTON, Frances Erving, 1912-31, \$5,000. Bequest. Income to aid a native-born American Protestant girl of Massachusetts.
- 535 WESTON, Samuel Martin, 1912-31, \$5,000. Bequest of Frances E. Weston in memory of husband. Income to aid a native-born American Protestant boy; preference to be given one from Roxbury.
- WHEELER, Alexander S., 1907-16, \$30,000. Contributed by friends. Used for new dormitories, 1924.
- 989 WHEELER, Knight W., 1950, \$20,000. Subject to life annuity provisions.
- WHITE, George R., 1912, \$10,000. Gift. Used toward purchase of new site.
- 537 WHITING, Amasa J., 1927, \$4,515. Bequest of Mary W. C. Whiting. Income as scholarship to deserving students; preference to students from the town of Hingham, Massachusetts.
 WHITNEY, Edward, 1910, \$37,171. Bequest as a memorial to him and his wife, Caroline. Principal and interest used (1930-38) for conduct of research in geophysics.
- 345 WHITNEY, Jonathan, 1912. Present balance \$520,819. Bequest of Mrs. Francis B. Green. Income to assist poor and deserving young men and women in obtaining an education at M. I. T.
- 683 WIESS, Harry C., 1947-49, \$135,800. Gift. For unrestricted purposes. Income to be added to Fund. Present balance \$163,569.

- 179 WIGGLESWORTH, George, 1931, \$25,000. Bequest. Ten per cent of gross annual income to be added to principal, balance of income for general purposes of the Institute. Present balance \$27,089.
WIGGLESWORTH, George, 1917-24, \$65,000. Gift. Used for additional land purchase, 1924.
- 259 WILDER, Stephen H., 1951, \$1,174. From the estate of Edith Carson Wilder. Income only to be used for scientific research.
- WILKS, H. Sylvia A. H. G., 1948, \$175,000. Round Hill property, Dartmouth, Massachusetts.
- 684 WILLISTON, Belle A., 1948, \$17,118.68. Bequest for general purposes.
- 539 WILLMANN, Elizabeth Babcock, 1935, \$5,065. Bequest. Income to be used toward tuition of young women students taking Chemistry courses.
- 990 WITMER, George S., 1938-50. Balance \$85,419. In Trust, subject to special annuity provisions.
- 686 WOOD, Edwin J., 1949, \$5,000. Bequest for general purposes.
WOOD, Kenneth F., 1926, \$25,000. Bequest. Appropriated for new dormitory, 1930.
WRIGHT MEMORIAL WIND TUNNEL, 1937-41, \$95,795. Contributed by friends toward construction of wind tunnel.
- 181 WYETH, Edwin A., 1913-35, \$254,704. Balance of Trust Fund held by M. I. T. from 1913 for itself and five other beneficiary institutions subject to annuity. Distributed January, 1935. Fund separately invested until June 30, 1943. Net income available for general purposes of the Institute.
- 541 WYMAN, Morrill, 1915-16, \$66,538. Bequest. Income to aid deserving and promising students upon understanding that if in later 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

- ASHLEY, HOLT and GEORGE HAVILAND. Bending Vibrations of a Pipe Line Containing Flowing Fluid. *J. of Appl. Mech.* 17, pp. 229-232, September, 1950.
- BISPLINGHOFF, RAYMOND L., T. H. H. PIAN, and L. I. LEVY. A Mechanical Analyzer for Computing Transient Stresses in Airplane Structures. *J. of Appl. Mech.* 17, p. 310, September, 1950.
- BISPLINGHOFF, RAYMOND L., G. ISAKSON, and T. F. O'BRIEN. Gust Loads on Rigid Airplanes with Pitching Neglected. *J. Aero. Sci.* 18, No. 1, p. 33, January, 1951.
- FINSTON, MORTON. Compressible Wake behind a Flat Plate. In U. S. Navy. Bur. of Ordnance. *Symposium on Aeroballistics* held at University of Texas, Austin, Texas, November 15-17, 1950; compiled and edited by Eleanor Crow Lyons. Pp. 279-293. 1951.
- FINSTON, MORTON. Thermal Effects in Calendering Viscous Fluids. *J. Appl. Mech.* 18, pp. 12-18, March, 1951.
- HALFMAN, ROBERT L. and HOLT ASHLEY. Aeroelastic Properties of Slender Wings. (Abstract of a paper given at the First U. S. National Congress of Applied Mechanics, Illinois Institute of Technology, Chicago, Ill., June 11-16, 1951.) *J. Appl. Mech.* 18, pp. 329-330, September, 1951.
- HUNSAKER, JEROME C. Aeronautics. *J. Franklin Institute* 251, pp. 48-57, January, 1951.
- MILLER, RENE H. Principal Factors Influencing Helicopter Control Characteristics. (Preprint of a paper presented at Congrès International de Giraviation, Paris. June, 1951.)

DEPARTMENT OF ARCHITECTURE

- BROWN, WILLIAM H., CARL KOCH, R. W. KENNEDY, RALPH RAPSON and VERNON DEMARS, *Designers*. Boston Builds Balconies. (Presentation of Eastgate Apartments, 100 Memorial Drive.) *Arch. Forum* 94, pp. 115-129, May, 1951.
- KENNEDY, ROBERT W. Form, Function and Expression. *Am. Inst. Architects J.* 14, p. 198, November, 1950.
- KENNEDY, ROBERT W. Stati Uniti. *Edilizia Moderna* No. 45, p. 85, December, 1950.
- KENNEDY, ROBERT W. Low Rent Housing — Massachusetts. *Arch. Record* 109, p. 120, May, 1951.

DEPARTMENT OF BIOLOGY

- BEAR, RICHARD S., O. E. A. BOLDUAN, and T. P. SALO. A Model for Collagen Fibril Structure Derived from Small-Angle X-Ray Diffraction. *Am. Leather Chem. Assoc. J.* 46, p. 107, February, 1951.
- BEAR, RICHARD S., O. E. A. BOLDUAN, and T. P. SALO. X-Ray Diffraction Studies of the Penetration of Stains and Tans into Collagen Fibrils. *Am. Leather Chem. Assoc. J.* 46, p. 124, February, 1951.
- BEAR, RICHARD S. and O. E. A. BOLDUAN. Periodic Statistical Distortion of Unidirectionally Ordered Diffractors, with Application to Collagen. *J. of Appl. Phys.* 22, p. 191, February, 1951.
- BEAR, RICHARD S. and H. J. RUGO. The Results of X-Ray Diffraction Studies on Keratin Fibers. *N. Y. Acad. Sci. Annals* 53, Art. 3, p. 627, March, 1951.
- BEAR, RICHARD S. and O. E. A. BOLDUAN. General Nature of the Extension of Structure Transverse to Collagen Fibril Axes. *J. of Polymer Science* 6, No. 3, p. 271, March, 1951.
- BLAKE, CHARLES H. Age Determination. *EBBA News* (Eastern Bird-Banding Assoc.) 13, p. 6, October, 1950.
- BLAKE, CHARLES H. Length of Stay of Migrants. *Bird-Banding* 21, pp. 151-152, October, 1950.
- BLAKE, CHARLES H. Ornithologists Alive! VII. James Lee Peters. *Mass. Audubon Soc. Bull.* 34, pp. 248-249, October, 1950.
- BLAKE, CHARLES H. Biographical Note on Scopoli. *Condor* 53, p. 47, January-February, 1951.
- BLAKE, CHARLES H. Communism and Genetics. *Tech Eng. News* 32, pp. 8, 28, 30, April, 1951.
- BLAKE, CHARLES H. Letter on Curriculum Changes. *Tech Eng. News* 32, p. 17, April, 1951.
- BLAKE, CHARLES H. Trapping Rose-breasted Grosbeaks. *Bird-Banding* 22, p. 81, May, 1951.
- EBERT, JAMES D. An Analysis of the Effects of Anti-Organ Sera on the Development, in Vitro, of the Early Chick Blastoderm. *J. Exper. Zool.* 115, pp. 351-378, November, 1950.
- EBERT, JAMES D. Ontogenetic Change in the Antigenic Specificity of the Chick Spleen. *Physiol. Zool.* 24, pp. 20-41, January, 1951.
- GOULD, BERNARD S. and H. M. GOLDMAN. Histologic Bioassay of 3-methyl-L-ascorbic Acid. *J. Nutrition* 43, pp. 193-200, February, 1951.
- HALL, CECIL E. Electron Microscopy of Crystalline Edestin. *J. Biol. Chem.* 185, pp. 45-51, July, 1950.
- HALL, CECIL E. Electron Microscopy of Crystalline Catalase. *J. Biol. Chem.* 185, pp. 749-754, August, 1950.
- HALL, CECIL E. Scattering Phenomena in Electron Microscope Image Formation. *J. Appl. Phys.* 22, pp. 655-662, May, 1951.

- HOCH, FREDERIC L. and BERT L. VALLEE. Characterization of Leucocyte Zinc Protein (Abstract). *J. Clinical Investigation* 30, p. 650, June, 1951.
- KOECHLIN, BERNARD A., T. H. KRITCHEVSKY and T. F. GALLAGHER. Partial Synthesis of Compounds Related to Adrenal Cortical Hormones. XV. 17, 21-Dihydroxy- Δ^4 -pregnene-3, 20-dione ("Reichstein's Substance S"). *Am. Chem. Soc. J.* 73, pp. 189-194, January, 1951.
- LION, KURT S. and E. R. POWSNER. A New Method for Ergometric Measurements. *Arch. Phys. Medicine* 31, pp. 508-510, August, 1950.
- SCHMITT, FRANCIS O. The Colloidal Organization of the Nerve Fiber. (In *Genetic Neurology*; edited by P. Weiss. p. 40. Univ. of Chicago Press, 1950.)
- SCHMITT, FRANCIS O. Review of *Biophysical Research Methods*, by F. M. Uber, New York: Interscience Press, 1950. *U. S. Quart. Book Rev.* 6, p. 252, June, 1950.
- SCHMITT, FRANCIS O., J. H. HIGHBERGER, and JEROME GROSS. Electron Microscope Observations of Certain Fibrous Structures Obtained from Connective Tissue Extracts. *Am. Chem. Soc. J.* 72, p. 3321, July, 1950.
- SCHMITT, FRANCIS O., J. H. HIGHBERGER, and JEROME GROSS. The Interaction of Mucoprotein with Soluble Collagen; an Electron Microscope Study. *Nat. Acad. Sci. Proc.* 37, p. 286, 1951.
- SCOTT, JESSE F., R. L. SINSHEIMER, and J. R. LOOFBOUROW. Ultraviolet Absorption Spectra at Reduced Temperatures. I. Principles and Methods. *J. of Biol. Chem.* 187, p. 299, November, 1950. II. Pyrimidines and Purines. *J. Biol. Chem.* 187, p. 313, November, 1950.
- SIZER, IRWIN W., W. J. HAAS, and J. R. LOOFBOUROW. Oxidation by Tyrosinase of Compounds Containing Tyrosyl Groups as Studied by Absorption Spectroscopy. *Biochimica et Biophysica Acta* 6, pp. 589-600, March, 1951.
- SIZER, IRWIN W., W. J. HAAS, and J. R. LOOFBOUROW. The Effect of Permanganate on the Ultraviolet Absorption Spectra of Aromatic Amino Acids and Proteins. *Biochimica et Biophysica Acta* 6, pp. 601-605, March, 1951.
- SIZER, IRWIN W. Enzymology and Biochemistry of the Mouth. *J. of Dental Medicine* 6, pp. 5-9, January, 1951.
- SIZER, IRWIN W. The Oxidative Inactivation of Poison Ivy Allergens by Peroxidase. *J. Investigative Dermatology* 16, pp. 103-110, February, 1951.
- SIZER, IRWIN W., W. J. HAAS, and J. R. LOOFBOUROW. A Spectroscopic Study of Oxidation by Tyrosinase of Certain Proteins, Protein Hydrolysates and Synthetic Derivatives of Tyrosine. *Federation Proc.* 10, p. 57, March, 1951.
- SIZER, IRWIN W. The Inactivation of Invertase by Tyrosinase. I. The Influence of Certain Phenolic Compounds on the Inactivation, by I. W. Sizer and C. O. Brindley. *J. Biol. Chem.* 185, pp. 323-333, July, 1950; II. The Influence of Copper and Gold on the Oxidation of Invertase and Pepsin, by I. W. Sizer and J. F. Fennessey. *J. Biol. Chem.* 188, pp. 351-359, January, 1951.

- VALLEE, BERT L., C. B. REIMER, and J. R. LOOFBOUROW. The Influence of Argon, Helium, Oxygen, and Carbon Dioxide on Emission Spectra in the D.C. Arc. *Optical Soc. Am. J.* 40, pp. 751-754, November, 1950.
- VALLEE, BERT L., C. B. REIMER, and J. R. LOOFBOUROW. The Influence of Noble Gases on Emission Spectra in the D.C. Arc. (Abstract.) *Optical Soc. Am. J.* 40, p. 803, November, 1950.
- VALLEE, BERT L. and D. W. FAWCETT. Some New Approaches to the Cytologic Diagnosis of Cancer From Serous Fluids. *New England Medical Center Bull.* 12, p. 224, December, 1950.
- VALLEE, BERT L. The Function of Trace Elements in Biology. *Sci. Monthly* 62, p. 368, June, 1951.
- WAUGH, DAVID F. Ultracentrifuge Studies on ACTH. *Am. Chem. Soc. Abstracts of Papers* 118, p. 11C, 1950.
- WAUGH, DAVID F., R. E. THOMPSON, and R. J. WEIMER. Assay of Insulin in Vitro by Fibril Elongation and Precipitation. *J. Biol. Chem.* 185, pp. 85-95, July, 1950.
- WAUGH, DAVID F. and B. J. LIVINGSTONE. Clotting Time and Reaction Velocity in the Interaction of Bovine Fibrinogen and Thrombin. *Science* 113, pp. 121-124, February, 1951.
- WAUGH, DAVID F. and B. J. LIVINGSTONE. Formaldehyde as an Inhibitor of Clotting of Fibrinogen by Thrombin. *J. Phys. Colloid Chem.* 55, pp. 464-476, March, 1951.

*DEPARTMENT OF BUILDING ENGINEERING
AND CONSTRUCTION*

- DIETZ, ALBERT G. H. Potentialities of Glass in Building. *Arch. Record* 109, p. 161, April, 1951.
- GUMPERTZ, WERNER H. Reviewed foreign language articles for the *American Concrete Institute J.* 1950-1951; also reviewed for *Applied Mechanics Reviews*.
- MURRAY, JAMES A., HERMAN C. FISCHER, and D. W. SABEAN. The Effect of Time and Temperature of Burning on the Properties of Quicklime prepared from Calcite. *Am. Soc. Testing Materials Proc.* 50, pp. 1263-1282, 1950.
- MURRAY, JAMES A. and H. C. FISCHER. A Study of White Coat Plaster by Differential Thermal Analysis. *Am. Soc. Testing Materials Proc.* Preprint, 1951.
- VOSS, WALTER C. The Architects' and Engineers' Approach to Building Codes. *Boston Soc. Civil Engrs. J.* 38, p. 87, January, 1951.

*DEPARTMENT OF BUSINESS
AND ENGINEERING ADMINISTRATION*

- BECKETT, JOHN A. Accounting — A Mid-Century Appraisal. *Nat. Assoc. Cost Accountants Bull.* 32, p. 3, September, 1950.

- BECKETT, JOHN A. Distribution Costing: The Science and the Art. *Nat. Assoc. Cost Accountants Bull.* 32, p. 893, April, 1951.
- BROWN, CARROLL J. Incentive Wage Methods. *Plant Engineering Handbook*; edited by William Staniar. pp. 60-78. New York: McGraw-Hill, 1950.
- CLARK, W. VAN ALAN, JR. Review of *Dynamic Equipment Policy* by George W. Terborgh. New York: McGraw-Hill, 1949. *The Technology Review* 53, No. 1, p. 50, November, 1950.
- CLARK, W. VAN ALAN, JR. Eight Keys to Overhead. *Nat. Assoc. Cost Accountants Bull.* 33, p. 363, December, 1950.
- CUNNINGHAM, ROSS M. Evaluation of Census Tracts. *J. Marketing* 15, p. 463, April, 1951.
- HILL, THOMAS M. with other members of the Boston Class II Price Committee. *Pricing Class II Milk in the Boston Market*. U. S. Dept. of Agriculture. February, 1951.
- HILL, THOMAS M. with other members of the American Accounting Association's Committee on Concepts and Standards Underlying Corporate Financial Statements. Reserves and Retained Income—Supplementary Statement N. 1. *Accounting Rev.* 26, p. 153, April, 1951.
- ROBNETT, RONALD H., T. M. HILL, and J. A. BECKETT. *Accounting: A Management Approach*. Chicago: Richard D. Irwin, Inc., 1951.
- ROBNETT, RONALD H. Business and Fiscal Relationships in Government Sponsored Research. (In Central Assoc. College and Univ. Business Officers, April 30-May 2, 1950. *Proc.* pp. 81-88. 1951.)
- SHELL, ERWIN HASKELL. The Nature of Current Executive Decisions (In *Institute of Business and Economic Problems*, 1951, p. 55. A series of lectures jointly sponsored by the Chamber of Commerce of Pittsburgh and the School of Business Administration, University of Pittsburgh.)
- SHELL, ERWIN HASKELL. What's Ahead for Management and Labor? (In *Silver Bay Conference on Human Relations in Industry*. New York: Association Press, 1950; conducted by National Council of the YMCA's and Its Committee on Industrial Service.)
- SHELL, ERWIN HASKELL. Current Certainties in a Time of Low Visibility. *Mag. Cambridge* 10, No. 11, pp. 1-4, August, 1950.
- SHELL, ERWIN HASKELL. Leadership for the Trade Association. *Am. Trade Assoc. Exec. J.* p. 20, October, 1950.
- SHELL, ERWIN HASKELL. *The Technique of Executive Control*. Seventh Edition. New York: McGraw-Hill, 1950.
- SHELL, ERWIN HASKELL. Twelve Facts of Life for Today's Leaders. (Editorial.) *Modern Ind.* 20, No. 5, November 15, 1950.
- SHELL, ERWIN HASKELL. *Technique of Administration*. (Second Edition of his *Administrative Proficiency in Business*.) New York: McGraw-Hill, 1951.

DEPARTMENT OF CHEMICAL ENGINEERING

- GEIST, JACOB M., G. G. BROWN, and J. L. YORK. Electronic Spray Analyzer for Electrically Conducting Particles. *Ind. Eng. Chem.* 43, p. 1371, June, 1951.
- GILLILAND, EDWIN R. *Elements of Fractional Distillation*, by Clark S. Robinson and E. R. Gilliland; revised and rewritten by E. R. Gilliland. Fourth Edition. New York: McGraw-Hill, 1950.
- GILLILAND, EDWIN R. Natural and Synthetic Rubber. (In *Plant Engineering Handbook*; edited by William Staniar. pp. 163-171. New York: McGraw-Hill, 1950.)
- GILLILAND, EDWIN R. Techniques of Contacting Fluids and Solids. *Canadian Chem. and Process Industries* 34, pp. 632-639, August, 1950. (Also in *Chemistry in Canada*, 1950.)
- GILLILAND, EDWIN R. Problems in Chemical Engineering Research. *Chem. Eng. Progress* 47, p. 11, January, 1951.
- HAUSER, ERNST A. The Colloidal Nature of Antibiotics. *N. Y. Acad. Sci. Annals* 53, Art. 1, pp. 18-26, August, 1950.
- HAUSER, ERNST A. and GEORGE J. MARLOWE. Colloidal Phenomena of Antibiotics. *J. Phys. and Colloid Chem.* 54, p. 1077, November, 1950.
- HAUSER, ERNST A. Canamin Clay and its Properties. *Canadian Chem. and Process Industries* 34, p. 979, December, 1950.
- HAUSER, ERNST A., D. S. LE BEAU, and P. P. PEVEAR. The Surface Structure and Composition of Colloidal Siliceous Matter. *J. Phys. Colloid Chem.* 55, p. 68, January, 1951.
- HAUSER, ERNST A. Letter to the Editor: Canamin Clay and its Properties. *Canadian Chem. and Process Industries* 35, p. 123, February, 1951.
- HAUSER, ERNST A. and ALAN S. MICHAELS. Interfacial Tension at Elevated Pressure and Temperature. II. Interfacial Properties of Hydrocarbon-Water Systems. *J. Phys. Colloid Chem.* 55, p. 408, March, 1951.
- HAUSER, ERNST A. Korzybski's Relation to Colloid Chemistry. *General Semantics Bull.* Nos. 4 and 5, p. 6. Autumn-Winter 1950-1951.
- HAUSER, ERNST A. Modern Colloidchemical Concepts of the Phenomenon of Coagulation. *J. Phys. Colloid Chem.* 55, p. 605, April, 1951.
- HAUSER, ERNST A. Photomicrography by Incident Light in Organic High Polymer Research. *Photographic Science and Technique*, 17B, p. 46, April, 1951.
- HAUSER, ERNST A. Science and Education. *J. Chem. Educ.* 28, p. 208, April, 1951.
- HAUSER, ERNST A. The Importance of Science in American Education. *Science* 113, p. 643, June 8, 1951.
- LEWIS, WARREN K., E. R. GILLILAND, B. CHERTOW, and W. P. CADOGAN. Adsorption Equilibria: Hydrocarbon Gas Mixtures. *Ind. Eng. Chem.* 42, pp. 1319-1326, July, 1950.

- LEWIS, WARREN K., E. R. GILLILAND, B. CHERTOW, and W. P. CADOGAN. Adsorption Equilibria: Pure Gas Isotherms. *Ind. Eng. Chem.* 42, pp. 1326-1332, July, 1950.
- LEWIS, WARREN K. Practical Training in Universities. *Chem. Eng. News* 29, p. 1397, April 9, 1951.
- LEWIS, WARREN K., E. R. GILLILAND, and M. P. SWEENEY. Gasification of Carbon: Metal Oxides in a Fluidized Powder Bed. *Chem. Eng. Progress* 47, pp. 251-256, May, 1951.
- SATTERFIELD, CHARLES N., H. RESNICK, G. M. KAVANAGH, and R. N. KINGSBURY. Hydrogen Peroxide Vapor Explosions-Determination of Explosive Composition. *Am. Chem. Soc. J.* 72, p. 4308, September, 1950.
- VIVIAN, J. EDWARD and D. PEACEMAN. Bantam Differential Analyzer. *Chem. Eng.* 57, pp. 106-107, August, 1950.
- WEBER, HAROLD C. Thermal Properties of Bodies and Thermodynamics. (In *Mechanical Engineers' Handbook*; edited by Lionel S. Marks. Fifth Edition, pp. 273-353. New York: McGraw-Hill, 1951.)

DEPARTMENT OF CHEMISTRY

- AMDUR, ISADORE, M. C. KELLS, and D. E. DAVENPORT. Collision Cross Sections of Hydrogen and of Deuterium. *J. Chem. Phys.* 18, p. 1676, December, 1950.
- ASHDOWN, AVERY A. Michael J. Ahern, S.J. *The Nucleus* 28, p. 269, June, 1951.
- BEATTIE, JAMES A. and STANLEY MARPLE, JR. The Compressibility of and an Equation of State for Gaseous 1-Butene. *Am. Chem. Soc. J.* 72, p. 4143, September, 1950.
- BYRNE, JOHN T. Preparation of Carrier-Free Manganese 52. *J. Chem. Phys.* 19, p. 504, April, 1951.
- COPE, ARTHUR C., *Editor*. Organic Syntheses, Vol. 30. New York: Wiley, 1950.
- COPE, ARTHUR C. and ELBERT C. HERRICK. Diethyl *cis*- Δ^4 -tetrahydrophthalate and Diethyl *cis*-hexahydrophthalate. (In *Organic Syntheses*, Vol. 30, pp. 29-32. New York: Wiley, 1950.)
- COPE, ARTHUR C. Chemistry of Eight-membered Ring Compounds. *Record of Chem. Progress* 2, No. 3, p. 115, Summer Issue, 1950.
- COPE, ARTHUR C. Cyclic Polyolefins. VII. Structure of the Eight-membered Cyclic Dimer of Chloroprene, by A. C. Cope and W. R. Schmitz. *Am. Chem. Soc. J.* 72, p. 3056, July, 1950. VIII. Reactions of 6-Hydroxycyclodecanone and Cyclodecan-1,6-diol *p*-Toluenesulfonates, by A. C. Cope and George Holzman. *Am. Chem. Soc. J.* 72, p. 3062, July, 1950. IX. Synthesis from Carbonyl-bridged Intermediates. 2,4-Diphenylcycloöcta-1,4-diene, by A. C. Cope, F. S. Fawcett and George Munn. *Am. Chem. Soc. J.* 72, p. 3399, August, 1950. X. Synthesis of Phenylcycloöcta-1,3-diene, by A. C. Cope and E. C. Hermann. *Am. Chem. Soc. J.* 72, p. 3405, August, 1950. XI. Carbonyl-bridged Compounds

- Derived from the Adduct of α -Carbethoxy-cyclohexanone and Acrolein by A. C. Cope and M. E. Synerholm. *Am. Chem. Soc. J.* 72, p. 5228, November, 1950. XII. Isolation of Vinylcycloöctatetraene and *cis*-1-Phenyl-1,3-butadiene from Acetylene Polymers, by A. C. Cope and S. W. Fenton. *Am. Chem. Soc. J.* 73, p. 1195, March, 1951. XIII. Allylic Rearrangement in the Reactions of *cis*- and *trans*-3,5-Dibromocyclopentenes with Dimethylamine, by A. C. Cope, L. Estes, Jr., J. R. Emery and A. C. Haven, Jr. *Am. Chem. Soc. J.* 73, p. 1199, March, 1951. XIV. 3,7-Dibromo-1,2,5,6-Dibenzcycloöctadiene and 1,2,5,6-Dibenzcycloöctatetraene, by A. C. Cope and S. W. Fenton. *Am. Chem. Soc. J.* 73, p. 1668, April, 1951. XV. 1-Methylene-2,3,6,7-dibenzcycloheptatriene, by A. C. Cope and S. W. Fenton. *Am. Chem. Soc. J.* 73, p. 1673, April, 1951.
- COPE, ARTHUR C. and ALFRED C. HAVEN, JR. Rearrangement of Oxime N-Ethers. *Am. Chem. Soc. J.* 72, p. 4896, November, 1950.
- CORYELL, CHARLES D. and NATHAN SUGARMAN. The Acceptance of the New Official Names for the Elements. *J. Chem. Educ.* 27, pp. 460-461, August, 1950.
- CORYELL, CHARLES D. and NATHAN SUGARMAN, *Editors*. *Radiochemical Studies: The Fission Products*. Books 1-3. New York: McGraw-Hill, 1951.
- CORYELL, CHARLES D. Relation Between Range and Energy of β -Particles. (*In Radiochemical Studies: The Fission Products*; edited by C. D. Coryell and Nathan Sugarman. Book 1, Paper 11. New York: McGraw-Hill, 1951.)
- CORYELL, CHARLES D. and Others. Coseparation of Aqueous Barium Ion with Solid Lanthanum Fluoride. (*In Radiochemical Studies: The Fission Products*; edited by C. D. Coryell and Nathan Sugarman. Book 1, Paper 12. New York: McGraw-Hill, 1951.)
- CORYELL, CHARLES D. and Others. Comparison of Gross Fission-Product Decay with Decay of the Sum of the Separated Fission Products (I). (*In Radiochemical Studies: The Fission Products*; edited by C. D. Coryell and Nathan Sugarman. Book 1, Paper 39, New York: McGraw-Hill, 1951.)
- CORYELL, CHARLES D., L. E. GLENDENIN, and R. R. EDWARDS. Distribution of Nuclear Charge in Fission. (*In Radiochemical Studies: The Fission Products*; edited by C. D. Coryell and Nathan Sugarman. Book 1, Paper 52. New York: McGraw-Hill, 1951.)
- CORYELL, CHARLES D., and L. E. GLENDENIN. Further Studies on Sr^{90} and Y^{90} . (*In Radiochemical Studies: The Fission Products*; edited by C. D. Coryell and Nathan Sugarman. Bk. 2, Paper 78. New York: McGraw-Hill, 1951.)
- CORYELL, CHARLES D. and Others. β and ν Radiations from the Chain 77h Te-2. 4h I. (*In Radiochemical Studies: The Fission Products*; edited by C. D. Coryell and Nathan Sugarman. Bk. 2, Paper 135. New York: McGraw-Hill, 1951.)

- CORYELL, CHARLES D. *and Others*. Interchange of Radioactive Iodine with Carrier Iodine. (In *Radiochemical Studies: The Fission Products*; edited by C. D. Coryell and Nathan Sugarman. Bk. 3, Paper 279. New York: McGraw-Hill, 1951.)
- CORYELL, CHARLES D. and JOHN W. IRVINE, JR. The Development of Radiochemistry and the Teaching of Radiochemistry with Laboratory. *J. Chem. Educ.* 28, pp. 14-20, January, 1951.
- CORYELL, CHARLES D. and K. S. SPIEGLER. Electromigration in a Cation Exchange Resin, I. *Science* 113, pp. 546-547, May 11, 1951.
- DITTMER, DONALD C. and ELLIOT R. ALEXANDER. Studies on the Mechanism of the Pinacol Rearrangement. I. Compounds Related to *meso* and *dl*-2,3-Butanediol. *Am. Chem. Soc. J.* 73, p. 1665, April, 1951.
- GODDU, ROBERT F. and DAVID N. HUME. Determination of Small Amounts of Vanadium in Steel by Photometric Titration. *Anal. Chem.* 22, pp. 1314-1317, October, 1950.
- HEIDT, LAWRENCE J. and KENNETH A. MOON. Stability of Carbonate Buffered Cupritartrate Reagents of Low pH for Estimating Micro and Macro Quantities of Reducing Sugars. *Am. Chem. Soc. J.* 72, p. 4130, September, 1950.
- HERSHENSON, HERBERT M. and A. SCATTERGOOD. Some New Glycol Trichloroacetates. *Am. Chem. Soc. J.* 72, p. 2808, June, 1950.
- HUME, DAVID N. and G. E. BOYD. Radiochemical Analytical Methods. (Chapter 28 in *Analytical Chemistry of the Manhattan Project*; edited by C. J. Rodden. New York: McGraw-Hill, 1950.)
- HUME, DAVID N. and A. J. FREEDMAN. Determination of Cerium. *Anal. Chem.* 22, p. 932, July, 1950.
- HUME, DAVID N. and I. M. KOLTHOFF. The Polarography of the Nickel Cyanide Complexes and the Solubility and Constitution of Nickel Cyanide. *Am. Chem. Soc. J.* 72, p. 4423, October, 1950.
- HUME, DAVID N. and A. J. FREEDMAN. A Precision Method of Counting Radioactive Liquid Samples. *Science* 112, p. 461, October 20, 1950.
- HUME, DAVID N. A Note on Removal of Zirconium and Niobium from Amberlite Resin Adsorbent. (In *Radiochemical Studies: The Fission Products*; edited by C. D. Coryell and Nathan Sugarman. Book 3, Paper 252. New York: McGraw-Hill, 1951.)
- HUME, DAVID N., J. M. SIEGEL, and W. P. BIGLER. Improved Preparation of Carrier-free Niobium Traces with Manganium Dioxide. (In *Radiochemical Studies: The Fission Products*; edited by C. D. Coryell and Nathan Sugarman. Book 3, Paper 255. New York: McGraw-Hill, 1951.)
- HUME, DAVID N. Preparation of Carrier-free Ruthenium Tracer. (In *Radiochemical Studies: The Fission Products*; edited by C. D. Coryell and Nathan Sugarman. Book 3, Paper 261. New York: McGraw-Hill, 1951.)

- HUME, DAVID N. and W. F. BOLDRIDGE. Radiochemical Determination of Total Antimony Tracer Activity and Differential Sb(III) and Sb(V) Activities. (In *Radiochemical Studies: The Fission Products*; edited by C. D. Coryell and Nathan Sugarman. Book 3, Paper 272. New York: McGraw-Hill, 1951.)
- HUME, DAVID N. and W. F. BOLDRIDGE. Improved Determination of Cerium and Other Rare Earth Activities in Fission. (In *Radiochemical Studies: The Fission Products*; edited by C. D. Coryell and Nathan Sugarman. Book 3, Paper 294. New York: McGraw-Hill, 1951.)
- HUME, DAVID N. and R. J. MARTENS. Rapid Determination of Rare Earth Gamma Activities. (In *Radiochemical Studies: The Fission Products*; edited by C. D. Coryell and Nathan Sugarman. Book 3, Paper 304. New York: McGraw-Hill, 1951.)
- HUME, DAVID N. and N. E. BALLOU. Determination of UX₁ Activity. (In *Radiochemical Studies: The Fission Products*; edited by C. D. Coryell and Nathan Sugarman. Book 3, Paper 310. New York: McGraw-Hill, 1951.)
- HUME, DAVID N., C. M. NELSON, and H. A. LEVY. A Polarographic Cell for Use in Remote-Control Systems. (In *Radiochemical Studies: The Fission Products*; edited by C. D. Coryell and Nathan Sugarman. Book 1, Paper 29. New York: McGraw-Hill, 1951.)
- HUME, DAVID N. Determination of Zirconium Activity in Fission Barium Fluozirconate Method. (In *Radiochemical Studies: The Fission Products*; edited by C. D. Coryell and Nathan Sugarman. Book 3, Paper 245. New York: McGraw-Hill, 1951.)
- HUME, DAVID N., M. HUMPHREY, and C. L. McCABE. Determination of Zirconium Activity in Solution Containing Lanthanum. (In *Radiochemical Studies: The Fission Products*; edited by C. D. Coryell and Nathan Sugarman. Book 3, Paper 246. New York: McGraw-Hill, 1951.)
- HUME, DAVID N. and D. E. WATERS. Comparison of Oxalate and Fluoride Method for Determination of Zirconium Activity in Fission. (In *Radiochemical Studies: The Fission Products*; edited by C. D. Coryell and Nathan Sugarman. Book 3, Paper 247. New York: McGraw-Hill, 1951.)
- HUME, DAVID N., J. A. MARINSKY, and N. E. BALLOU. Preparation of Carrier-free Zirconium-Niobium Tracer. (In *Radiochemical Studies: The Fission Products*; edited by C. D. Coryell and Nathan Sugarman. Book 3, Paper 250. New York: McGraw-Hill, 1951.)
- HUME, DAVID N. and Others. Studies of Cation-Exchange Equilibrium on a Synthetic Resin. *Am. Chem. Soc. J.* 73, p. 2666, May, 1951.
- HUNTRESS, ERNEST H. Centennials and Sesquicentennials During 1951 with Interest for Chemists and Physicists. *Am. Acad. Arts Sci. Proc.* 79, pp. 7-48, January, 1951.
- HUNTRESS, ERNEST H. Influence of Nomenclatural Evaluation upon Comprehensive Literature Searches. *Advances in Chem.* 4, pp. 10-18, April, 1951.

- IRVINE, JOHN W., JR. and GEOFFREY WILKINSON. The Preparation and Properties of Tetrakis-trichlorophosphine Nickel. *Science* 113, pp. 742-743, June 29, 1951.
- IRVINE, JOHN W., JR., C. J. MALETSKOS, and E. W. BACKOFEN. Preparation of Zn^{65} of High Specific Activity from Copper Bombarded with 16-Mev Deuterons. *J. Chem. Phys.* 19, p. 796, June, 1951.
- KEYES, FREDERICK G. and D. J. SANDELL, JR. New Measurements of the Heat Conductivity of Steam and Nitrogen. *Am. Soc. Mech. Engrs. Trans.* 72, pp. 767-778, August, 1950.
- KEYES, FREDERICK G. and C. E. HUCKABA. Error in the Average Coefficients of Specific Volume Change from 0 to 20° in Aqueous Solutions of Hydrogen Peroxide. *Am. Chem. Soc. J.* 72, p. 5324, November, 1950.
- LORD, RICHARD C., E. R. LIPPINCOTT, and R. S. McDONALD. Structure of *cyclo* Octatetraene. *Nature*, v. 166, p. 227, August 5, 1950.
- LORD, RICHARD C. and E. NIELSEN. Apparatus for Low-Temperature Study of the Raman Effect. *Optical Soc. Am. J.* 40, p. 655, October, 1950.
- LORD, RICHARD C. and J. OCAMPO. Raman Spectrum of Allene-d₄. *J. Chem. Phys.* 19, p. 260, February, 1951.
- LORD, RICHARD C. Review of *Analytical Absorption Spectroscopy*, edited by M. G. Mellon. New York: Wiley, 1950. *Rev. Sci. Instr.* 21, p. 879, 1950.
- LORD, RICHARD C. Review of *Spectroscopic Properties of Uranium Compounds*, by G. H. Dieke and A. B. F. Duncan. New York: McGraw-Hill, 1949. *Rev. Sci. Instr.* 21, p. 386, 1950.
- LORD, RICHARD C. and E. NIELSEN. Vibrational Spectra of Diborane and Some of its Isotopic Derivatives. *J. Chem. Phys.* 19, p. 1, January, 1951.
- LORD, SAMUEL S., JR., L. B. ROGERS, and R. C. O'NEILL. Coulometric Determination of Submicrogram Amounts of Silver. *Anal. Chem.*, preprint form.
- MILAS, NICHOLAS A., PAULS DAVIS, IGOR BELIC, and DRAGUTIN A. FLES. Synthesis of β -Carotene. *Am. Chem. Soc. J.* 72, p. 4844, October, 1950.
- MILAS, NICHOLAS A. Review of *Chemie und Technik der Vitamine. Erster Band: Die fettloslichen Vitamine*, by Hans Vogel. Dritte Auflage. Revised by Heinrich Knobloch. Stuttgart, Germany: Ferdinand Enke, 1950. *Chem. Eng. News* 29, p. 2422, June, 1951.
- MORTON, AVERY A. Polymerization. IX. Metalation During Alfin Polymerization of Butadiene and the Formation of Gel, by Avery A. Morton and others. *Am. Chem. Soc. J.* 71, pp. 481-486, February, 1949. X. Metalation of Alkylaryl Hydrocarbons and Their Use in the Polymerization of Butadiene, by Avery A. Morton and Ernest L. Little, Jr. *Am. Chem. Soc. J.* 71, pp. 487-489, February, 1949. XI. Not yet printed. XII. The Metalation of Olefins and Dienes and Their Use in Alfin Polymerization of Butadiene, by Avery A. Morton and others. *Am. Chem. Soc. J.* 72, pp. 3785-3792, August, 1950.

- MORTON, AVERY A. and WILSON R. SLAUNWHITE, JR. Polymerization of 6-Hydroxyindoles and Its Relation to the Formation of Melanin. *J. Biol. Chem.* 179, pp. 259-270, May, 1949.
- MORTON, AVERY A. Alfin Catalysts and the Polymerization of Butadiene. *Ind. Eng. Chem.* 42, p. 1488, August, 1950.
- PAPPAS, ALEXIS C. and CHARLES D. CORYELL. Activities and Fission Yields in Chains of Masses 129 to 134. *Phys. Rev.* 81, p. 329, January 15, 1951.
- PAPPAS, ALEXIS C. New Antimony Isotopes in Fission. *Phys. Rev.* 81, p. 299, January 15, 1951.
- ROBERTS, JOHN D. The Dipole Moment and Molecular Configuration of 1,6-dichloro-1,5-cyclooctadiene. *Am. Chem. Soc. J.* 72, p. 3300, 1950.
- ROBERTS, JOHN D. and Others. The Reaction of Norbornylene with N-Bromosuccinimide. Nortricyclene and its Derivatives. *Am. Chem. Soc. J.* 72, p. 3116, July, 1950.
- ROBERTS, JOHN D., W. BENNETT, and R. ARMSTRONG. Solvolytic Reactivities of Nortricyclyl, Dehydronorbornyl and Norbornyl Halides. Possible Steric Requirements for Hyperconjugative Resonance. *Am. Chem. Soc. J.*, 72, p. 3329, August, 1950.
- ROBERTS, JOHN D., R. E. McMAHON, and J. S. HINE. Rearrangements of Carbon Atoms in *t*-Butyl and *t*-Amyl Derivatives. *Am. Chem. Soc. J.* 72, p. 4237, September, 1950.
- ROBERTS, JOHN D. and W. WATANABE. The Kinetics and Mechanism of Acid-catalyzed Reaction of Diphenyldiazomethane with Ethyl Alcohol. *Am. Chem. Soc. J.* 72, p. 4869, November, 1950.
- ROBERTS, JOHN D., D. R. SMITH, and C. C. LEE. The Decarbonylation of Diphenyl Triketone. *Am. Chem. Soc. J.* 73, p. 618, February, 1951.
- ROBERTS, JOHN D., W. WATANABE, and R. E. McMAHON. The Kinetics and Mechanism of the Reaction of Diphenyldiazomethane and Benzoic Acid in Ethanol. *Am. Chem. Soc. J.* 73, p. 760, February, 1951.
- ROBERTS, JOHN D. and J. A. YANCEY. Reactivities of 4- and 5- Substituted 2-Methylbenzoic Acids. *Am. Chem. Soc. J.* 73, p. 1011, March, 1951.
- ROBERTS, JOHN D. and SUKH DEV. Reactions of Bis-(halomethyl)-dimethylsilanes with Metals. *Am. Chem. Soc. J.* 73, pp. 1879-1880, April, 1951.
- ROBERTS, JOHN D., R. A. CLEMENT, and J. J. DRYSDALE. The Electrical Effect of the Trimethylammonium [$-N(CH_3)_3^+$] Group. *Am. Chem. Soc. J.* 73, p. 2181, May, 1951.
- ROBERTS, JOHN D., W. WATANABE, and R. E. McMAHON. Kinetics and Mechanism of the Reaction of Diphenyldiazomethane with 2,4-Dinitrophenol in Ethanol. *Am. Chem. Soc. J.* 73, p. 2521, June, 1951.
- ROBERTS, JOHN D. Small-Ring Compounds. IV. Interconversion Reactions of Cyclobutyl, Cyclopropylcarbiny and Allylcarbiny Derivatives, by John D. Roberts and R. H. Mazur. *Am. Chem. Soc. J.* 73, p. 2509, June, 1951. V. Synthesis of Cyclopropanecarboxaldehyde by the MacFadyen-Stevens Reduction, by John D. Roberts. *Am. Chem. Soc. J.* 73, p. 2959, June, 1951.

- ROGERS, LOCKHART B. Review of *Physical Methods in Chemical Analysis*. Vol. I, Edited by W. G. Berl. New York: Academic Press, 1950. *Electrochem. Soc. J.* 98, p. 29C, February, 1951.
- ROGERS, LOCKHART B. Separation of Ultramicro Quantities of Elements by Electrodeposition. *Analyt. Chem.* 22, p. 1386, November, 1950.
- ROGERS, LOCKHART B. Review of *The Solubility of Nonelectrolytes* by J. H. Hildebrand and R. L. Scott. Third Edition. New York: Reinhold, 1950. *Electrochem. Soc. J.* 98, p. 45C, March, 1951.
- ROGERS, LOCKHART B. Review of *The Polarographic Method of Analysis*, by O. H. Müller. Easton, Pa.: Chemical Educ. Pub. Co., 1951. *Electrochem. Soc. J.* 98, p. 71C, May, 1951.
- SCATCHARD, GEORGE. The Colloid Osmotic Pressure of Serum. *Science* 113, p. 201, February 23, 1951.
- SCATCHARD, GEORGE. The Social Behavior of Molecules. *Scientist* 38, p. 437, July, 1950.
- SCHENBERG, I. HERBERT. Interaction of Proteins and Small Molecules in Relation to Medicine. *New England Medical Center Bull.* 12, p. 161, August, 1950.
- SCHUMB, WALTER C. and MAURICE A. LYNCH, JR. Iodine Heptafluoride — Preparation and Some Properties. *Ind. Eng. Chem.* 42, p. 1383, July, 1950.
- SCHUMB, WALTER C. and ARTHUR J. STEVENS. The Partial Hydrolysis of Silicon Tetrachloride. *Am. Chem. Soc. J.* 72, p. 3178, July, 1950.
- SCHUMB, WALTER C. Review of *A Textbook of Inorganic Chemistry*, by J. R. Partington. London: Macmillan, 1950. *J. Chem. Educ.* 28, p. 54, January, 1951.
- SCHUMB, WALTER C. Graduate Inorganic Chemistry at the Massachusetts Institute of Technology. *J. Chem. Educ.* 28, p. 297, June, 1951.
- SCOTT, CARLETON B., CORWIN H. HANSCH, and HOWARD KELLER. Catalytic Synthesis of Benzofurans. *Ind. Eng. Chem.* 42, p. 2114, October, 1950.
- STOCKMAYER, WALTER H. Intramolecular Reaction in Polycondensations. I. The Theory of Linear Systems, by Walter H. Stockmayer and Homer Jacobson. *J. Chem. Phys.* 18, p. 1600, December, 1950. II. Ring-Chain Equilibrium in Polydecamethylene Adipate, by Walter H. Stockmayer, Homer Jacobson and Charles O. Beckmann. *J. Chem. Phys.* 18, p. 1607, December, 1950.
- STOCKMAYER, WALTER H. Theory of Moving Concentration Boundaries. *New York Acad. Sci. Trans.* Ser. II, 13, No. 7, p. 266, May, 1951.
- SWAIN, C. GARDNER and KENNETH HEDBERG. The Mechanism of Oxidation of Leuco Malachite Green by Ceric Sulfate. *Am. Chem. Soc. J.* 72, p. 3373, August, 1950.
- SWAIN, C. GARDNER. Concerted Displacement Reactions. V. The Mechanism of Acid-Base Catalysis in Water Solution. *Am. Chem. Soc. J.* 72, p. 4578, October, 1950. VI. m- and p-Substituent Effects as Evidence for a Unity of Mechanism in Organic Halide Reactions, by C. G. Swain and William P. Langsdorf, Jr. *Am. Chem. Soc. J.* 73, p. 2813, June, 1951.

- SWAIN, C. GARDNER, WALTER H. STOCKMAYER, and JOHN T. CLARKE. Effect of Structure on the Rate of Spontaneous Thermal Decomposition of Substituted Benzoyl Peroxides. *Am. Chem. Soc. J.* 72, p. 5426, December, 1950.
- SWAIN, C. GARDNER and HENRY B. BOYLES. The Mechanism of Addition of Grignard Reagents to Ketones. *Am. Chem. Soc. J.* 73, p. 870, February, 1951.
- WILKINSON, GEOFFREY. Note on 11.5-Day Tl^{202} . *Phys. Rev.* 79, pp. 1014-1015, September 15, 1950.
- WILKINSON, GEOFFREY and H. G. HICKS. Radioactive Isotopes of the Rare Earths, III. Terbium and Holmium. *Phys. Rev.* 79, pp. 815-818, September 15, 1950.
- WILKINSON, GEOFFREY and H. G. HICKS. Note on Neutron-Deficient Europium Activities. *Phys. Rev.* 80, pp. 491-492, November 1, 1950.
- WILKINSON, GEOFFREY. Neutron Deficient Isotopes of Tantalum and Wolfram. *Phys. Rev.* 80, pp. 495-499, November, 1950.
- WILKINSON, GEOFFREY and H. G. HICKS. Radioactive Isotopes of Lutetium and Hafnium. *Phys. Rev.* 81, pp. 540-543, February, 1951.

DEPARTMENT OF CITY AND REGIONAL PLANNING

- KELLY, BURNHAM. *The Prefabrication of Houses*. Cambridge: Technology Press and N. Y.: Wiley, 1951.
- RODWIN, LLOYD. Land Economics in the United States. *Town Planning Rev.* 21, p. 121, July, 1950.
- RODWIN, LLOYD. The Theory of Residential Growth and Structure. *Appraisal J.* 18, p. 295, July, 1950.
- RODWIN, LLOYD. Rejoinder to Dr. Firey and Dr. Hoyt. *Appraisal J.* 18, p. 454, October, 1950.
- RODWIN, LLOYD. Rent Control and Housing. *Social Research* 17, p. 302, September, 1950.
- RODWIN, LLOYD. Income and Housing Cost Trends of Boston's Middle Income Groups, 1846-1947. *Land Econ.* 26, p. 368, November, 1950.
- RODWIN, LLOYD. The Paradox of Boston's Middle Income Housing. *Appraisal J.* 19, p. 42, January, 1951.
- RODWIN, LLOYD. *Recommendations to the Bureau of the Census on 1950 Housing Census Cross-Classifications and Monographs*, in collaboration with the Committee on Housing Research, New York: Social Science Research Council, January 15, 1951. Also *Supplementary Materials Accompanying Recommendations*.
- RODWIN, LLOYD. Housing. (In *1951 Collier's Year Book Covering Events of the Year, 1950*. New York: P. F. Collier & Son Corp., 1951.)

DEPARTMENT OF CIVIL AND SANITARY ENGINEERING

- BABCOCK, JOHN B. 3D and ALEXANDER J. BONE. Railway, Highway and Airport Engineering. (Section 2 in *Civil Engineering Handbook*; edited by L. C. Urquhart. Third Edition. New York: McGraw-Hill, 1950.)
- BREED, CHARLES B. *Principles and Practice of Surveying*. Volume 1, revised. *Elementary Surveying*, by C. B. Breed and G. L. Hosmer. New York: Wiley, 1951.
- DAILY, JAMES W. Hydraulic Machinery. (Chapter 13 in *Engineering Hydraulics*; edited by Hunter Rouse. New York: Wiley, 1950.)
- DAILY, JAMES W., C. DEEMER, and A. L. KELLER. The Unsteady Flow Water Tunnel at the Massachusetts Institute of Technology. M. I. T. Hydrodynamics Lab. *Tech. Rept.* No. 2. 1951.
- ELIASSEN, ROLF and W. N. GRUNE. Studies on the Effect of Radioactive Phosphorous on the Biochemical Oxidation of Sewage. *Sewage and Ind. Wastes* 23, p. 141, February, 1951.
- HORTON, JOHN P. and M. P. HORWOOD. The Relationship of Acoustical Energy to the Lethal Effects of Ultrasonic Vibrations on *E. coli*. *Science* 113, pp. 693-695, June 15, 1951.
- HORWOOD, MURRAY P., R. E. MCKINNEY, and R. S. ENGELBRECHT. The Characteristics of Some Floc Producing Bacteria Isolated from Activated Sludge. *Bacteriological Proc.*, p. 57, May, 1951.
- HORWOOD, MURRAY P. A Comparative Bacteriological Study of Milk Derived from a Refrigerated Bulk Dispenser and Similar Milk Delivered in Sealed Bottles. *J. Milk and Food Tech.* 13, pp. 367-371, November-December, 1950.
- HORWOOD, MURRAY P., J. P. HORTON, and V. A. MINCH. Factors Influencing Bactericidal Action of Ultrasonic Waves. *Am. Water Works Assoc. J.* 43, pp. 153-160, February, 1951.
- HORWOOD, MURRAY P. and V. A. MINCH. The Numbers and Types of Bacteria Found on the Hands of Food Handlers. *Food Research* 16, pp. 133-136, March-April, 1951.
- HORWOOD, MURRAY P. Sixty Years of Progress in Sanitation, 1890-1950. *J. Milk and Food Tech.* 13, pp. 237-238, July-August, 1950.
- IPPEN, ARTHUR T. Channel Transitions and Controls. (Chapter 8 in *Engineering Hydraulics*; edited by Hunter Rouse. New York: Wiley, 1950.)
- IPPEN, ARTHUR T. and DONALD R. F. HARLEMAN. Studies on the Validity of the Hydraulic Analogy to Supersonic Flow, Part III. Report to U.S. Air Force, Air Materiel Command. AF Tech. Rept. 5985. October, 1950.
- IPPEN, ARTHUR T. Mechanics of Fluids. (In *Mechanical Engineers' Handbook*; edited by L. S. Marks. Fifth Edition. pp. 230-264. New York: McGraw-Hill, 1951.)
- IPPEN, ARTHUR T., R. S. YOSEPH, and B. N. POSTHILL. The Continuous Measurement of Oxygen Concentration in Water During Aeration Processes. (A report to the U.S. Public Health Service, March, 1951.)

- IPPEN, ARTHUR T. The New Hydrodynamics Laboratory. *The Technology Review* 53, pp. 399-403+, June, 1951.
- LAMBE, T. WILLIAM. Research in Chemical Stabilization of Soils. (In Conference on Ground Facilities for Air Transportation, M. I. T., Cambridge, Mass., September 12-14, 1950. pp. 129-132. *Proc.*)
- LAMBE, T. WILLIAM. *Soil Testing for Engineers*. New York: Wiley, 1951.
- LAMBE, T. WILLIAM. The Stabilization of Soils with Calcium Acrylate. *Boston Soc. Civil Eng'rs. J.* 38, p. 127, April, 1951.
- SAWYER, CLAIR N. and ERMAN A. PEARSON. Recent Developments in Chlorination in the Beet Sugar Industry. Industrial Waste Conference, Purdue Univ. *Proc.* 5, p. 110, 1949.
- SAWYER, CLAIR N. and E. A. PEARSON. Beet Sugar Process Waters — Treatment and Utilization. *Chem. Eng. Progress* 46, p. 380, August, 1950.
- SAWYER, CLAIR N. and Others. Nutritional Requirements in the Biological Stabilization of Industrial Wastes. I. Experimental Method. *Sewage and Industrial Wastes* 22, p. 1200, September, 1950.
- SHEA, HERMAN J. Surveying Instruction in the Civil Engineering Curriculum. *J. Eng. Educ.* 41, p. 185, November, 1950.
- STANLEY, WILLIAM E. and S. A. GREELEY. Chapters 18 and 19 in *Handbook on Applied Hydraulics*, by C. V. Davis. Second Edition. New York: McGraw-Hill, 1951.

DEPARTMENT OF ECONOMICS AND SOCIAL SCIENCE

- ADELMAN, MORRIS A. Integration and the Outlook for the Future. (In New York State Bar Assoc. Antitrust Law Section. Antitrust Law Symposium, 1951. *Business Practices Under Federal Antitrust Laws*. pp. 135-150, New York: Commerce Clearing House, Inc., 1951.)
- BAVELAS, ALEX. Reseaux de Communication au Sein de Groupes Placés dans des Conditions Experimentales de Travail. Traduit de l'Americain par L. Brams. Paris: Armand Colin. (Extrait de Les "Sciences de la Politique" aux Etats-Unis; cahier n° 19 de la Fondation Nationale des Sciences Politiques.)
- BAVELAS, ALEX and F. DERMOT BARRETT. An Experimental Approach to Organizational Communication. *Personnel* 27, pp. 366-370, March, 1951.
- BROWN, E. CARY, A. G. HART, and H. F. RASMUSSEN. *Financing Defense*. New York: Twentieth Century Fund, 1951.
- FREEMAN, HAROLD A. Two Sigma or Three Sigma? *Am. Soc. for Quality Control. Conference Papers* 5, pp. 181-188, 1951.
- HANSEN, ROBERT J., ALBERT G. H. DIETZ and Others. Reaction of Buildings to the Atomic Bomb. *Mass. Civil Defense Agency. Tech. Pam.* No. 3, June, 1951.
- KINDLEBERGER, CHARLES P. International Disequilibrium. *Canadian J. Econ. Political Sci.* 16, pp. 529-537, November, 1950.

- KINDLEBERGER, CHARLES P. *The Dollar Shortage*. Cambridge: The Technology Press and New York: Wiley, 1950.
- KINDLEBERGER, CHARLES P. European Economic Integration. (In *Money, Trade and Economic Growth in Honor of John Henry Williams*. pp. 58-75. New York: Macmillan, 1951.)
- KINDLEBERGER, CHARLES P. Bretton Woods Reappraised. *International Organization* 5, No. 1, pp. 32-47, February, 1951.
- KINDLEBERGER, CHARLES P. Group Behavior and International Trade. *J. Political Econ.* 59, pp. 30-46, February, 1951.
- MYERS, CHARLES A. and GEORGE P. SHULTZ. *The Dynamics of a Labor Market*. New York: Prentice-Hall, 1951.
- MYERS, CHARLES A. Individual Initiative and Labor-Management Relations. (In *Individual Initiative in Business*; edited by George H. Allen. pp. 135-140. Cambridge: Harvard University Press, 1950.)
- MYERS, CHARLES A. *Industrial Relations in Sweden*. Cambridge: The Technology Press, 1951.
- PADEFORD, NORMAN J. *International Relations; Fundamentals and Problems*. Preliminary Edition. Cambridge: The Murray Printing Company, 1950.
- PIGORS, PAUL and FAITH PIGORS. Let's Talk Policy. *Personnel* 27, pp. 5-14, July, 1950.
- PIGORS, PAUL and FAITH PIGORS. Who Should Make Personnel Policies? *Personnel* 27, pp. 176-189, November, 1950.
- PIGORS, PAUL. Organizational Teamwork: Fact or Fiction? *Advanced Management* 16, pp. 25-29, June, 1951.
- SAMUELSON, PAUL A. Probability and the Attempts to Measure Utility. (English and Japanese.) *The Economic Review* (Japanese) 1, pp. 167-173, July, 1950.
- SAMUELSON, PAUL A. and Others. The Problem of Economic Instability. *Am. Econ. Rev.* 40, pp. 505-538, September, 1950.
- SAMUELSON, PAUL A. The Problem of Integrability in Utility Theory. *Economica* 17, pp. 355-395, November, 1950.
- SAMUELSON, PAUL A. Principles and Rules in Modern Fiscal Policy: A Neo-Classical Reformation. (In *Money, Trade and Economic Growth in Honor of John Henry Williams*. pp. 157-176. New York: Macmillan, 1951.)
- SAMUELSON, PAUL A. Abstract of a Theorem Concerning Substitutability in Open Leontief Models. (Chapter VII in Cowles Commission for Research in Economics. *Activity Analysis of Production and Allocation*; edited by T. C. Koopmans in cooperation with P. A. Samuelson and others. New York: Wiley, 1951.)
- SAMUELSON, PAUL A. Economic Theory and Wages. (In *Impact of the Union*; edited by D. McC. Wright. pp. 312-342. New York: Harcourt, Brace, 1951.)
- SAMUELSON, PAUL A. *Economics: An Introductory Analysis*. Second Edition. New York: McGraw-Hill, 1951.

- SAMUELSON, PAUL A. Schumpeter as a Teacher and Economic Theorist. *Rev. Econ. and Statistics* 33, pp. 98-103, May, 1951.
- SHULTZ, GEORGE P. *Pressures on Wage Decisions*. Cambridge: The Technology Press and New York: Wiley, 1951.
- SHULTZ, GEORGE P. *The Dynamics of a Labor Market*. New York: Prentice-Hall, June, 1951.
- SOLOW, ROBERT. Review of *Labor Productivity Functions in Meat Packing*, by W. H. Nichols. Chicago: University of Chicago Press, 1948. *Rev. Econ. and Statistics* 32, pp. 270-272, August, 1950.

DEPARTMENT OF ELECTRICAL ENGINEERING

- BARSTOW, FREDERICK E. Infrared Photography with Electric Flash. *Soc. Motion Picture Television Engrs. J.* 55, pp. 488-495, November, 1950.
- BARUCH, JORDAN J. The Design of a High-Speed Polariscopes. *Instrumentation Soc.* 8, pp. 197-204, July, 1950.
- BARUCH, JORDAN J. The Thyatron as a Close-Differential Relay. *Nat. Electronics Conference Proc.* 5, pp. 87-93, September, 1950.
- BERANEK, LEO L. Apparatus for Noise Measurements. *National Noise Abatement Symposium Proc.*, pp. 17-32, October, 1950.
- BERANEK, LEO L. Enclosures and Amplifiers for Direct-Radiator Loudspeakers. *Nat. Electronics Conference Proc.* 5, pp. 348-359, September, 1950.
- BERANEK, LEO L. How Well Does Your Earphone Work? *Standardization* 21, pp. 170-172, 188, July, 1950.
- BERANEK, LEO L. and Others. American Standard Method for the Coupler Calibration of Earphones, Z24.9-1949. *Acoustical Soc. Am. J.* 22, pp. 602-608, September, 1950.
- BERANEK, LEO L. and Others. American Standard Specification for Laboratory Standard Pressure Microphones, Z24.8-1949. *Acoustical Soc. Am. J.* 22, pp. 609-610, September, 1950.
- BERANEK, LEO L. and Others. American Standard Method for the Pressure Calibration of Laboratory Standard Microphones, Z24.4-1949. *Acoustical Soc. Am. J.* 22, pp. 611-613, September, 1950.
- BERANEK, LEO L., A. L. CUDWORTH, J. L. MARSHALL, and A. P. G. PETERSON. Calculations and Measurements of the Loudness of Sounds. *Acoustical Soc. Am. J.* 23, pp. 261-269, May, 1951.
- BUCKLEY, ELERY F., J. P. CHISHOLM, and G. W. FARNELL. A Multichannel PAM-FM Radio Telemetry System. *I. R. E. Proc.* 39, pp. 36-43, January, 1951.
- CARRUS, PIERRE A., PHYLLIS FOX, FELIX HAAS, and ZDENEK KOPAL. Propagation of Shock Waves in the Generalized Roche Model. *Astrophys. J.* 113, pp. 193-209, January, 1951.

- CARRUS, PIERRE A. and CHARLOTTE G. TREUENFELS. Tables of Roots and Incomplete Integrals of Associated Functions of Fractional Orders. *J. Math. Physics* 29, pp. 282-299, January, 1951.
- CASPARI, MAX E. and W. J. MERZ. The Electromechanical Behavior of BaTiO₃ Single-Domain Crystals. *Phys. Rev.* 80, pp. 1082-1089, December 15, 1950.
- COOKSON, ALBERT E. and WALTER B. RENHULT, JR. The Model II Pulse Seeker. *M. I. T. Res. Lab. of Electronics. Tech. Rept. No. 58*, 1950.
- COSTAS, JOHN P. Periodic Sampling of Stability Time Series. *M. I. T. Res. Lab. of Electronics. Tech. Rept. 156*, 1951.
- DAVENPORT, WILBUR B., JR. *A Study of Speech Probability Distributions. M. I. T. Res. Lab. Electronics. Tech. Rept. No. 148*, 1950.
- DAVENPORT, WILBUR B., JR. Correlator Errors Due to Finite Observation Intervals. *M. I. T. Res. Lab. of Electronics. Tech. Rept. No. 191*, 1951.
- DAWES, LYMAN M. Physics in the Industries. (In *Plant Engineering Handbook*; edited by William Staniar, pp. 1623-1686. New York: McGraw-Hill, November, 1950.)
- EDGERTON, HAROLD E. Electric Flash. (Section in *New Leica Manual*, by W. D. Morgan and H. M. Lester. Twelfth Edition. New York: Morgan and Lester, 1951.)
- EDGERTON, HAROLD E. and R. S. CARLSON. The Stroboscope as a Light Source for Motion Pictures. *Soc. Motion Picture Television Engrs. J.* 55, pp. 88-100, July, 1950.
- EDGERTON, HAROLD E. and CHARLES W. WYCKOFF. Rapid Action Shutter with No Moving Parts. *Soc. Motion Picture Television Engrs. J.* 56, pp. 398-406, April, 1951.
- EPSTEIN, DAVID J. Phase Shift of Microwaves in Passage Through Parallel-Plate Arrays. *M. I. T. Res. Lab. of Electronics. Tech. Rept. No. 42*, August, 1950.
- FANO, ROBERT M. Short-Time Autocorrelation Functions and Power Spectra. *Acoustical Soc. Am. J.* 22, pp. 546-550, September, 1950.
- FANO, ROBERT M. The Information Theory Point of View in Speech Communication. *Acoustical Soc. Am. J.* 22, pp. 691-696, November, 1950.
- FANO, ROBERT M. Signal-to-Noise Ratio in Correlation Detectors. *M. I. T. Res. Lab. of Electronics. Tech. Rept. No. 186*, 1951.
- FAY, RICHARD D. and O. V. FORTIER. Transmission of Sound Through Steel Plates Immersed in Water. *Acoustical Soc. Am. J.* 23, pp. 339-346, May, 1951.
- GILLES, M. ALTEN. Optional Absorption and Photoconductivity of Amorphous and Hexagonal Selenium. *M. I. T. Lab. for Insulation Research Tech. Rept. No. 35*, February, 1951.
- GRAY, TRUMAN S. and H. B. FREY. Acorn Diode Has Logarithmic Range of 10°. *Rev. Sci. Instr.* 22, pp. 117-118, February, 1951.
- GRAY, TRUMAN S. and Others. Response of an Anthracene Scintillation Counter to Protons. *Phys. Rev.* 82, pp. 372-373, May 1, 1951.

- GREEN, PAUL E., JR. Magnetic Tape Recorder for Very Low Frequency Phenomena. *Rev. Sci. Instr.* 21, pp. 893-895, November, 1950.
- GUILLEMIN, ERNST A. A Summary of Modern Mathematics of Network Synthesis. (In *Advances in Electronics*. Volume 3, pp. 261-303. New York: Academic Press, 1951.)
- HADDEN, FREDERICK A. Precision Magnetic Field Regulation Using Nuclear Magnetic Resonance. *M. I. T. Servomechanisms Lab. Tech. Rept.* No. 1-6663, December 4, 1950.
- HUGGINS, WILLIAM H. System-Function Analysis of Speech Sounds. *Acoustical Soc. Am. J.* 22, pp. 765-767, November, 1950.
- HUGGINS, WILLIAM H. and J. C. R. LICKLIDER. Place Mechanisms of Auditory Frequency Analysis. *Acoustical Soc. Am. J.* 23, pp. 290-299, May, 1951.
- KOPAL, ZDENEK. The Computation of Elements of Eclipsing Binary Systems. *Harvard University. Astronomical Observatory, Monograph*, No. 8, p. 181, December, 1950.
- KOPAL, ZDENEK, PIERRE CARRUS, and KATHERINE E. KAVANAGH. A New Formula for Repeated Mechanical Quadratures. *J. Math. Phys.* 20, pp. 44-48, April, 1951.
- KOPAL, ZDENEK, PIERRE CARRUS, PHYLLIS A. FOX, and FELIX HAAS. The Propagation of Shock Waves in a Stellar Model with Continuous Density Distribution. *Astrophys. J.* 113, pp. 496-518, May, 1951.
- KU, YU-HSIU. Transient Analysis of Rotating Machines and Stationary Networks by Means of Rotating Reference Frames. *A.I.E.E. Tech. Reprint* 51-176, May, 1951.
- LEE, YUK-WING. Application of Statistical Methods to Communication Problems. *M. I. T. Res. Lab. of Electronics. Tech. Rept.* No. 181, 1950.
- LEE, YUK-WING, J. B. WIESNER, and T. P. CHEATHAM. Application of Correlation Analysis to the Detection of Periodic Signals in Noise. *I.R.E. Proc.* 38, pp. 1165-1171, October, 1950.
- LEPHAKIS, ACHILLES J. Storage Devices for Communications. *Electronics* 23, pp. 69-73, December, 1950.
- LICKLIDER, JOSEPH C. R., J. C. WEBSTER, and J. M. HEDLUN. On the Frequency Limits of Binaural Beats. *Acoustical Soc. Am. J.* 22, pp. 468-473, July, 1950.
- LICKLIDER, JOSEPH C. R. The Intelligibility of Amplitude-Dichotomized, Time-Quantized Speech Waves. *Acoustical Soc. Am. J.* 22, pp. 820-823, November, 1950.
- LINVILL, JOHN G. Amplifiers with Prescribed Frequency Characteristics and Arbitrary Bandwidth. *M. I. T. Res. Lab. of Electronics. Tech. Rept.* No. 163, 1950.
- MOON, PARRY and DOMINA E. SPENCER. Interfections in Coupled Enclosures. *Franklin Inst. J.* 250, pp. 151-166, August, 1950.
- MOON, PARRY and DOMINA E. SPENCER. How to Design Your Luminous Ceilings. *Illuminating Eng.* 46, pp. 295-298, June, 1951.

- MOON, PARRY and DOMINA E. SPENCER. Simplified Interflexion Calculations. *Franklin Inst. J.* 251, pp. 215-230, February, 1951.
- MOON, PARRY and DOMINA E. SPENCER. A Slide Rule for Lighting Calculations. *Optical Soc. Am. J.* 41, pp. 98-103, February, 1951.
- MOON, PARRY and DOMINA E. SPENCER. Modeling with Light. *Franklin Inst. J.* 251, pp. 453-466, April, 1951.
- NEWTON, GEORGE C., JR. What Size Motor? — for Proper Servomechanism Operation. *Machine Design* 22, pp. 125-132, November, 1950.
- SANTELMANN, WILLIAM F., JR., STANFORD GOLDMAN, COUGER WILLIAMS, and FRED ALEXANDER. Area Displays of the Electrical Activity of the Heart. *M. I. T. Res. Lab. of Electronics. Tech. Rept.* No. 121, 1950.
- SCOTT, RONALD E. An Analog Device for Solving the Approximation Problem of Network Synthesis. *M. I. T. Res. Lab. of Electronics. Tech. Rept.* No. 137, 1950.
- SINGLETON, HENRY E., Theory of Nonlinear Transducers. *M. I. T. Res. Lab. of Electronics. Tech. Rept.* No. 160, 1950.
- SINGLETON, HENRY E. A Digital Electronic Correlator. *I.R.E. Proc.* 38, pp. 1422-1428, December, 1950.
- STEVENS, KENNETH N. Autocorrelation Analysis of Speech Sounds. *Acoustical Soc. Am. J.* 22, pp. 679-771, November, 1950.
- STRAUS, OLIVER H. The Relation of Phonetics and Linguistics to Communication Theory. *Acoustical Soc. Am. J.* 22, pp. 765-767, November, 1950.
- STUTT, CHARLES A. Experimental Study of Optimum Filters. *M. I. T. Res. Lab. of Electronics. Tech. Rept.* No. 182, 1951.
- VON HIPPEL, ARTHUR R. Ferroelectricity, Domain Structure, and Phase Transitions of Barium Titanate. *Rev. Modern Phys.* 22, pp. 221-237, July, 1950.
- VON HIPPEL, ARTHUR R. Dielectrics in Electrical Engineering. *Elec. Eng.* 69, pp. 771-773. September, 1950.
- VON HIPPEL, ARTHUR R. and M. C. BLOOM. The Electroplating of Metallic Selenium. *J. of Chem. Phys.* 18, pp. 1243-51, September, 1950.
- VON HIPPEL, ARTHUR R. Preparation for Defense. *M. I. T. Lab. for Insulation Res. Tech. Rept.* No. 40, 1950.
- VON HIPPEL, ARTHUR R. Dielectrics Made to Order. *Electronics* 24, pp. 126-151, June, 1951.
- WELCHMAN, W. GORDON. *An Introduction to Algebraic Geometry.* Cambridge [Eng.], University Press, 1950.
- YOUTZ, PATRICK, S. H. DODD, and H. KLEMPERER. Electrostatic Storage Tube. *Elec. Eng.* 69, pp. 990-995, November, 1950.

DEPARTMENT OF ENGLISH AND HISTORY

- BLUM, JOHN M. Nativism, Anti-Radicalism, and the Foreign Scare, 1917-1920. *Midwest J.* 3, pp. 46-53, Winter, 1950-1951.
- BLUM, JOHN M. Theodore Roosevelt and the Legislative Process (An Address at the Mississippi Valley Historical Convention, April, 1951).
- BRYANT, LYNWOOD S. and J. B. RAE, *Editors*. *Lowell: an Early American Industrial Community*. Cambridge, Mass.: The Technology Press, 1950.
- DE SANTILLANA, GEORGE and W. PITTS. Philolaos in Limbo, or: What Happened to the Pythagorians. *Isis* 42, pt. 2, pp. 112-120, June, 1951.
- DE SANTILLANA, GEORGE. Vico and Descartes. *Osiris* 9, p. 385, 1950.
- DE SANTILLANA, GEORGE. Review of *Four Views of Time in Ancient Philosophy*, by John F. Callahan. Cambridge: Harvard Univ. Press, 1948. *Isis* 42, pt. 1, pp. 89-90, April, 1951.
- DEUTSCH, KARL W. Nationalism, Communication and Community. (In *Perspectives on a Troubled Decade*, tenth symposium: Conference on Science, Philosophy and Religion. . . . pp. 339-365. New York: Harper, 1950.
- KOEHL, ROBERT L. The Eternal Polish Question. *Current History* 19, pp. 340-347, December, 1950.
- LIEPMANN, KLAUS. Music and Engineers. *J. Eng. Educ.* 41, No. 2, p. 106, October, 1950.
- LIEPMANN, KLAUS. *Three Pieces from Music for Children. Opus 65, by Serge Prokofieff*. Arranged for violin and piano, by Klaus Liepmann. New York: G. Schirmer, 1950.
- MAHONEY, THOMAS H. D. Four Articles on *The Korean Situation*. *The Tech* Vol. 71, October 31, November 3, 10, 21, 1950.
- MAHONEY, THOMAS H. D. and JOHN B. RAE. *Readings on International Order*. Cambridge, Mass.: The Technology Press, 1951.
- MAHONEY, THOMAS H. D. Lessons from Korea. *Am. Acad. Pol. & Soc. Sci. Annals* 276, pp. 43-47, July, 1951.
- MAHONEY, THOMAS H. D. Reviewed books on international affairs for *America* and for the *Boston Herald* in 1950-1951.
- MANN, ARTHUR. Frank Parsons: The Professor as Crusader. *Mississippi Valley Historical Rev.* 37, pp. 471-490, December, 1950.
- MANN, ARTHUR. Solomon Schindler: Boston Radical. *New England Quarterly* 23, pp. 453-476, December, 1950.
- MORISON, ELTING E., JOHN M. BLUM, and JOHN J. BUCKLEY, *Editors*. *The Letters of Theodore Roosevelt*. Cambridge: Harvard University Press, 1951. Vols. I, II.
- RAE, JOHN B. Review of *Jefferson and Madison: The Great Collaboration*, by Adrienne Koch. New York: Knopf, 1950. *Midwest J.* 3, pp. 139-140, May, 1951.
- ROSTOW, WALT W. The United Nations' Report on Full Employment. *Econ. J.* 60, pp. 323-350, June, 1950.

- ROSTOW, WALT W. The Terms of Trade in Theory and Practice. *Econ. History Rev.* 3, No. 1, pp. 1-20, 1950.
- ROSTOW, WALT W. Review of *The Theory of Fluctuations in Contemporary Economic Thought*, by S. D. Merlin. New York: Columbia Univ. Press, 1949. *Economic History Rev.* 3, No. 2, pp. 256-257, 1950.
- ROSTOW, WALT W. Two Analyses of Britain's Transition. *J. Econ. History* 11, pp. 55-59, Winter, 1951.
- ROSTOW, WALT W. Some Notes on Mr. Hicks and History. *Am. Econ. Rev.* 41, pp. 316-324, June, 1951.
- ROSTOW, WALT W. Government and Private Enterprise in European Recovery. *Tasks of Economic History* (*J. Econ. Hist. Suppl.* 10, pp. 105-113, 1950).
- ROSTOW, WALT W. An Historical Analysis of the Terms of Trade. *Econ. Hist. Rev.* 4, No. 1, pp. 53-76, 1951.

DEPARTMENT OF FOOD TECHNOLOGY

- DUNN, CECIL G. Industrial Microbiology Laboratory Manual. Boston: Spaulding-Moss, 1950.
- DUNN, CECIL G. Effects of X-Rays Produced at Two Megavolts on Some Ascosporegenous Yeasts. *Am. Brewer* 84, p. 27, May, 1951.
- GOLDBLITH, SAMUEL A. and BERNARD E. PROCTOR. Photometric Determination of Catalase Activity. *J. Biol. Chem.* 187, pp. 705-709, December, 1950.
- GOLDBLITH, SAMUEL A. Ascorbic Acid. (Chapter 4 in *Methods of Vitamin Assay*; edited by Association of Vitamin Chemists. New York: Interscience, 1951.)
- GOLDBLITH, SAMUEL A. Sterile Foods Without Heat. *M. I. T. Reports on Research* 2, No. 3, p. 1, January, 1951.
- HARRIS, ROBERT S. and KENNETH V. THIMANN, *Editors*. *Vitamins and Hormones*, Vol. 8. New York: Academic Press, 1950.
- HARRIS, ROBERT S. and *Others*. The Effect of Phytate and Other Food Factors on Iron Absorption. *J. Nutrition* 41, pp. 433-446, July, 1950.
- HARRIS, ROBERT S. Las Plantas Comestibles de Centro América y Panamá. *Pan American Union Sanitary Office. Boletín* 29, p. 841, Agosto, 1950.
- HARRIS, ROBERT S., LOUIS O. WILLIAMS and *Others*. Composición de las Plantas Alimenticias de la América, II-III. Guatemala. *Pan American Union. Sanitary Office. Boletín* 29, pp. 926-944, Septiembre, 1950; 30, pp. 474-493, Abril, 1951.
- HARRIS, ROBERT S., and LOUIS O. WILLIAMS and *Others*. Composition of Food Plants of Central America. IV. El Salvador. *Food Research* 15, pp. 263-296, July-August, 1950. V. Nicaragua. *Food Research* 15, pp. 355-365, September-October, 1950. VI. Costa Rica. *Food Research* 15, pp. 379-404, September-October, 1950. VII. Honduras 15, pp. 421-438, November-December, 1950. VIII. Guatemala. *Food Research* 15, pp. 439-453, November-December, 1950.

- HARRIS, ROBERT S. and HAZEL E. MUNSSELL. Edible Plants of Central America. *J. Home Economics* 42, No. 8, October, 1950.
- HARRIS, ROBERT S. Thiaminase. (Chapter 38 in *The Enzymes*; edited by K. B. Sumner. Vol. 1, part 2. New York: Academic Press, 1951.)
- HARRIS, ROBERT S. Article on "Vitamins." *Americana Annual*. New York: Corporation, 1951.
- HARRIS, ROBERT S. and ABRAHAM E. NIZEL. The Caries-producing Effect on Similar Foods Grown in Different Soil Areas. *N. E. J. Med.* 244, p. 361, March 8, 1951.
- LANDROCK, ARTHUR H. and B. E. PROCTOR. Measuring Humidity Equilibria. *Modern Packaging* 24, No. 6, pp. 123-130 and 186, February, 1951.
- LOCKHART, ERNEST E. Review of *Related Science for the Food Trades*, by Bernard E. Silver. New York: University of the State of New York, State Education Department, 1949. *Am. J. Public Health* 40, pp. 1328-1329, October, 1950.
- LOCKHART, ERNEST E. and M. C. MERRITT. Absorption Spectrum of 3,7-Dimethylxanthine. *Am. Chem. Soc. J.* 72, p. 5328, November, 1950.
- LOCKHART, ERNEST E. and J. M. GAINER. Effect of Monosodium Glutamate on Taste of Pure Sucrose and Sodium Chloride. *Food Research* 15, pp. 459-464, November-December, 1950.
- LOCKHART, ERNEST E., M. C. MERRITT, and C. D. MEAD. Molar Absorbancy Indices of Some 2,4-Dinitrophenylhydrazones. *Am. Chem. Soc. J.* 73, pp. 858-859, February, 1951.
- PROCTOR, BERNARD E. and SAMUEL A. GOLDBLITH. Oxidation-Reduction Dyes as Radiation Indicators. *Nucleonics* 7, No. 2, p. 83, August, 1950.
- PROCTOR, BERNARD E. The Training of Food Technologists at the Massachusetts Institute of Technology. *Food Tech.* 4, pp. 303-305, August, 1950.
- PROCTOR, BERNARD E., HARVEY FRAM, and C. G. DUNN. Effects of X-Rays Produced at 50 Kilovolts on Different Species of Bacteria. *J. Bacteriology* 60, pp. 263-267, September, 1950.
- PROCTOR, BERNARD E. and DARSHAN S. BHATIA. Effect of High-Voltage Cathode Rays on Amino Acids in Fish Muscle. *Food Tech.* 4, pp. 357-361, September, 1950.
- PROCTOR, BERNARD E., SAMUEL A. GOLDBLITH, and HARVEY FRAM. Effect of Supervoltage Cathode Rays on Bacterial Flora of Spices and Other Dry Food Materials. *Food Research* 15, pp. 490-493, November-December, 1950.
- PROCTOR, BERNARD E. and SAMUEL A. GOLDBLITH. Electromagnetic Radiation Fundamentals and Their Applications in Food Technology. *Advances in Food Research* 3, 119-196, 1951.
- PROCTOR, BERNARD E. Nutrition and Food Technology. *Nutrition Reviews* 9, No. 2, pp. 33-34, February, 1951.

- PROCTOR, BERNARD E. and JOHN P. O'MEARA. Effect of High-Voltage Cathode Rays on Ascorbic Acid. *Ind. Eng. Chem.* 43, pp. 718-721, March, 1951.
- SHERMAN, HENRY. Pyridoxine and Fat Metabolism. (In *Vitamins and Hormones*; edited by R. S. Harris and K. W. Thimann. Vol. 8, pp. 55-68. New York: Academic Press, 1950.)
- SHERMAN, HENRY, M. R. JETTON, and R. S. HARRIS. Metabolism of Deuteriumated Lauric Acid. *Federation Proc.* 10, p. 385, March, 1951.
- SZCZESNIAK, ALINA S., HENRY SHERMAN, and R. S. HARRIS. The Percutaneous Absorption of Water. *Science* 113, pp. 293-294, March 16, 1951.
- WILSON, ELSIE A. Basal Metabolic Rates of South American Indians. (In *U. S. American Ethnology*, Bur. Bull. 143. *Handbook of South American Indians*; edited by J. H. Steward. Vol. 6, pp. 97-104, 1950.)

DEPARTMENT OF GEOLOGY

- AHRENS, LOUIS H. *Spectrochemical Analysis*. Cambridge, Mass.: Addison-Wesley Press, December, 1950.
- AHRENS, LOUIS H. and L. G. GORFINKLE. Age of Extremely Ancient Pegmatites for Southeastern Manitoba. *Nature* 166, p. 149, July 22, 1950.
- AHRENS, LOUIS H. and W. R. LIEBENBERG. Tin and Indium in Mica, as Determined Spectrochemically. *Am. Mineralogist* 35, pp. 571-578, July-August, 1950.
- AHRENS, LOUIS H., D. M. SHAW, and O. I. JOENSUU. A Double-Arc Method for Spectrochemical Analysis of Geological Materials. *Spectrochim. Acta* 4, pp. 233-236, September, 1950.
- AHRENS, LOUIS H. and L. G. GORFINKLE. The Abundance of Several Relatively Rare Elements in Igneous Rocks of North America. *Science* 112, p. 565, November 10, 1950.
- AHRENS, LOUIS H. Quantitative Spectrochemical Analysis of Silicate Rocks, Silicate Minerals, and Allied Materials. (Preliminary report on a scheme of analysis.) *Spectrochim. Acta* 4, pp. 302-306, May, 1951.
- AHRENS, LOUIS H. and L. G. GORFINKLE. Quantitative Spectrochemical Analysis of Rubidium in Lepidolite. *Am. J. Sci.* 249, pp. 451-456, June, 1951.
- BUERGER, MARTIN J. Fourier Summations for Symmetrical Crystals. *Am. Mineralogist* 34, pp. 771-788, November, 1949.
- BUERGER, MARTIN J. Disorder in Crystals of Non-Metals. *Acad. Brasileira de Ciencias. Anais.* 21, pp. 245-266, December, 1949.
- BUERGER, MARTIN J. Vector Sets. *Acta Crystallographica* 3, pp. 87-97, March, 1950.
- BUERGER, MARTIN J. The Photography of Atoms in Crystals. *Nat. Acad. Sci. Proc.* 36, pp. 330-335, May, 1950.
- BUERGER, MARTIN J. The Crystallographic Symmetries Determinable by X-Ray Diffraction. *Nat. Acad. Sci. Proc.* 36, pp. 324-329, May, 1950.

- BUERGER, MARTIN J. Some New Functions of Interest in X-Ray Crystallography. *Nat. Acad. Sci. Proc.* 36, pp. 376-382, July, 1950.
- BUERGER, MARTIN J. and GABRIELLE DONNAY. The Determination of the Crystal Structure of Tourmaline. *Acta Crystallographica* 3, pp. 379-388, September, 1950.
- BUERGER, MARTIN J. Generalized Microscopy and the Two-Wave-Length Microscope. *J. Appl. Phys.* 21, pp. 909-917, September, 1950.
- BUERGER, MARTIN J. Tables of the Characteristics of the Vector Representations of the 230 Space Groups. *Acta Crystallographica* 3, pp. 465-471, November, 1950.
- BUERGER, MARTIN J. Limitation of Electron Density by the Patterson Function. *Nat. Acad. Sci. Proc.* 36, pp. 738-742, December, 1950.
- DENNEN, WILLIAM H. Variations in Chemical Composition Across Igneous Contacts. *Geol. Soc. Am. Bull.* 62, No. 6, June, 1951.
- FAIRBAIRN, HAROLD W. *Structural Petrology of Deformed Rocks*. Cambridge, Mass.: Addison-Wesley, 1950.
- FAIRBAIRN, HAROLD W. Synthetic Quartzite. *Am. Mineralogist* 35, pp. 735-748, September-October, 1950.
- FAIRBAIRN, HAROLD W. Pressure Shadows and Relative Movements in a Shear Zone. *Am. Geophys. Union Trans.* 31, pp. 914-916, December, 1950.
- HURLEY, PATRICK M. and JAMES B. THOMPSON. Airborne Magnetometer and Geological Reconnaissance Survey in Northwestern Maine. *Geol. Soc. Am. Bull.* 61, pp. 835-842, August, 1950.
- HURLEY, PATRICK M. On the Origin of Continents. *Tech Eng. News* 32, No. 5, p. 8, February, 1951.
- SHROCK, ROBERT R., V. KNUDSEN, R. C. REDFIELD, and R. D. REVELLE. Education and Training for Oceanographers. *Science* 111, pp. 700-703, June 23, 1950.
- SHROCK, ROBERT R. Review of *Stratigraphy and Paleontology of the Brownport Formation of Western Tennessee*, by T. W. Amsden. New Haven: Yale University Press, 1949. *U. S. Quarterly Book List* 6, p. 238, June, 1950.
- SHROCK, ROBERT R. Memorial to Clyde Arnett Malott. *Geological Soc. Am. Proc.* Annual Rept. 1950, pp. 104-109, 1951.
- WHITEHEAD, WALTER L., CLARK GOODMAN, and I. A. BREGER. The Decomposition of Fatty Acids by Alpha Particles. *J. Chimie Physique* 48, Nos. 3-4, p. 184-189, March-April, 1951.

SECTION OF GRAPHICS

- RULE, JOHN T. and EARLE F. WATTS. *Engineering Graphics*. New York: McGraw-Hill, 1951.

INSTITUTE LIBRARY

- BOOTH, ROBERT E. Index Catalog — Army Medical Library. *Am. Documentation* 1, pp. 124-125, Spring (April), 1950.
- TATE, VERNON D. The Charles Hayden Memorial Library. *College and Research Libraries* 11, p. 367, October, 1950.
- TATE, VERNON D. Giant Globe Dominates M. I. T. Map Room. *Library Journal* 76, p. 64, January 1, 1951.
- TATE, VERNON D. The Charles Hayden Memorial Library. In *M. I. T. Library Annual* 1950; edited by Vernon D. Tate and Margaret P. Hazen. pp. 10-13, 1951.
- TATE, VERNON D. Review of *Microfilms and Microcards: Their Use in Research*, by Blanche Prichard McCrum. Washington, D.C.: Library of Congress, 1950. *Am. Archivist* 14, p. 84, January, 1951.

DEPARTMENT OF MATHEMATICS

- BATTIN, RICHARD H. and C. C. LIN. On the Stability of the Boundary Layer over a Cone. *J. Aero. Sci.* 17, p. 453, July, 1950.
- CODDINGTON, EARL A. The Classical Existence Theorem of Nonlinear Analytic Differential Equations. *Am. Math. Soc. Proc.* 1, pp. 738-743, December, 1950.
- DOUGLASS, RAYMOND D. Graphical Mathematics. (Section 29 in *Plant Engineering Handbook*; edited by William Staniar, New York: McGraw-Hill, 1950.)
- FRANKLIN, PHILIP. Mathematical Tables, by E. V. Huntington; revised by Philip Franklin. (In *Mechanical Engineers' Handbook*; edited by Lionel S. Marks. Fifth Edition. pp. 2-69. New York: McGraw-Hill, 1951.)
- FRANKLIN, PHILIP. Mathematics, by E. V. Huntington; revised by Philip Franklin. (In *Mechanical Engineers' Handbook*; edited by Lionel S. Marks. Fifth Edition. pp. 87-178. New York: McGraw-Hill, 1951.)
- LEVINSON, NORMAN, A. B. FARNELL, and C. E. LANGENHOP. Forced Periodic Solutions of a Stable Non-Linear System of Differential Equations. *J. Math. and Physics* 29, pp. 300-302, January, 1951.
- LEVINSON, NORMAN. A Simplified Proof of the Expansion Theorem for Singular Second Order Differential Equations. *Duke Math. J.* 18, pp. 57-71, March, 1951.
- LEVINSON, NORMAN. Small Periodic Perturbations of an Autonomous System with a Stable Orbit. *Annals of Math.* 52, pp. 727-738, November, 1950.
- LEVINSON, NORMAN. On Stability of Non-Linear Systems of Differential Equations. *Colloquium Mathematicum* 2, pp. 40-45, 1949.
- LIN, CHIA-CHIAO and NEAL TETERVIN. A General Integral Form of the Boundary-Layer Equation for Incompressible Flow. . . . *N.A.C.A. Tech. Note* 2158, August, 1950.

- LIN, CHIA-CHIAO and J. R. FOOTE. Some Recent Investigations in the Theory of Hydrodynamic Stability. *Quarterly Appl. Math.* 8, pp. 265-280, October, 1950.
- LIN, CHIA-CHIAO and TH. VON KARMAN. On the Statistical Theory of Isotropic Turbulence. pp. 2-19. In *Advances in Applied Mechanics*, Vol. 2. New York: Academic Press. 1951.
- MURRAY, J. A., H. C. FISCHER, and D. W. SABEAN. The Effect of Time and Temperature of Burning on the Properties of Quicklime Prepared from Calcite. *Am. Soc. Testing Materials* 50, p. 1263, 1950. (Reprinted in *Paper Trade J.* 132, p. 22, June 1, 1951.)
- REISSNER, ERIC. On the Theory of Beams on an Elastic Foundation. (In *Beiträge zur Angewandten Mechanik*. Federhofer-Girkmann Festschrift.) Pp. 87-102, Wien: Deuticke, 1950.
- REISSNER, ERIC. Small Bending and Stretching of Sandwich-Type Shells. *N.A.C.A. Rept.* 975, 1950.
- REISSNER, ERIC. On a Variational Theorem in Elasticity. *J. Math. Phys.* 29, pp. 90-95, July, 1950.
- REISSNER, ERIC and R. A. CLARK. Deformations and Stresses in Bourdon Tubes. *J. Appl. Phys.* 21, pp. 1340-1341, December, 1950.
- REISSNER, ERIC. On Axi-symmetrical Deformations of Thin Shells of Revolution. *Symposia Appl. Math. Proc.* 3, pp. 27-52, 1951.
- REISSNER, ERIC. Extension of the Theory of Oscillating Airfoils of Finite Span in Subsonic Compressible Flow. *N.A.C.A. Tech. Note* 2274, February, 1951.
- REISSNER, ERIC. Note on the Relation of Lifting-Line Theory to Lifting-Surface Theory. *J. Aero. Sci.* 18, pp. 212-213, March, 1951.
- REISSNER, ERIC. On the Application of Mathieu Functions in the Theory of Subsonic Compressible Flow Past Oscillating Airfoils. *N.A.C.A. Tech. Note* 2363, May, 1951.
- REISSNER, ERIC and MANUEL STEIN. Torsion and Transverse Bending of Cantilever Plates. *N.A.C.A. Tech. Note* 2369, June, 1951.
- RUDIN, WALTER. A Theorem on Subharmonic Functions. *Am. Math. Soc. Proc.* 2, pp. 209-212, April, 1951.
- RUDIN, WALTER. Uniqueness Theory for Hermite Series. *Am. Math. Soc. Trans.* 70, pp. 387-403, May, 1951.
- SPRINGER, GEORGE. The Coefficient Problem for Schlicht Mappings of the Exterior of the Unit Circle. *Am. Math. Soc. Trans.* 70, p. 421, May, 1951.
- STRUIK, DIRK J. Communism and Genetics. *Tech Engineering News* 32, p. 9, April, 1951.
- STRUIK, DIRK J. *Lectures on Classical Differential Geometry*. Cambridge, Mass.: Addison-Wesley, 1950.
- THOMAS, GEORGE B., JR. *Calculus and Analytical Geometry*. Cambridge, Mass.: Addison-Wesley Press, 1951.

- WHITEHEAD, GEORGE W. The $(n + 2)$ nd Homotopy Group of the n -Sphere. *Annals Math.* 52, pp. 245-247, September, 1950.
- WIENER, NORBERT. *The Human Use of Human Beings*. Boston: Houghton Mifflin, 1950.
- WIENER, NORBERT. Some Maxims for Biologists and Psychologists. *Dialectica* 4, pp. 186-191, September 15, 1950.
- WIENER, NORBERT, KARL DEUTSCH, and GEORGE DE SANTILLANA. How U. S. Cities Can Prepare for Atomic War. *Life* 29, pp. 77-82+, December 18, 1950.
- WIENER, NORBERT. Homeostasis in the Individual and Society. *Franklin Institute J.* 251, pp. 65-68, January, 1951.
- WIENER, NORBERT. Problems of Sensory Prosthesis. *Am. Math. Soc. Bull.* 57, p. 27, January, 1951.

DEPARTMENT OF MECHANICAL ENGINEERING

- BURWELL, JOHN T., JR. Wear Tests and Service Performance. (In Am. Soc. Metals. *Interpretation of Tests and Correlation with Service*, pp. 88-140. Cleveland: A.S.M., 1951.
- BURWELL, JOHN T., JR. The Calculated Performance of Dynamically Loaded Sleeve Bearings — III. *J. Appl. Mech.* Preprint No. 51-A7, 1951.
- BURWELL, JOHN T., JR. and C. D. STRANG. Further Study of Metal Transfer Between Sliding Surfaces. *N.A.C.A. Tech. Note* 2271, January, 1951.
- BURWELL, JOHN T., JR. and FRANK C. LINN. Bearings and Lubrication for Marine Turbines and Reduction Gears. *Shipbuilder and Marine-Engine Builder* 58, April, 1951, p. 354. (Also *Soc. Naval Arch. Marine Engrs. Trans.* 58, 1950, Preprint.)
- FENG, I-MING. Application of Polystyrene Particles in Conjunction with Shadow Casting to the Study of Polished Metallic Surfaces. *J. Appl. Phys.* 22, pp. 820-824, June, 1951. (Figure 3 of this article appeared as the cover of the same issue of the journal.)
- FINCH, ROGERS B. Inter-Fiber Stress and Its Transmission, Parts I and II. *Textile Research J.* 21, pp. 375-392, June, 1951.
- GROSSMAN, NICHOLAS. Effect of Shot Peening on the Brittle Transition Temperature. *Metal Progress* 58, pp. 352-354, September, 1950.
- HAWTHORNE, WILLIAM R. Secondary Circulation in Fluid Flow. *Royal Soc. London Proc. A.* 206, p. 374, May 7, 1951.
- HRONES, JOHN A. and JAMES B. RESWICK. Nondimensional Study of Proportional-Plus Reset Control of a Single-Capacity System. *Am. Soc. Mech. Engrs. Trans.* 73, p. 511, July, 1951.
- KAYE, JOSEPH. The Transient Temperature Distribution in a Wing Flying at Supersonic Speeds. *J. Aero. Sci.* 17, pp. 787-808, December, 1950.
- KAYE, JOSEPH, J. H. KEENAN, and W. H. McADAMS. Report of Progress on Measurements of Friction Coefficients Recovery Factors, and Heat Transfer Coefficients for Supersonic Flow of Air in a Pipe. *Am. Soc. Mech. Engrs. Trans.* 73, pp. 267-280, April, 1951.

- KEENAN, JOSEPH H., E. P. NEUMANN, and F. L. LUSTWERK. An Investigation of Ejector Design by Analysis and Experiment. *Am. Soc. Mech. Engrs. Trans.* 72, pp. 299-309, September, 1950.
- KEENAN, JOSEPH H. Education for Freedom. *The Technology Review* 53, No. 4, p. 195, February, 1951.
- LENT, DEANE. *Machine Drawing*. New York: Prentice-Hall, 1951.
- LESSELLS, JOHN M. and Others. Machine Elements. (In *Mechanical Engineers' Handbook*; edited by Lionel S. Marks. Fifth Edition. pp. 860-946. New York: McGraw-Hill, 1951.)
- LESSELLS, JOHN M. and G. S. CHERNIAK. Strength of Materials. (Section 8 in *Kent's Mechanical Engineers' Handbook*. . . Twelfth Edition. New York: Wiley, 1950.)
- LUSTWERK, FERDINAND and E. P. NEUMANN. High Efficiency Supersonic Diffusers. *J. Aero. Sci.* 18, pp. 369-374, June, 1951.
- MACGREGOR, CHARLES W. Mechanical Properties of Materials. (Chapter 1 in *Handbook of Experimental Stress Analysis*; edited by M. Hetényi. New York: Wiley, 1950.)
- MACGREGOR, CHARLES W. Mechanical Properties of Materials. (In *Mechanical Engineers' Handbook*; edited by Lionel S. Marks. Fifth Edition. pp. 394-413. New York: McGraw-Hill, 1951.)
- MURRAY, WILLIAM M. and T. J. DOLAN. Fundamentals and Two-dimensional Applications. (Chapter 17, Part 1 in *Handbook of Experimental Stress Analysis*; edited by M. Hetényi. New York: Wiley, 1950.)
- MURRAY, WILLIAM M. Some Experimental Techniques in Stress Analysis. *Am. Iron Steel Inst. Year Book*, pp. 383-395, 1950.
- RATHBUN, KENNETH C. and H. G. STEVER. Theoretical and Experimental Investigation of the Condensation of Air in Hypersonic Wind Tunnels. *M. I. T.: Aero. Eng'g Dept.*, 1950.
- RATHBUN, KENNETH C. Condensation of Air in Hypersonic Wind Tunnels. *Univ. of Virginia Eng. Rev.* 7, No. 5, p. 10, May, 1951.
- RATHBUN, KENNETH C. *Working Your Way Through College*. Cambridge, Mass.: The Author, 1951.
- ROHSENOW, WARREN M. Heat Transfer. (In *Plant Engineering Handbook*; edited by William Staniar. pp. 1606-1617. New York: McGraw-Hill, 1950.)
- ROHSENOW, WARREN M. and G. H. EISENHARDT. Calculation of Thermal Stresses in a Wedge-shaped Wing. *J. Aero. Sci.* 18, pp. 115-123, February, 1951.
- ROHSENOW, WARREN M. and J. A. CLARK. Heat Transfer and Pressure Drop Data for High Heat Flux Densities to Water at High Sub-Critical Pressures. *Heat Transfer and Fluid Mechanics Inst. Proc.* June, 1951.
- ROHSENOW, WARREN M. and J. A. CLARK. A Study of the Mechanism of Boiling Heat Transfer. *Am. Soc. Mech. Engrs. Trans.* 73, pp. 609-620, July, 1951.

- SCHWARZ, EDWARD R. New Developments in Textiles. *J. Home Econ.* 42, p. 518, September, 1950.
- SCHWARZ, EDWARD R. Building Safety into Textile Machines. *Mech. Eng.* 72, pp. 977-978, December, 1950.
- SCHWARZ, EDWARD R. Suit Yourself. *The Technology Review* 53, p. 190, February, 1951.
- SCHWARZ, EDWARD R. Certain Aspects of Yarn Structure. *Textile Research J.* 21, No. 3, pp. 125-136, March, 1951.
- SHANK, MAURICE E. and T. J. AGNOR. Fracture Modes of High Purity Metals. *J. Appl. Phys.* 21, No. 9, p. 939-940, September, 1950.
- SHAPIRO, ASCHER H. and WALTON FORSTALL, JR. Momentum and Mass Transfer in Coaxial Gas Jets. *J. Appl. Mech.* 17, p. 399, December, 1950.
- SHAPIRO, ASCHER H. and FRED LANDIS. The Turbulent Mixing of Co-Axial Gas Jets. (In *Heat Transfer and Fluid Mechanics Institute*, Stanford University, June 20-21, 1951. *Preprints of Papers.* pp. 133-146. 1951.)
- SHAPIRO, ASCHER H. Review of *Elements of Aerodynamics of Supersonic Flows*, by Antonio Ferri. New York: Macmillan, 1949. *J. Appl. Mech.* 18, p. 126, March, 1951.
- SHAPIRO, ASCHER H., F. W. BARRY, and E. P. NEUMANN. The Interaction of Shock Waves with Boundary Layers on a Flat Surface. *J. Aero. Sci.* 18, p. 229, April, 1951.
- SHAW, MILTON C. and E. G. LOEWEN. Worked on portions of Curtiss-Wright Corp. *Increased Production, Reduced Costs Through a Better Understanding of the Machining Progress. . . .* Wood-Ridge, N. J., 1950. (U. S. Air Force Machinability Report.)
- SHAW, MILTON C., J. D. PIGOTT, and L. P. RICHARDSON. The Effect of the Cutting Fluid upon Chip-Tool Interface Temperature. *Am. Soc. Mech. Engrs. Trans.* 73, p. 45, January, 1951.
- SHAW, MILTON C., E. G. LOEWEN, and E. R. MARSHALL. Electric Strain Gage Tool Dynamometers. *Soc. Exper. Stress Analysis Proc.* 8, No. 2, p. 1, March, 1951.
- SODERBERG, C. RICHARD. Working Stresses. (Chapter 10 in *Handbook of Experimental Stress Analysis*; edited by M. Hetényi. New York: Wiley, 1950.)
- TAYLOR, C. FAYETTE. Effect of Size on the Design and Performance of Internal Combustion Engines. *Am. Soc. Mech. Engrs. Trans.* 72, p. 633, July, 1950.
- TAYLOR, C. FAYETTE. Discussion of Analysis of Exhaust Process in Four-Stroke Reciprocating Engines, by J. D. Stanitz. *Am. Soc. Mech. Engrs. Trans.* 73, p. 327, April, 1951.
- TAYLOR, C. FAYETTE. Correlation and Presentation of Diesel-Engine Performance Data. *S.A.E. Quarterly Trans.* 5, pp. 194-206, April, 1951.
- WILKES, GORDON B. *Heat Insulation*. New York: Wiley, 1950.

MEDICAL DEPARTMENT

- COLE, EDWIN M. Specific Reading Disability: A Problem in Integration and Adaptation. *Am. J. Ophthalmology* 34, No. 2, February, 1951.
- CRAWFORD, G. MARSHALL. Treatment of Acne. *Modern Medicine* 18, No. 22, pp. 95-100, November, 1950.
- CRAWFORD, G. MARSHALL. Syphilis. *N. E. J. Med.* 243, pp. 916-927; 955-966, December, 1950.
- FARNSWORTH, DANA L. The 18-Year-Old: An Indistinct Portrait. *The New York Times Magazine Section*, pp. 11, 36, March 4, 1951.
- FARNSWORTH, DANA L. M. I. T.'s Psychiatric Service. *The Tech Engineering News* 32, No. 2, pp. 11, 26, 32, November, 1950.
- FARNSWORTH, DANA L. The Nurse's Role in Mental Health. *Public Health Nursing* 43, No. 4, pp. 173-177, April, 1951.
- HARDY, HARRIET L. Beryllium Poisoning. (In *Oxford Medicine*, April, 1951.)
- HARDY, HARRIET L. The Character and Distribution of Disease in American Industries Using Beryllium Compounds. *Royal Soc. Medicine, London. Proc.* 44, p. 257, March, 1951.
- HARDY, HARRIET L. Hazards of Common Solvents. *Physics Today* 3, p. 15, July, 1950.
- HARDY, HARRIET L. and C. C. MALOOF. Treatment of Lead Poisoning with Sodium Citrate. *Arch. Indus. Hyg. Occ. Med.* 3, p. 267, March, 1951.
- HARDY, HARRIET L., FREDERIC C. BARTTER, and ABRAHAM E. JAFFIN. Metabolic Study of a Case of Chronic Beryllium Poisoning Treated with ACTH. *Arch. Indus. Hyg. Occ. Med.* 3, p. 579, June, 1951.
- HARRIS, HERBERT I. Repression as a Factor in Learning Theory. *Psychoanalytic Quarterly* 19, No. 3, July, 1950.

DEPARTMENT OF METALLURGY

- AVERBACH, BENJAMIN L., B. S. LEMENT, and C. S. ROBERTS. Determination of Small Thermal Expansion Coefficients by a Micrometric Dilatometer Method. *Rev. Sci. Instr.* 22, p. 194, March, 1951.
- AVERBACH, BENJAMIN L., B. S. LEMENT, and MORRIS COHEN. Dimensional Behavior of Invar. *Am. Soc. Metals Trans.* 43, p. 1072, 1951.
- BACKOFEN, WALTER A. Torsion Texture of Copper. *Am. Inst. Mining Engrs. Trans. (J. Metals)* 188, p. 1454, December, 1950.
- BACKOFEN, WALTER A. The Deformation and Recrystallization Texture of Cold-drawn OFHC Copper Wire. (Technical Note.) *J. Metals* 3, p. 250, March, 1951.
- BEVER, MICHAEL B. and R. ROCCA. Le Principe de Le Chatelier et ses Applications en Metallurgie. *La Revue de Metallurgie* 48, pp. 363-368, May, 1951.

- BEVER, MICHAEL B. and W. O. PHILBROOK, *Editors*, in Collaboration with H. B. EMERICK and B. M. LARSEN. *Basic Open Hearth Steelmaking*. Second Edition. New York: Am. Inst. Min'g Met. Engrs., June, 1951.
- BEVER, MICHAEL B., G. W. P. RENGSTORFF, and C. F. FLOE. The Carbonitriding Process of Case Hardening Steel. *Am. Soc. Metals Trans.* 43, pp. 342-368, 1951.
- BEVER, MICHAEL B., G. W. P. RENGSTORFF, and C. F. FLOE. Constitution of Carbonitrided Cases. *Am. Soc. Metals Trans.* 43, pp. 378-397, 1951.
- BUFFINGTON, FRANCIS S., I. D. BAKALAR, and MORRIS COHEN. Self-Diffusion in Iron. (Chapter 6 in *The Physics of Powder Metallurgy*; edited by W. E. Kingston. New York: McGraw-Hill, 1951.)
- CHIPMAN, JOHN, C. W. SHERMAN, and H. I. ELVANDER. Thermodynamic Properties of Sulphur in Molten Iron-Sulphur Alloys. *Am. Inst. Mining Engrs. Trans.* 188, pp. 334-340, February, 1950.
- CHIPMAN, JOHN and M. N. DASTUR. Vanadium-Oxygen Equilibrium in Liquid Iron. *Am. Inst. Min'g Engrs. Trans. (J. Metals)* 191, pp. 111-115, February, 1951.
- CHIPMAN, JOHN and JOHN F. ELLIOTT. The Thermodynamic Properties of Binary Liquid Cadmium Solutions. *Faraday Soc. Trans.* 47, part 2, p. 138, February, 1951.
- CHIPMAN, JOHN, R. J. ROCCA, and N. J. GRANT. Distribution of Sulphur between Liquid Iron and Slags of Low Iron-Oxide Concentrations. *J. Metals* 3, p. 319, April, 1951.
- CHIPMAN, JOHN and JOHN F. ELLIOTT. The Thermodynamic Properties of Liquid Ternary Cadmium Solutions. *Am. Chem. Soc. J.* 73, pp. 2682-2693, June, 1951.
- COHEN, MORRIS, F. S. BUFFINGTON, and I. D. BAKALAR. Discussion of paper by C. E. Birchenall and R. F. Mehl on "Self-Diffusion in Alpha and Gamma Iron." *Am. Inst. Mining Engrs. Trans.* 188, p. 1375, November, 1950.
- COHEN, MORRIS, R. W. BALLUFFI, and B. L. AVERBACH. The Tempering of Chromium Steels. *Am. Soc. Metals Trans.* 43, p. 497, 1951.
- FISHER, JOHN C. The Limiting Hydrostatic Tension of Water Near 0°C. *J. Appl. Phys.* 21, p. 1068, October, 1950.
- FISHER, JOHN C. Calculation of Diffusion Penetration Curves for Surface and Grain Boundary Diffusion. *J. Appl. Phys.* 22, pp. 74-77, January, 1951.
- GAUDIN, ANTOINE M. and F. SENFTLE. Concentration of Ores by Induced Activities. *Nucleonics* 8, pp. 53-59, May, 1951.
- GRANT, NICHOLAS J. and A. DE S. BRASUNAS. Accelerated Oxidation of Certain Stainless High Temperature Alloys. *Iron Age* 166, No. 7, p. 85, August 17, 1950.
- GRANT, NICHOLAS J. and W. R. OPIE. Hydrogen Solubility in Aluminum and Some Aluminum Alloys. *Am. Inst. Mining Engrs. Trans. (J. Metals)* 188, p. 1237, October, 1950.

- GRANT, NICHOLAS J. and W. R. OPIE. The Effect of Hydrogen upon the Mechanical Properties of Some Aluminum Alloys. *Foundry* 78, No. 10, p. 104, October, 1950.
- GRANT, NICHOLAS J., J. SEABROOK, and D. CARNEY. Hydrogen Embrittlement of SAE 1020 Steel. *Am. Inst. Mining Engrs. Trans. (J. Metals)* 188, p. 1317, November, 1950.
- GRANT, NICHOLAS J., L. W. KATES, and N. HAMILTON. The Development and Evaluation of Cast Turbine Rotors. *Foundry* 78, No. 12, p. 86, December, 1950.
- GRANT, NICHOLAS J. Stress Rupture Testing. (In Am. Soc. Metals. *High Temperature Properties of Metals*, pp. 41-72. Cleveland: A.S.M., 1951.)
- GRANT, NICHOLAS J., J. W. PUTMAN, R. D. POTTER. The Ternary System Chromium-Molybdenum-Iron. *Am. Soc. Metals Trans.* 43, pp. 824-852, 1951.
- GRANT, NICHOLAS J., and W. R. OPIE. Solubility of Hydrogen in Molten Lead. *J. Metals* 3, p. 244, March, 1951.
- GRANT, NICHOLAS J., R. ROCCA, and J. CHIPMAN. Distribution of Sulfur Between Molten Iron and Slags at Low Iron Oxide Concentrations. *J. Metals* 3, p. 319, April, 1951.
- GRANT, NICHOLAS J. and I. SERVI. Metallographic Techniques for High Purity Aluminum. (Technical Note.) *J. Metals* 3, p. 473, June, 1951.
- KAUFMANN, ALBERT R. Magnetic Methods of Analysis. (Chapter in *Physical Methods in Chemical Analysis*; edited by W. G. Berl. Vol. 1, pp. 229-254. New York: Academic Press, 1951.)
- KINGERY, WILLIAM DAVID. Fundamental Study of Phosphate Bonding in Refractories: I, II, III. *Am. Ceramic Soc. J.* 33, p. 239, August, 1950.
- KULIN, S. ANDREW and MORRIS COHEN. On the Martensitic Transformation at Temperature Approaching Absolute Zero. *Am. Inst. Mining Engrs. Trans. (J. Metals)* 188, p. 1139, September, 1950.
- PUTMAN, JOHN W., N. J. GRANT, and D. S. BLOOM. Sigma Phase in Chromium-Molybdenum Alloys with Iron or Nickel. (In Am. Soc. Testing Materials. *Symposium on the Nature, Occurrence and Effects of Sigma Phase*. Philadelphia: A.S.T.M. Spec. Pub. No. 110. 1951.
- REESE, DONALD J. ABC of Foundry Practice; Carbon and its Effect on Cast Iron. *Foundry* 79, p. 121, January, 1951; Silicon and its Effect on Cast Iron. *Foundry* 79, p. 182, February, 1951.
- SCHUHMAN, REINHARDT, JR. and OLIVER W. MOLES. Sulphur Activities in Liquid Copper Sulphides. *J. Metals* 3, pp. 235-241, March, 1951.
- SCHUHMAN, REINHARDT, JR. and PEKKA J. ENSIO. Thermodynamics of Iron-Silicate Slags: Slags Saturated with Gamma Iron. *J. Metals* 3, pp. 401-411, May, 1951.
- SPEDDEN, H. RUSH and ARVID THUNAES. An Improved Method of Gravity Concentration in the Fine-Size Range. *Am. Inst. Mining Engrs. Trans.* 187, pp. 879-882, August, 1950.

- SPEDDEN, H. RUSH. Flotation. Article in *Encyclopedia of Chemical Technology*; edited by R. E. Kirk and D. F. Othmer. Vol. 6. New York: Interscience Encyclopedia, 1951.
- TAYLOR, HOWARD F. and L. M. DIRAN. Chamotte — A Synthetic Molding Material. *Steel Foundry Facts* No. 104, pp. 7-12, July, 1950.
- TAYLOR, HOWARD F. An Evaluation of Riser Compounds. *Steel Founders' Soc. Am. Research Rept.* No. 24, August, 1950.
- TAYLOR, HOWARD F., J. F. WALLACE, and J. E. SAVAGE. Some Mechanical Properties of Alloy Cast Steels and the Relative Effects of Mass and Segregation. *Am. Foundrymen's Assoc. Trans.* 59, 1951. (Preprint.)
- TELKES, MARIA. A Low Cost Solar Heated House. *Heating and Ventilating* 47, pp. 72-74, August, 1950.
- TELKES, MARIA. Thermoelectric Power and Resistivity of Minerals. *Am. Mineralogist* 35, pp. 536-555, July-August, 1950.
- UDIN, HARRY. Grain Boundary Effect in Surface Tension Measurement. *Am. Inst. Mining Engrs. Trans. (J. Metals)* 189, p. 63, January, 1951.
- UHLIG, HERBERT H. Adsorbed and Reaction-Product Films on Metals. *Electrochem. Soc. J.* 97, pp. 215C-220C, November, 1950.
- UHLIG, HERBERT H. and ANTON DE S. BRASUNAS. Effect of Magnetic Transformation at the Curie Temperatures on Oxidation Rates of Chromium-Iron Alloys. *Electrochem. Soc. J.* 97, pp. 448-452, December, 1950.
- WAGNER, CARL. Methods of High Temperature Oxidation Testing and Evaluation of Observations. In Am. Soc. Metals. *High Temperature Properties of Metals.* pp. 93-132. Cleveland: A.S.M., 1951.
- WAGNER, CARL. Diffusion and High Temperature Oxidation of Metals. (In Am. Soc. Metals. *Atom Movements.* pp. 153-173. Cleveland: A.S.M., 1951.
- WAGNER, CARL. Diffusion of Lead Chloride Dissolved in Solid Silver Chloride. *J. Chem. Phys.* 18, pp. 1227-1230, September, 1950.
- WAGNER, CARL. Theoretical Analysis of the Current Density Distribution in Electrolytic Cells. *Electrochem. Soc. J.* 98, pp. 116-128, March, 1951.
- WAGNER, CARL. On the Solution of Fredholm Integral Equations of Second Kind by Iteration. *J. Math. and Phys.* 30, pp. 23-30, April, 1951.
- WAGNER, CARL. Thermodynamic Investigations on Ternary Amalgams. *J. Chem. Phys.* 19, pp. 626-631, May, 1951.
- WULFF, JOHN, J. E. CLINE, and R. T. THURSTON. Determination of the Temperature of Sprayed Metal Particles. *Welding J.* 29, pp. 320-s, July, 1950.
- WULFF, JOHN and R. T. THURSTON. Metal Spraying of High-Temperature Metals and Alloys. *Welding J.* 29, p. 313-s, July, 1950.
- WULFF, JOHN, W. J. CHILDS, J. E. CLINE, and W. M. KISNER. Molybdenum Plating by Reduction of the Pentachloride Vapor. *Am. Soc. Metals Trans.* 43, p. 105, 1951.

DEPARTMENT OF METEOROLOGY

- AUSTIN, JAMES M. and R. SHAPIRO. Tropospheric and Stratospheric Temperature Changes Associated with Pressure Changes. *J. Meteorology* 8, pp. 191-195, June, 1951.
- CUNNINGHAM, ROBERT M. An Observation of Large Temperature Fluctuations in the Free Atmosphere. *J. Meteorology* 7, pp. 347-349, October, 1950.
- HOUGHTON, HENRY G. An Appraisal of Cloud Seeding as a Means of Increasing Precipitation. *Am. Meteorological Soc. Bull.* 32, No. 2, pp. 39-46, February, 1951.
- HOUGHTON, HENRY G. A Preliminary Quantitative Analysis of Precipitation Mechanisms. *J. Meteorology* 7, No. 6, pp. 363-369, December, 1950.
- HOUGHTON, HENRY G. and H. C. CRAMER. A Theory of Entrainment in Convective Currents. *J. Meteorology* 8, No. 2, pp. 95-102, April, 1951.
- LETTAU, HEINZ H. Theory of Surface-Temperature and Heat-Transfer Oscillations near a Level Ground Surface. *Am. Geophys. Union Trans.* 32, No. 2, p. 189, April, 1951.
- LIGDA, MYRON G. H. Lighting Detection by Radar. *Am. Meteorological Society Bull.* 31, pp. 279-283, October, 1950.
- MURPHY, E. A. and E. S. PULK. *Workbook for Weather Forecasting*. New York: Prentice-Hall, 1951.
- STARR, VICTOR P. Geostrophic Departures in the Jet Stream. *Tellus* 2, pp. 233-235, August, 1950.
- STARR, VICTOR P. and ROBERT M. WHITE. A Hemispherical Study of the Angular-Momentum Balance. *Royal Meteor. Soc. Quart. J.* 77, pp. 215-225, April, 1951.
- STARR, VICTOR P. Note on Recent Study of Stability by R. Fjortoft. *Tellus* 2, pp. 321-323, November, 1950.
- STARR, VICTOR P. A Note on the Eddy Transport of Angular Momentum. *Royal Meteor. Soc. Quart. J.* 77, pp. 44-50, January, 1951.
- WILLETT, HURD C. Extrapolation of Sunspot-Climate Relationships. *J. Meteorology* 8, pp. 1-6, February, 1951.
- WILLETT, HURD C. Temperature Trends of the Past Century. *Royal Meteor. Soc. Quart. J.* (Centenary Proceedings) 76, pp. 195-206, 1950.

DEPARTMENT OF MODERN LANGUAGES

- BERRY, MADELINE M. and JAMES W. PERRY. A Review of Notational Systems for Designating Organic Structural Formulas. (Preprint distributed to Committees of the American Chemical Society and of the International Union of Pure and Applied Chemistry.)
- CONDOYANNIS, GEORGE E. Review of *Aus Nah und Fern*, by Lore Barbara Foltin. (German reading text.) *German Quarterly* 23, pp. 268-270, November, 1950.

- LOCKE, WILLIAM N. Effective Preparation for Graduate Language Requirements. *J. Chem. Educ.* 27, p. 426, August, 1950. (Also in *Modern Language J.* 34, November, 1950.)
- PERRY, JAMES W. Information Analysis for Machine Searching. *Am. Documentation* 1, pp. 133-139, Summer (August), 1950.
- PERRY, JAMES W. and S. W. COCHRAN. Conventional and Mechanized Search Methods. *Ind. Eng. Chem.* 42, pp. 1456-1457, August, 1950.
- PERRY, JAMES W. The Literature Chemist. *Chem. Eng. News* 26, pp. 4530-4532, December, 1950.
- PERRY, JAMES W. and ROBERT S. CASEY, *Editors*. *Punched Cards: Their Applications to Science and Industry*. New York: Reinhold Publishing Corp., 1951.
- PERRY, JAMES W. and ROBERT S. CASEY. Punched Card Fundamentals — Introduction. (In *Punched Cards: Their Applications to Science and Industry*; edited by R. S. Casey and J. W. Perry. pp. 5-9. New York: Reinhold, 1951.)
- PERRY, JAMES W. and ROBERT S. CASEY. Elementary Manipulations of Hand-Sorted Punched Cards. (In *Punched Cards: Their Applications to Science and Industry*; edited by R. S. Casey and J. W. Perry. pp. 10-24. New York: Reinhold, 1951.)
- PERRY, JAMES W. Punched-Card Coding — Some Practical Suggestions. (In *Punched Cards: Their Applications to Science and Industry*; edited by R. S. Casey and J. W. Perry. pp. 267-275. New York: Reinhold, 1951.)
- PERRY, JAMES W., LORNA A. FERRIS, KANARDY L. TAYLOR, and MARIA E. W. TOROK. Bibliography on Uses of Punched Cards. (In *Punched Cards: Their Applications to Science and Industry*; edited by R. S. Casey and J. W. Perry. pp. 459-485. New York: Reinhold, 1951.)
- PERRY, JAMES W. *Scientific Russian: An Introductory Text*. New York: Interscience Publishers, 1951.
- PERRY, JAMES W. New and Expanded Uses of Industrial Soap and Synthetic Detergents. *Soap and Glycerin Industry*, 24th Annual Convention, January 31-February 1, 1951. pp. 143-147. *Proceedings*.
- PERRY, JAMES W. and S. R. RANGANATHAN. External Memory and Research. (Published by UNESCO as Document NS/SL/5 October, 1950.) *J. Documentation* 7, pp. 10-14, March, 1951.

*DEPARTMENT OF NAVAL ARCHITECTURE
AND MARINE ENGINEERING*

- ABKOWITZ, MARTIN A. The Ship Model Towing Tank. *The Technology Review* 53, p. 404, June, 1951.
- BURTNER, EVERS. Marine Engineering. (In *Mechanical Engineers' Handbook*; edited by Lionel S. Marks. Fifth Edition. pp. 1439-1467. New York: McGraw-Hill, 1951.)

DEPARTMENT OF PHYSICS

- ALLIS, WILLIAM P., BENJAMIN LAX, and SANBORN C. BROWN. Effect of Magnetic Field on the Breakdown of Gases at Microwave Frequencies. *J. Appl. Phys.* 21, pp. 1297-1304, December, 1950. (*M. I. T. Res. Lab. Electronics. Tech. Rept.* No. 165, June 30, 1950.)
- ANNIS, MARTIN and H. S. BRIDGE. Cloud-Chamber Study of the New Unstable Particles. (Letter.) *Phys. Rev.* 82, p. 445, May 1, 1951.
- BITTER, FRANCIS and J. BROSEL. A New "Double Resonance" Method for the Investigation of Atomic and Nuclear Moments. Part 1. Theory of Effects in Mercury Vapor. *M. I. T. Res. Lab. Electronics. Tech. Rept.* No. 176, September 12, 1950.
- BITTER, FRANCIS and F. E. REED. A New Type of Electromagnet. Part I. Operation at 20-kw Level. *Rev. Sci. Instr.* 22, p. 171, March, 1951.
- BITTER, FRANCIS, N. I. ADAMS, III, and T. F. WIMETT. Nuclear Magnetic Moment Ratios of Isotopic Pairs. *Phys. Rev.* 82, p. 343, April 15, 1951.
- BITTER, FRANCIS, J. BROSEL, and P. SAGALYN. The Optical Detection of Radio Frequency Resonance. *Phys. Rev.* 79, p. 225-226, July 1, 1950.
- BOLT, RICHARD H. and P. E. DOAK. A Tentative Criterion for the Short-Term Transient Response of Auditoriums. *Acoustical Soc. Am. J.* 22, pp. 507-509, July, 1950.
- BOLT, RICHARD H. and ROBERT B. NEWMAN. Architectural Acoustics: Article 3, Part 1. Good Hearing Conditions. *Arch. Record* 108, p. 148, September, 1950.
- BOLT, RICHARD H., H. T. BALLANTINE, JR., T. F. HUETER, and G. D. LUDWIG. On the Detection of Intracranial Pathology by Ultrasound. *Science* 112, pp. 525-528, November 3, 1950.
- BOLT, RICHARD H. and ROBERT B. NEWMAN. Architectural Acoustics: Article 3, Part 2. Reverberation. *Arch. Record* 108, p. 158, November, 1950.
- BOLT, RICHARD H. and ROBERT B. NEWMAN. Control of Noise. (Chapter 4 in *Construction and Equipment of the Home*, by the Am. Public Health Assoc., Committee on the Hygiene of Housing. Chicago: Public Administration Service, 1951.) (Standards for Healthful Housing.)
- BOLT, RICHARD H. and T. F. HUETER. An Ultrasonic Method for Outlining the Cerebral Ventricles. *Acoustical Soc. Am. J.* 23, pp. 160-167, March, 1951.
- BOLT, RICHARD H. and U. INGARD. A Free Field Method of Measuring the Absorption Coefficient of Acoustic Materials. *Acoustical Soc. Am. J.* 23, pp. 509-516, September, 1951.
- BOLT, RICHARD H. and U. INGARD. Absorption Characteristics of Acoustic Material with Perforated Facings. *Acoustical Soc. Am. J.* 23, pp. 533-540, September, 1951.
- BROWN, SANBORN C. and L. J. VARNERIN. Microwave Determinations of Average Electron Energies and the First Townsend Coefficient in Hydrogen. *M. I. T. Res. Lab. Electronics. Tech. Rept.* No. 158, May 24, 1950. (Also in *Phys. Rev.* 79, p. 946, September 15, 1950.)

- BROWN, SANBORN C. High Frequency Gas Discharge Breakdown. *M. I. T. Res. Lab. Electronics. Tech. Rept. No. 195*, April 12, 1951.
- BUECHNER, WILLIAM W., D. M. VAN PATTER, E. N. STRAIT, and A. SPERDUTO. Proton Groups from $B^{11}(d,p)B^{12}$. *Phys. Rev.* 79, 262-265, July 15, 1950.
- BUECHNER, WILLIAM W. and ROBERT MALM. Proton Groups from the $N^{14}(d,p)N^{15}$ and $N^{15}(d,p)N^{16}$ Reactions. *Phys. Rev.* 80, pp. 771-774, December 1, 1950.
- BUECHNER, WILLIAM W., R. E. ADAMSON, W. M. PRESTON, CLARK GOODMAN, and D. M. VAN PATTER. The Neutron Yield from the $C^{13}(p,n)N^{13}$ Reaction. *Phys. Rev.* 80, 985-987, December 15, 1950.
- BUECHNER, WILLIAM W. and ROBERT MALM. Alpha-particle Groups from the $N^{14}(d,a)C^{12}$ and $N^{15}(d,a)C^{13}$ Reactions. *Phys. Rev.* 81, pp. 519-522, February 15, 1951.
- DEUTSCH, MARTIN and A. HEDGRAN. The Radioactivity of Hf^{181} . *Phys. Rev.* 79, p. 400, July 15, 1950.
- DEUTSCH, MARTIN. Angular Correlations in Nuclear Reactions. (Chapter 14 in *Reports on Progress in Physics*. London: Phys. Soc., 1951.)
- DEUTSCH, MARTIN and K. SHURE. Radiations from Zr^{89} . *Phys. Rev.* 82, p. 122, April 1, 1951.
- DEUTSCH, MARTIN and W. E. WRIGHT. Further Search for Nuclear Transitions with Lifetimes Between 3×10^{-9} and 10^{-7} sec. *Phys. Rev.* 82, p. 277, April 15, 1951.
- DEUTSCH, MARTIN. Evidence for the Formation of Positronium in Gases. *Phys. Rev.* 82, p. 455, May 1, 1951.
- DEUTSCH, MARTIN, K. BOYER, H. E. GOVE, J. A. HARVEY, and M. S. LIVINGSTON. Instrumentation of the M. I. T. Cyclotron for the Study of Nuclear Reactions. *Rev. Sci. Instr.* 22, pp. 310-320, May, 1951.
- DUNTLEY, SEIBERT Q. The Reflectance of Submerged Objects. *Optical Soc. Am. J.* 40, p. 795, November, 1950.
- DUNTLEY, SEIBERT Q. The Reflection of Light by Water Waves. *Optical Soc. Am. J.* 41, 286, April, 1951.
- DUNTLEY, SEIBERT Q., E. A. EDWARDS, and N. A. FINKELSTEIN. Spectrophotometry of the Living Human Skin in the Ultraviolet. *J. Investigative Dermatology* 16, pp. 311-321, May, 1951.
- FESHBACH, HERMAN and CYRIL M. HARRIS. On the Acoustics of Coupled Rooms. *Acoustical Soc. Am. J.* 22, p. 572, September, 1950.
- FESHBACH, HERMAN and H. LAX. Production of Mesons by Photons on Nuclei. *Phys. Rev.* 81, pp. 189-196, January 15, 1951.
- FESHBACH, HERMAN and R. L. PEASE. Binding Energy of the Triton. *Phys. Rev.* 81, pp. 142-143, January 1, 1951.
- FRANK, NATHANIEL H. *Introduction to Electricity and Optics*. Second Edition. New York: McGraw-Hill, 1950.

- FRANK, NATHANIEL H. and Others. The Teaching of Electricity and Magnetism at the College Level. *Am. J. Phys.* 18, pp. 1-25, January, 1950; 18, pp. 69-88, February, 1950.
- FRISCH, DAVID H. and JULES LEVIN. A Mechanical Wear Test Using Fission Fragments. *A.S.T.M. Bulletin* No. 172, pp. 64-65, February, 1951.
- GOODMAN, CLARK, J. W. CRAWFORD, JR., and E. E. KINTNER. The Effect of Ducts on the Attenuation of Neutrons and Gamma Rays in the M. I. T. Cyclotron Shield. *M. I. T. Lab. Nuclear Sci. Eng. Tech. Rept.* No. 38, September, 1950.
- GOODMAN, CLARK and VICTOR DELANO. Shielding Properties of the Concrete Wall of the M. I. T. Cyclotron. *J. Appl. Phys.* 21, pp. 1040-1047, October, 1950.
- GOODMAN, CLARK, P. H. STELSON, and W. M. PRESTON. The $V^{51}(p,n)Cr^{51}$ Neutron Spectrum. *Phys. Rev.* 80, p. 287, October 15, 1950.
- GOODMAN, CLARK, W. D. BAKER, J. S. HOWELL, and W. M. PRESTON. The (p,n) Reaction on Scandium and Vanadium: Energy Levels of Ti^{46} and Cr^{52} . *Phys. Rev.* 81, pp. 48-50, January 1, 1951.
- GOODMAN, CLARK and P. H. STELSON. The Inelastic Scattering of 15-Mev Neutrons by Lead, Iron, and Aluminum. *Phys. Rev.* 82, 69-71, April 1, 1951.
- GYORGY, E. MICHAEL and R. H. KINGSTON. A High-Vacuum Recording Spectrograph for the Study of Solids in the 50-1000A Range. (Abstract.) *Am. Phys. Soc. Bull.* 26, No. 3, p. 29, April, 1951.
- HARDY, ARTHUR C. and F. L. WURZBURG, JR. The Reproduction of Color. *Interchemical Rev.* 9, Part 1, pp. 3-13; Part 2, pp. 54-63, Spring-Summer, 1950, Autumn, 1950.
- HERLIN, MELVIN A. and H. E. RORSCHACH, JR. Low Temperature Resistance Minimum in Magnesium measured by a Mutual Inductance Method. (Letter.) *Phys. Rev.* 81, p. 467, February 1, 1951.
- HERLIN, MELVIN A. and M. PRINCE. Magnetic Dipole Interactions in Crystals Near Absolute Zero. *Phys. Rev.* 82, p. 328(A), April 15, 1951.
- HERLIN, MELVIN A. and R. D. MAURER. Pressure Variation of Second Sound Velocity in Helium II. *Phys. Rev.* 82, p. 329(A), April 15, 1951.
- HERLIN, MELVIN A. and H. E. RORSCHACH, JR. Resistance Minima in Metals. *Phys. Rev.* 82, p. 328(A), April 15, 1951.
- HILL, ALBERT G. *Bibliography in an Age of Science*. The University of Illinois Press, 1951.
- HINE, GERALD J. Scattering of Secondary Electrons Produced by X-Rays in Materials of Various Atomic Numbers. *Phys. Rev.* 82, p. 755, June 1, 1951.
- HINE, GERALD J. Response of G-M Counters and Photographic Emulsions to High Energy Photons. *Nucleonics* 7, No. 4, p. 18, October, 1950.
- HINE, GERALD J. and F. E. SENFTLE. Neutron Yield from $Be^9(x,n)Be^8$ Reaction. *Phys. Rev.* 80, p. 904, December 1, 1950.

- KING, GILBERT W. Stochastic Methods in Quantum Mechanics. (In *Proceedings of the Seminar on Scientific Computation*, November, 1949. New York: Int. Business Machines Corp., 1950.)
- KING, GILBERT W., HARRY C. ALLEN, and PAUL C. CROSS. The Vibrational Energy of H_2S . *J. Chem. Phys.* 18, No. 10, p. 1412, October, 1950.
- KING, GILBERT W. and R. M. HAINER. Effect of Low Temperatures on Infrared Spectra. *Nature* 166, p. 1029, December 16, 1950.
- KING, GILBERT W. Further Remarks on Stochastic Methods in Quantum Mechanics. In *Proceedings of Computation Seminar*, December, 1949. New York: Int. Business Machines Corp., 1951.
- KING, GILBERT W. and A. G. EMSLIE. Spectroscopy from the Point of View of Communication Theory. Part I. Resolution. *Optical Soc. Am. J.* 41, pp. 405-412, June, 1951.
- KINGSTON, ROBERT H. and E. M. GYORGY. Spectrographic Study of the Electron Energy Bands in Metals. (Abstract.) *Am. Phys. Soc. Bull.* 26, No. 3, p. 29, April, 1951.
- LIVINGSTON, M. STANLEY. Shielded Milling Machine For Cyclotron Targets. *Rev. Sci. Instr.* 22, p. 429, June, 1951.
- MCMAHON, HOWARD O., R. J. BOWEN, and G. A. BLEYLE, JR. A Perforated-Plate Heat Exchanger. *Am. Soc. Mech. Engrs. Trans.* 72, pp. 623-632, July, 1950.
- MCMAHON, HOWARD O., IVAN SIMON, and R. J. BOWEN. Dry Metallic Friction as a Function of Temperature Between $4.2^\circ K$ and $600^\circ K$. *J. Appl. Phys.* 22, p. 177, February, 1951.
- MCMAHON, HOWARD O. Thermal Radiation Characteristics of Some Glasses. *Am. Ceramic Soc. J.* 34, p. 91, March, 1951.
- MCMAHON, HOWARD O. Thermal Radiation from Partially Transparent Reflecting Bodies. *Optical Soc. Am. J.* 40, p. 376, June, 1950.
- MALETSKOS, CONSTANTINE J. and G. L. BROWNELL. Half-Life of Fe^{55} and Co^{60} . *Phys. Rev.* 80, pp. 1102-1103, December 15, 1950.
- MALETSKOS, CONSTANTINE J., E. W. BACKOFEN, and JOHN W. IRVINE, JR. Preparation of Zn^{65} of High Specific Activity from Copper Bombarded with 16-Mev Deuterons. *J. Chem. Phys.* 19, 796, June, 1951.
- MARGOLIS, BERNARD. Neutron Capture Gamma Rays. (Abstract.) *Am. Phys. Soc. Bull.* 26, No. 1, p. 22, February 1, 1951.
- MAURER, ROBERT D. and MELVIN A. HERLIN. Pressure Dependence of Second Sound Velocity in Liquid Helium II. *Phys. Rev.* 81, p. 444, February 1, 1951.
- MORSE, PHILIP M. and G. E. KIMBALL. *Methods of Operations Research*. Cambridge, Mass.: The Technology Press and New York: Wiley, 1951.
- ROBERTS, BENJAMIN W., JR., K. E. PERRY, and R. G. FLUHARTY. An Improved Resolving Time Measuring Device. *Rev. Sci. Instr.* 21, p. 790, September, 1950.
- RORSCHACH, HAROLD E., JR. and MELVIN A. HERLIN. Resistance Minima in Metals. (Abstract.) *Phys. Rev.* 82, p. 328, April 15, 1951.

- RORSCHACH, HAROLD E., JR. and MELVIN A. HERLIN. Low Temperature Resistance Minimum in Magnesium Measured by a Mutual Inductance Method. (Letter.) *Phys. Rev.* 81, p. 467, February 1, 1951.
- SCHULZ, GEORGE J. and JOHN E. COOLIDGE. Note on Static Electrification of Dust Particles on Dispersion into a Cloud. *J. Appl. Phys.* 22, p. 103, January, 1951.
- SCHULZ, GEORGE J. and JOHN E. COOLIDGE. Photoelectric Measurement of Dust. *Instruments* 24, p. 534, May, 1951.
- SLATER, JOHN C. Effects of Radiation on Materials. *J. Appl. Phys.* 22, p. 237, March, 1951.
- SLATER, JOHN C. The Lorentz Correction in Barium Titanate. *Phys. Rev.* 78, pp. 748-761, June 15, 1950.
- SLATER, JOHN C. Note on Orthogonal Atomic Orbitals. *J. Chem. Phys.* 19, p. 220, February, 1951.
- SLATER, JOHN C. A Simplification of the Hartree-Fock Method. *Phys. Rev.* 81, p. 385, February 1, 1951.
- SLATER, JOHN C. Structure and Polarization of Atoms and Molecules. *Elec. Eng.* 69, p. 855, October, 1950.
- STRANDBERG, MALCOLM W. P. and C. C. LOOMIS. Microwave Spectrum of Arsine, Phosphine and Stibine. *Phys. Rev.* 81, p. 798, March 1, 1951.
- TISZA, LASZLO. The Theory of Critical Points. *J. Phys. and Colloid Chem.* 54, No. 9, pp. 1317-1323, December, 1950.
- TISZA, LASZLO. Theory of Superconductivity. *Phys. Rev.* 80, p. 717, November 15, 1950.
- VAN PATER, DOUGLAS M., ANTHONY SPERDUTO, E. N. STRAIT, and W. W. BUECHNER. Magnetic Analysis of the $B^{10}(p,\alpha)Be^7$ Reaction. *Phys. Rev.* 79, pp. 900-901, September 1, 1950.
- VAN PATER, DOUGLAS M., ANTHONY SPERDUTO, S. S. HOLLAND, JR., and WILLIAM W. BUECHNER. Excited State of C^{14} from the $C^{13}(d,p)C^{14*}$ Reaction. *Phys. Rev.* 80, p. 769, November 15, 1950.
- VAN PATER, DOUGLAS M., ANTHONY SPERDUTO, K. HUANG, E. N. STRAIT, and W. W. BUECHNER. Excited State of Be^9 from the $B^{11}(d,\alpha)Be^{9*}$ Reaction. *Phys. Rev.* 81, pp. 233-238, January 15, 1951.
- VAN PATER, DOUGLAS M., E. N. STRAIT, W. W. BUECHNER, and ANTHONY SPERDUTO. Reaction Energies of Light Nuclei from Magnetic Analysis. *Phys. Rev.* 81, p. 747, March 1, 1951.
- VAN PATER, DOUGLAS M., WILLIAM W. BUECHNER, and ANTHONY SPERDUTO. Energy Levels of B^{11} from $B^{10}(d,p)B^{11*}$ Reaction. *Phys. Rev.* 82, pp. 248-257, April 15, 1951.
- WARREN, BERTRAM E. and BENJAMIN L. AVERBACH. The Effect of Cold Work Distortion on X-Ray Patterns. *J. Appl. Phys.* 21, p. 595, June, 1950.

- WARREN, BERTRAM E. and DAVID T. KEATING. Long Range Order in Beta Brass and Cu_3Au . *J. Appl. Phys.* 22, p. 286, March, 1951.
- WARREN, BERTRAM E. and B. L. AVERBACH. X-Ray Diffraction Studies of Cold Work in Metals. (In *Symposium on Plastic Deformation of Crystalline Solids*. pp. 113-122, May 19, 1950. Carnegie Institute of Technology and Office of Naval Research, 1950.)
- WARREN, BERTRAM E. and DAVID CHIPMAN. X-Ray Measurement of Long Range Order in Beta Brass. *J. Appl. Phys.* 21, p. 696, July, 1950.
- WARREN, BERTRAM E. and NICOLAI NORMAN. X-Ray Measurement of Short Range Order in Ag-Au. *J. Appl. Phys.* 22, p. 483, April, 1951.
- WEISSKOPF, VICTOR F. Nuclear Models. *Science* 113, p. 2926, January 26, 1951.
- WILLIAMS, ROBERT W. and T. M. SNYDER. Upper Limit for the Time Between Fission and the Emission of Neutrons. *Phys. Rev.* 81, p. 171, January 15, 1951.

ADMINISTRATION

- BURCHARD, JOHN E. Editor and annotator of *Mid-Century: The Social Implications of Scientific Progress*. Cambridge, Mass.: The Technology Press and New York: Wiley, 1950.
- BURCHARD, JOHN E. Out of Old Fields. *The Rice Institute Pamphlet* 37, p. 1, October, 1950.
- HARRISON, GEORGE R., EDWARD H. JACOBSEN, and JEAN CAMUS. Automatic Electronic Control of Groove Straightness in Grating Ruling. (Abstract.) *Opt. Soc. Am. J.* 40, p. 800, November, 1950.
- HARRISON, GEORGE R. The Challenge of the Ruled Grating. *Physics Today* 3, p. 9, September, 1950.
- HARRISON, GEORGE R. and C. L. BAUSCH. Echelle Spectroscopy. (In Conference on Optical Instruments, London, July 19-26, 1950. *Proc.* London: Chapman and Hall, 1950.)
- HARRISON, GEORGE R. and JAMES E. ARCHER. Monitoring of the Ruling of Diffraction Gratings with the Commensurator. (Abstract.) *Opt. Soc. J.* 41, p. 285, April, 1951.
- HARRISON, GEORGE R. Foreword to *Spectrochemical Analysis* by Louis H. Ahrens. Cambridge, Mass.: Addison-Wesley, 1950.
- HARRISON, GEORGE R. Testimony on Manpower. *Physics Today* 4, p. 3, March, 1951.
- HUNTER, DARD. The World's Most Important Material, Paper; Its Origin and History. *Illus. London News* 217, pp. 437-440, September 16, 1950.
- HUNTER, DARD. American Paper Labels of the Nineteenth Century. (In *Gutenberg Jahrbuch für 1951*, Mainz, Germany: Gutenberg Gesellschaft, 1951.)
- HUNTER, DARD. The Early Paper Mills of Ohio. (In *The Briquet Album*. Hilversum, Holland: Paper Publications Society, 1951.)

- KILLIAN, JAMES R., JR. Our Shared Convictions. *The Technology Review* 52, pp. 503-505, July, 1950.
- KILLIAN, JAMES R., JR. Men with a Mission. *The Technology Review* 53, pp. 20-21+, November, 1950.
- KILLIAN, JAMES R., JR. Review of *Security, Loyalty and Science*, by Walter Gellhorn. Ithaca, New York: Cornell Univ. Press, 1950. *Yale Rev.* 40, Winter, 1950.
- KILLIAN, JAMES R., JR. Everett Moore Baker, 1901-1950.
- KILLIAN, JAMES R., JR. The Touchstone of Freedom. *Niemann Report*, p. 3, January, 1951.
- KILLIAN, JAMES R., JR. The University's Responsibility to Science. *Chem. Eng. News* 29, p. 2033, May 21, 1951.
- KILLIAN, JAMES R., JR. Review of *Science and Common Sense*, by James B. Conant (New Haven: Yale University Press, 1951), and *The Impact of Science on Society*, by Bertrand Russell (New York: Columbia University Press, 1951). *Yale Rev.* 40, pp. 725-726, Summer, 1951.
- SHERWOOD, THOMAS K. Creative Accomplishment. *Chem. Eng. Progress* 46, p. 433, September, 1950.
- SHERWOOD, THOMAS K. The Curious History of the Wet-Bulb Hygrometer. *Chemistry in Canada* 2, p. 6, June, 1950.
- SHERWOOD, THOMAS K. Graduate Training in Chemical Engineering. *Chem. Eng. News* 28, pp. 2648-2650, August 7, 1950.
- SHERWOOD, THOMAS K. Heat Transfer, Mass Transfer, and Fluid Friction. Relationships in Turbulent Flow. *Ind. Eng. Chem.* 42, pp. 2077-2084, October, 1950.
- SHERWOOD, THOMAS K. and W. H. LINTON, JR. Mass Transfer from Solid Shapes to Water in Streamline and Turbulent Flow. *Chem. Eng. Progress* 46, p. 258, May, 1950.

THESES PRESENTED FOR DOCTORS' DEGREES

*(Not available in printed form. Photostat or microfilm copies
may be obtained from the Reference Librarian.)*

DEPARTMENT OF AERONAUTICAL ENGINEERING

DOCTOR OF SCIENCE

- ASHLEY, HOLT. Some Unsteady Aerodynamic Problems Affecting the Dynamic Stability of Aircraft. January, 1951.
- LEES, SIDNEY. Integration by the Viscous Shear Process. October, 1950.
- LINGARD, ALDRO IMMANUEL. Noise and Varying Parameters in Fixed-Gun Fighter Fire Control Systems. June, 1951.
- SCHWARTZ, MARTIN DE PUY. Investigation of Flight Flutter Testing Techniques. October, 1950.
- SEAMANS, ROBERT CHANNING, JR. Comparison of Automatic Tracking Systems for Interceptor Aircraft. June, 1951.

DEPARTMENT OF BIOLOGY

DOCTOR OF PHILOSOPHY

- BEERS, ROLAND FRANK, JR. Mechanism and Kinetics of Catalase Action Under the Influence of Inhibitors. June, 1951.
- McCULLOCH, DAVID. Electron and Polarization Microscopic Study of the Egg of *Arbacia Punctulata*. June, 1951.

DEPARTMENT OF CHEMICAL ENGINEERING

DOCTOR OF SCIENCE

- BADDOUR, RAYMOND FRANK. Rate of Ion Exchange. June, 1951.
- HIPKIN, HOWARD GEORGE. Carbon-Steam System at Low Temperatures and Under Pressure. June, 1951.
- KROLL, CHARLES LOUIS. Heat Transfer and Pressure Drop for Air Flowing in Small Diameter Tubes. January, 1951.
- METZNER, ARTHUR BERTHOLD. Use of Sulfur in Preparation of Adsorptive Carbons. June, 1951.
- O'NEILL, JOHN HENRY, JR. Viscosities of Concentrated Solutions of Polystyrene in m-Xylene. January, 1951.
- ROY, TUHIN KUMAR. Production of Pure Sulfur Dioxide. June, 1951.
- RYAN, FRANK ALVIN. Kinetics of Exchange Adsorption. June, 1951.

- STEWART, WARREN EARL. Interaction of Heat, Mass and Momentum Transfer. January, 1951.
- STOKES, CHARLES ANDERSON. Use of Salt Solutions and Solid Adsorbents to Dehydrate Gases and Organic Liquids. June, 1951.

DEPARTMENT OF CHEMISTRY

DOCTOR OF PHILOSOPHY

- BAKER, ALVIN W. Preparation of Cyclopropane- d_6 and Its Study by Means of Infrared and Raman Spectra. October, 1950.
- BEASLEY, JOHN KNOX. Infrared Optical Properties of Gold Smoke Deposits. January, 1951.
- BENEDICT, JOSEPH TVRZICKY. Separation of Zirconium and Hafnium by Ion Exchange Resins. October, 1950.
- BLOOM, BARRY MALCOLM. Synthesis of Some Compounds Related to Scopolamine. June, 1951.
- BOLTON, FRANK HAROLD. Effect of Salts on the Polymerization of Dienes by Sodium Reagents. June, 1951.
- BRECK, DONALD WESLEY. Some Metathetical Reactions of the Gaseous Fluorides of Group IV. June, 1951.
- BROWN, JOHN FRANCIS, JR. Polyfunctional Organic Catalysis. October, 1950.
- BYRNE, JOHN THOMAS. Electrodeposition Behavior of Sub-microgram Quantities. June, 1951.
- CAVE-BROWN-CAVE, GENILLE. Study of Thiocyanateargentate Ions by a Solubility Method.
- CHAMBERLAIN, MALCOLM. Study of Certain Cyclopropane Derivatives. June, 1951.
- CHAMBERS, VAUGHAN CRANDALL, JR. Study of the Structure and Reactivity of Small Ring Compounds. January, 1951.
- COBB, CAROLUS MELVILLE. Heat Capacity of Ammonium Iodide. January, 1951.
- COREY, ELIAS JAMES, JR. Synthesis of Diacylamino Acids and Analogs of Penicillin. January, 1951.
- DAVISON, ROBERT WILDER. Photochemical Polymerization of Methyl Methacrylate. October, 1950.
- ESTEVE, RAMON MARIA, JR. I. Mechanism of Hydrolysis of Triphenylsilyl Fluorides. II. Mechanism of Decarboxylation of β -Ketoacids. January, 1951.
- GATOS, HARRY COSTA. Passivity of Evaporated Iron Films in Nitric Acid. October, 1950.
- GEE, ALLEN. Osmotic Pressure of Human Serum Albumin and Gamma-globulin Solutions. January, 1951.

412 THESES PRESENTED FOR DOCTORS' DEGREES

- HAM, EDWARD ALBERT. Studies in the Nitrofluorenone and Nitrophenanthridone Series. June, 1951.
- HAVEN, ALFRED COLES, JR. Rearrangement of Oxime N-Ethers. October, 1950.
- KELLER, WILLIAM JOHN. Derivatives of Bicyclo[3.3.0]-1(5)-Octene. June, 1951.
- KINTER, MARK ROBERT. Preparation of Aryl-Substituted Cycloöctatetraenes and 1,3-Diphenylcycloöctane. June, 1951.
- LE BLANC, NORMAN FRANCIS. Analytical Chemistry of Zirconium. October, 1950.
- MANN, JOSEPH BIRD, JR. Actinometer for Use in the Visible. October, 1950.
- MASON, EDWARD ALLEN. Self-Diffusion of Gases. I. The System CO₂-CO₂. January, 1951.
- MAZUR, ROBERT HENRY. Interconversion of Cyclobutyl, Cyclopropylcarbinyl, and Allylcarbinyl Derivatives. January, 1951.
- MOORE, LOUIS DOYLE, JR. Dimensions of Styrene-Methylmethacrylate Copolymer Molecules in Solution. June, 1951.
- ROSS, JOHN. Self-Diffusion of Gases. II. The Isostere System Co₂-N₂O. January, 1951.
- SCHMITZ, WILLIAM RUDOLPH. Synthesis of Cyclic Polyolefins from 2-chloro-1,3-butadiene. October, 1950.
- TICKNOR, LELAND BRUCE. Thermodynamics of the Liquid System; Benzene-Carbon Tetrachloride-Methanol. October, 1950.
- VAN ORDEN, HARRIS OLSON. Alkyl Substituted Cyclic Polyolefins from the Reaction of Cycloöctatetraene with Alkyl lithium Compounds. January, 1951.
- WICK, EMILY LIPPINCOTT. Investigation of Several Hydrocarbons Derived from Carbonyl-Bridged Cyclic Olefins: Attempted Synthesis of 1,2,3,4-Dibenzcycloöctatetraene. June, 1951.

DEPARTMENT OF CIVIL AND SANITARY ENGINEERING

DOCTOR OF SCIENCE

- ALDRICH, HARL PRESLAR, JR. Analysis of Foundation Stresses and Settlements at the Hayden Library. June, 1951.
- CLOUGH, RICHARD HUDSON. Investigation of Strength and Rigidity Characteristics of Clay Sheared Without Drainage. June, 1951.
- MUELLER, EDWARD ARNOLD. Flat Slabs — An Investigation of Methods of Analysis. January, 1951.
- PAYNTER, HENRY MARTYN, JR. Transient Analysis of Certain Non-Linear Systems in Hydroelectric Plants. June, 1951.
- VERMA, RAMJEE PRASAD. Study of the Motion of Discrete Particles Along the Bed of A Turbulent Stream. June, 1951.

DOCTOR OF SCIENCE IN SANITARY ENGINEERING

- McKINNEY, ROSS ERWIN. Biology and Biochemistry of the Micro-organisms in Activated Sludge. June, 1951.
- TOM, ALBERT QUON YAU. Investigations on Improving the Biochemical Oxygen Demand Test. June, 1951.

DEPARTMENT OF ECONOMICS AND SOCIAL SCIENCE

DOCTOR OF PHILOSOPHY

- ADAMS, ROBERT WILLIAM. Use of Economic Models in Forecasting. June, 1951.
- BERGMANN, RALPH HASKEL. Field Study of Factors Determining Worker Attitudes Toward a Union Organizing Drive. October, 1950.
- DE VRIES, BAREND ARIE. Study of the Price Effects of Exchange Depreciation. June, 1951.
- DIAS CARNEIRO, OCTAVIO AUGUSTO. Study on the Theory of International Economic Organization. June, 1951.
- FEIGENBAUM, ARMAND VALLIN. Membership Relationship Problems in the Announced-Purpose Centered Aggregation. June, 1951.
- KNOWLTON, STUART LEE. Some Problems of Negotiated Pension Plans. October, 1950.
- LEVINE, SOLOMON BERNARD. Union-Management Relations and Technical Change: A Field Study of Experiences in Woolen and Worsted Textile Mills. June, 1951.
- LOVELL, HUGH GILBERT. Mediation Process. June, 1951.
- REYNOLDS, ROY RICHARD. Public Policy with Respect to the Settlement of Labor Disputes in the Canadian Railway Industry. June, 1951.

DEPARTMENT OF ELECTRICAL ENGINEERING

DOCTOR OF SCIENCE

- BARUCH, JORDAN JAY. Instrumentation for a Transmission Research Program. October, 1950.
- COSTAS, JOHN PETER. Interference Filtering. June, 1951.
- GRANLUND, JOHN. Interference in Frequency Modulation Reception. October, 1950.
- HADDEN, FREDERICK ALAN. Precision Magnetic Field Regulation Using Nuclear Magnetic Resonance. January, 1951.
- HANCE, HAROLD VIVIAN. Optimization and Analysis of Systems for the Detection of Pulse Signals in Random Noise. January, 1951.
- HARRIS, LAWRENCE ARNOLD. Axially Symmetric Electron Beam and Magnetic Field Systems. October, 1950.

- KASHMIRY, MONIR ALL. Self-Excitation of Induction Motors with Series Capacitors. June, 1951.
- KUSKO, ALEXANDER. Study of the Electrical Behavior of Gases at High Pressure. January, 1951.
- MOATS, ROBERT RYDER. Interaction of Modes in Magnetron Oscillators. October, 1950.
- SEIFERT, WILLIAM WALTHER. Study of Noise in Missile Control Systems. June, 1951.
- SENSIPER, SAMUEL. Electromagnetic Wave Propagation on Helical Conductors. June, 1951.
- SINGLETON, HENRY EARL. Theory of Nonlinear Transducers. October, 1950.
- STUTT, CHARLES ADOLPHUS. Experimental Study of Optimum Filters. June, 1951.
- TRUXAL, JOHN GROFF. Servomechanism Synthesis Through Pole-Zero Configurations. October, 1950.
- TSAO, CHIEN-YOU. Betatron Characteristics of the M. I. T. Synchrotron. October, 1950.

DEPARTMENT OF GEOLOGY

DOCTOR OF PHILOSOPHY

- JENSEN, MEAD LEROY. Diffusion in Minerals. June, 1951.
- SERAPHIM, ROBERT HENRY. Some Aspects of the Geochemistry of Fluorine. June, 1951.
- SHAW, WILLIAM SIMON. Cumberland Basin of Deposition. June, 1951.
- SOUTHWICK, STANLEY HARPHAM. Inorganic Constituents of Crude Oil. June, 1951.
- STEWART, ROBERT WILLIAM. Reef Limestones of North Snyder Oilfield, Texas. June, 1951.
- TOWSE, DONALD FREDERICK. Frontier Formation, Southwest Powder River Basin, Wyoming. June, 1951.
- WHITING, FRANCIS BEAUMONT. Use of Biotite for Strontium Age Measurements. June, 1951.
- WITTELS, MARK CAESAR. Thermo-Chemical Analysis of Some Amphiboles. June, 1951.

DEPARTMENT OF MATHEMATICS

DOCTOR OF PHILOSOPHY

- BATTIN, RICHARD HORACE. Investigation of Oscillations in Flows Over Curved Surfaces. June, 1951.
- DAVIS, ROBERT BENJAMIN. Boundary Value Problem Existence Theorems for Third Order Semi-elliptic Partial Differential Equations. June, 1951.

- GELLER, LEONARD. Absolute Convergence of Lebesgue-Stieltjes Trigonometric Integrals. June, 1951.
- HAAS, VIOLET BUSHWICK. Singular Perturbations of an Ordinary Differential Equation. June, 1951.
- PERRY, ALBERT DOWNING, JR. Conditionally Stable Feedback Amplifiers. October, 1950.

DEPARTMENT OF MECHANICAL ENGINEERING

DOCTOR OF SCIENCE

- CHU, CHEN. Elastic Behavior of the Twisted Bourdon Tube as a Pressure-Responsive Element. October, 1950.
- COOLEY, WILLIAM CROCKETT. Measurement of Supersonic Velocities by Ion Transit-Time Methods. June, 1951.
- EHRICH, FREDRIC FRANKLIN. Hydrodynamics Study of Valves and Orifices. June, 1951.
- ELDIN, AZIZ SAAD. Mechanical Properties of Metals at Liquid Helium Temperatures. June, 1951.
- FULTON, CHARLES DARBY, JR. Heat Switches for Cyclic Demagnetization. October, 1950.
- GREEN, ROBERT BOYCE. Ordinary Liquid Water-Substance — Its Thermodynamic Properties, Dynamic Behavior, and Tensile Strength. June, 1951.
- LANDIS, FRED. Turbulent Mixing of Co-axial Gas Jets. October, 1950.
- PRINCE, DAVID CHANDLER, JR. Flow of Air Through a Cascade. June, 1951.
- SEAMAN, RICHARD ERIC. Stress Restoration in Strained Fibers. June, 1951.
- SINIZER, DAVID IRA. Prediction of Creep Curves from Short-Time Tensile Data. January, 1951.
- VAN WYLEN, GORDON JOHN. New Method of Measuring the Specific Heat of Gases. January, 1951.
- WALCOTT, FREDMAN JEROME, JR. Torsion Creep to Rupture. January, 1951.
- YEH, HSUAN. Design of Cascades in Compressible Flows. October, 1950.
- ZAID, MELVIN. Plastic Flow of Thin Rotating Discs with Large Strains. June, 1951.

DEPARTMENT OF METALLURGY

DOCTOR OF SCIENCE

- BRASUNAS, ANTON DE SALES. Accelerated Oxidation of Metals at High Temperatures. October, 1950.
- BUFFINGTON, FRANCIS STEPHAN. Self-Diffusion in Iron. June, 1951.
- BUTTNER, FREDERICK HOWARD. Surface Energy and Viscous Flow of Gold at High Temperatures. June, 1951.

- CHANG, CHIEN-SIANG. Adsorption of Barium and Laurate Ions on Quartz. June, 1951.
- DIRAN, LORIS MELLIKOFF. Flowability of Foundry Sands. January, 1951.
- FUNK, EDWARD ROSS. Surface Tension of Solid Silver. June, 1951.
- GOKCEN, NEVZAT ALTAN. Silicon-Oxygen and Aluminum-Oxygen Equilibria in Liquid Iron. January, 1951.
- GURLAND, JOSEPH. Role of the Binder Phase in Cemented Wolfram Carbide Alloys. June, 1951.
- HUM, JACK KAYN YAN. Effect of Strain on the Stability of Austenitic Stainless Steels at High Temperatures. June, 1951.
- KULIN, SAUL ANDREW. Effect of Stress on the Martensitic Transformation. June, 1951.
- MACHLIN, EUGENE SOLOMON. Crystallography and Mechanism of the Martensitic Transformation. January, 1951.
- RAUTALA, PEKKA. Investigation of the System Wolfram-Cobalt-Carbon. June, 1951.
- ROCCA, ROBERTO. Distribution of Sulphur Between Iron and Slag at Low Iron Oxide Concentrations. January, 1951.
- SERVI, ITALO SALOMONE. Creep and Rupture Behavior of Aluminum as a Function of Purity. January, 1951.
- SMITH, CHARLES OLIVER. Temperature Distribution in Aluminum Weldments. June, 1951.
- ZILLMAN, RUDOLF WILLIAM. Gas Porosity in Copper and Copper-Tin Alloy Castings. October, 1950.

DOCTOR OF SCIENCE IN CERAMICS

- DEW, ROBERT JOSEPH, JR. Damping Capacity Measurement on Refractory Oxides Under Varying Stress and Temperature Conditions. October, 1950.
- KINGERY, WILLIAM DAVID. Phosphate Bonding in Refractories. October, 1950.
- SCHWARTZ, BERNARD. Thermal Shock Behavior of Pure Refractory Oxides. January, 1951.
- WYGANT, JAMES FREDERIC. Elastic and Flow Properties of Dense Pure Oxide Refractories. January, 1951.

DEPARTMENT OF METEOROLOGY

DOCTOR OF SCIENCE

- BODURTHA, FRANK THEODORE, JR. Investigation of Anticyclogenesis in Alaska. June, 1951.
- SHAPIRO, RALPH. Pressure Change Related to Tropospheric and Stratospheric Processes. October, 1950.
- SHUMAN, FREDERICK GALE. Solutions of a Differential Equation of Pressure Tendency. January, 1951.

*DEPARTMENT OF NAVAL ARCHITECTURE
AND MARINE ENGINEERING*

DOCTOR OF SCIENCE

HELLER, SAMUEL RIES, JR. Reinforced Circular Holes in Bending With Shear. June, 1951.

DEPARTMENT OF PHYSICS

DOCTOR OF PHILOSOPHY

ASCOLI, GIULIO. Mass of Cosmic Ray Mesons. June, 1951.

BEATTY, RALPH EMERSON, JR. Transmission of Randomly Incident Sound Through Single and Double Walls. October, 1950.

BELING, JOHN KINGSMAN. Alpha Gamma Angular Correlation in the Decay of Radiothorium. June, 1951.

CASWELL, RANDALL SMITH. Study of the Average Energy of Beta Rays. January, 1951.

COLEMAN, PAUL DARE. Generation of Millimeter Waves. June, 1951.

DEMOS, PETER THEODORE. Design and Properties of the M. I. T. Linear Electron Accelerator. January, 1951.

DEVANEY, JOSEPH JAMES. Alpha Decay. October, 1950.

EBEL, AUGUST ALEXANDER. Metastable States in Medium- and Heavy-Weight Nuclei. October, 1950.

ESHBACH, JOHN ROBERT. Magnetic Moment Determinations from Microwave Spectra. January, 1951.

FAJANS, JACK. Energy Conservation in Atomic Processes. October, 1950.

GELL-MANN, MURRAY. Coupling Strength and Nuclear Reactions. January, 1951.

GOKHALE, BAJIRAO VASUDEV. Microwave Spectrum of Oxygen. January, 1951.

HADLEY, CHARLES PELEG. Study of Thermionic Emission from Fine Grain Oxide-coated Emitters of Filamentary Dimensions. October, 1950.

HAUSER, WALTER. Schematic Theory for Neutron Cross-Sections. October, 1950.

JARRETT, HOWARD STARKE. Distribution of Energies of Photoelectrons Emitted from Germanium Deposited on a Molybdenum Substratum. June, 1951.

KINGSTON, ROBERT HILDRETH. Spectroscopic Study of the Electronic Structure of Metallic Potassium and Calcium. June, 1951.

LOOMIS, CHARLES CLARK. Quadrupole Coupling in Antimony Hydride. October, 1950.

PEASE, JANE ANN SHERA. Theory of Dibaric Particles. January, 1951.

- POHLMAN, WILLIAM BERNARD, JR. Comparison of Atomic g-Factors of Hydrogen and Potassium. June, 1951.
- PRINCE, MORTON BRONENBERG. Magnetic Dipole Interactions in Crystals at Temperatures near Absolute Zero. June, 1951.
- ROBERTS, BENJAMIN WASHINGTON, JR. Short and Long Range Order in CuAu. June, 1951.
- ROSE, DAVID JOHN. Study of the Maintaining Fields in a Microwave Gas Discharge. October, 1950.
- SCHWEINLER, HAROLD CONSTANTINE. Ferroelectricity in the Ilmenite Structure. June, 1951.
- SHAPIRO, MATHEW MAX. Scattering of Charged Particles by Nuclei. October, 1950.
- SHEARER, JAMES WELLES. Annihilation of Swift Positrons. October, 1950.
- SHURE, KALMAN. Isobaric Mass Differences. January, 1951.
- SIMONS, JOHN CRANKSHAW, JR. Electromagnetic Resonant Behavior of a Confocal Spheroidal Cavity System in the Microwave Region. October, 1950.
- SPETNER, LEE MORDECAI. Radiation Loss of Electrons. October, 1950.
- STELSON, PAUL HUGH. Fast Neutron Spectra Measured by the Photographic Plate Method. October, 1950.
- WALKER, CHRISTOPHER BLAND. Order-Disorder in the Alloy CuPt. June, 1951.
- WATSON, ROBERT TANNER. Relation Between the Thermionic Work Function and the Conductivity of an Oxide Coated Cathode. June, 1951.
- WEISS, MAX TIBOR. Microwave Inversion-Rotation Spectra of the Deutero-Ammonias. January, 1951.
- WESTERVELT, PETER JOCELYN. Interaction of Acoustic Waves with Obstacles. January, 1951.
- WILKINSON, MICHAEL KENNERLY. Crystallographic Variations of Field Emission from Single Tungsten Crystals. October, 1950.
- WILLARD, HARVEY BRADFORD. Interaction of Fast Neutrons with Nuclei. October, 1950.

DOCTOR OF SCIENCE

- CRONMEYER, DONALD CHARLES. Electrical and Optical Properties of Rutil Titanium Dioxide Single Crystals. June, 1951.
- STERNER, JOHN. Interferometric Investigation of the Isotopes of Mercury. June, 1951.

INDEX OF AUTHORS OF STAFF PUBLICATIONS

- Abkowitz, M. A.: 402
 Adams, N. I., III: 403
 *Adamson, R. E.: 404
 Adelman, M. A.: 381
 *Agnor, T. J.: 396
 Ahrens, L. H.: 390
 *Alexander, E. R.: 374
 *Alexander, F.: 386
 Allen, H. C.: 406
 Allis, W. P.: 403
 Amdur, I.: 372
 Annis, M.: 403
 Archer, J. E.: 408
 *Armstrong, R.: 377
 Ashdown, A. A.: 372
 Ashley, H.: 366
 Austin, J. M.: 401
 Averbach, B. L.: 397, 398, 407, 408
 Babcock, J. B., III: 380
 *Backofen, E. W.: 376, 406
 Backofen, W. A.: 397
 Bakalar, I. D.: 398
 *Baker, W. D.: 405
 *Ballantine, H. T., Jr.: 403
 *Ballou, N. E.: 375
 *Balluffi, R. W.: 398
 Barrett, F. D.: 381
 *Barry, F. W.: 396
 Barstow, F. E.: 383
 *Bartter, F. C.: 397
 Baruch, J. J.: 383
 Battin, R. H.: 392
 *Bausch, C. L.: 408
 Bavelas, A.: 381
 Bear, R. S.: 367
 Beattie, J. A.: 372
 Beckett, J. A.: 369, 370
 *Beckmann, C. O.: 378
 Belic, I.: 376
 *Bennett, W.: 377
 Beranek, L. L.: 383
 Berry, M. M.: 401
 Bever, M. B.: 397, 398
 *Bhatia, D. S.: 389
 *Bigler, W. P.: 374
 Bisplinghoff, R. L.: 366
 Bitter, F.: 403
 Blake, C. H.: 367
 *Bleyle, G. A., Jr.: 406
 Bloom, D. S.: 399
 *Bloom, M. C.: 386
 Blum, J. M.: 387
 *Boldridge, W. F.: 375
 *Bolduan, O. E. A.: 367
 Bolt, R. H.: 403
 Bone, A. J.: 380
 Booth, R. E.: 392
 *Bowen, R. J.: 406
 *Boyd, G. E.: 374
 *Boyer, K.: 404
 Boyles, H. B.: 379
 *Brasunas, A. deS.: 398, 400
 Breed, C. B.: 380
 Breger, I. A.: 391
 *Bridge, H. S.: 403
 Brossel, J.: 403
 Brown, C. J.: 370
 Brown, E. C.: 381
 Brown, G. G.: 371
 Brown, S. C.: 403, 404
 Brown, W. H.: 366
 Brownell, G. L.: 406
 Bryant, L. S.: 387
 Buckley, E. F.: 383
 Buckley, J. J.: 387
 Buechner, W. W.: 404, 407
 Buerger, M. J.: 390, 391
 Buffington, F. S.: 398
 Burchard, J. E.: 408
 Burtner, E.: 402
 Burwell, J. T.: 394
 Byrne, J. T.: 372
 *Cadogan, W. P.: 371, 372
 Camus, J.: 408
 Carlson, R. S.: 384
 *Carney, D.: 399
 Carrus, P. A.: 383, 384, 385
 *Casey, R. S.: 402
 Caspari, M. E.: 384
 *Cheatham, T. P.: 385
 *Cherniak, G. S.: 395
 *Chertow, B.: 371, 372

*Not on Institute Staff, 1950-51.

- *Childs, W. J.: 400
 *Chipman, D.: 408
 Chipman, J.: 398, 399
 *Chisholm, J. P.: 383
 Clark, J. A.: 395
 *Clark, R. A.: 393
 Clark, W. V., Jr.: 370
 *Clarke, J. T.: 379
 *Clement, R. A.: 377
 *Cline, J. E.: 400
 *Cochran, S. W.: 402
 Coddington, E. A.: 392
 Cohen, M.: 397, 398, 399
 Cole, E. M.: 397
 Condoyannis, G. E.: 401
 Cookson, A. E.: 384
 *Coolidge, J. E.: 407
 Cope, A. C.: 372-373
 Coryell, C. D.: 373, 374, 377
 Costas, J. P.: 384
 Cramer, H. C.: 401
 Crawford, G. M.: 397
 *Crawford, J. W.: 405
 Cross, P. C.: 406
 Cudworth, A. L.: 383
 Cunningham, R. M.: 370, 401
 Daily, J. W.: 380
 *Dastur, M. N.: 398
 *Davenport, D. E.: 372
 Davenport, W. B., Jr.: 384
 Davis, P.: 376
 Dawes, L. M.: 384
 Deemer, K. C.: 380
 *Delano, V.: 405
 Demars, V.: 366
 Dennen, W. H.: 391
 De Santillana, G.: 387, 394
 Deutsch, K. W.: 387, 394
 Deutsch, M.: 404
 *Dev, S.: 377
 Dietz, A. G. H.: 369, 381
 Diran, L. M.: 400
 Dittmer, D. C.: 374
 *Doak, P. E.: 403
 *Dodd, J. H.: 386
 *Dolan, T. J.: 395
 *Donnay, G.: 391
 Douglass, R. D.: 392
 *Drysdale, J. J.: 377
 Dunn, C. G.: 388, 389
 Duntley, S. Q.: 404
 Ebert, J. D.: 367
 Edgerton, H. E.: 384
 *Edwards, E. A.: 404
 *Edwards, R. R.: 373
 *Eisenhardt, G. H.: 395
 Eliassen, R.: 380
 *Elliott, J. F.: 398
 *Elvander, H. I.: 398
 *Emerick, H. B.: 398
 *Emery, J. R.: 373
 *Emslie, A. G.: 406
 *Engelbrecht, R. S.: 380
 *Ensio, P. K.: 399
 Epstein, D. J.: 384
 *Estes, L. L., Jr.: 373
 Fairbairn, H. W.: 391
 Fano, R. M.: 384
 *Farnell, A. B.: 392
 *Farnell, G. W.: 383
 Farnsworth, D. L.: 397
 Fawcett, D. W.: 369
 Fawcett, F. S.: 372
 Fay, R. D.: 384
 Feng, I. M.: 394
 Fenton, S. W.: 373
 Ferris, L. A.: 402
 Feshbach, H.: 404
 Finch, R. B.: 394
 *Finkelstein, N. A.: 404
 Finston, M.: 366
 Fischer, H. C.: 369, 393
 Fisher, J. C.: 398
 Fles, D. A.: 376
 Floe, C. F.: 398
 *Fluharty, R. G.: 406
 *Foote, J. R.: 393
 *Forstall, W., Jr.: 396
 *Fortier, O. V.: 384
 Fox, P.: 383, 385
 *Fram, H.: 389
 Frank, N. H.: 404, 405
 Franklin, P.: 392
 *Freedman, A. J.: 374
 Freeman, H. A.: 381
 *Frey, H. B.: 384
 Frisch, D. H.: 405
 *Gainer, J. M.: 389
 *Gallagher, T. F.: 368
 Gaudin, A. M.: 398
 Geist, J. M.: 371
 Gilleo, M. A.: 384
 Gilliland, E. R.: 371, 372
 *Glendenin, L. E.: 373

- Goddu, R. F.: 374
 Goldblith, S. A.: 388, 389
 *Goldman, H. M.: 367
 *Goldman, S.: 386
 Goodman, C.: 391, 404, 405
 Gorfinkle, L. G.: 390
 Gould, B. S.: 367
 Gove, H. E.: 404
 Grant, N. J.: 398, 399
 Gray, T. S.: 384
 *Greeley, S. A.: 381
 Green, P. E., Jr.: 385
 Gross, J.: 368
 Grossman, N.: 394
 Grune, W. N.: 380
 Guillemin, E. A.: 385
 Gumpertz, W. H.: 369
 Gyorgy, E. M.: 405, 406
 Haas, F.: 383, 385
 *Haas, W. J.: 368
 Hadden, F. A.: 385
 Hainer, R. M.: 406
 Halfman, R. L.: 366
 Hall, C. E.: 367
 *Hamilton, N.: 399
 *Hansch, C. H.: 378
 Hansen, R. J.: 381
 Hardy, A. C.: 405
 Hardy, H. L.: 397
 Harleman, D. R.: 380
 *Harris, C. M.: 404
 Harris, H. I.: 397
 Harris, R. S.: 388, 389, 390
 Harrison, G. R.: 408
 *Hart, A. G.: 381
 Harvey, J. A.: 404
 Hauser, E. A.: 371
 *Haven, A. C., Jr.: 373
 *Haviland, G.: 366
 Hawthorne, W. R.: 394
 *Hedberg, K.: 378
 *Hedgran, A.: 404
 *Hedlun, J. M.: 385
 Heidt, L. J.: 374
 Herlin, M. A.: 405, 406, 407
 *Hermann, E. C.: 372
 *Herrick, E. C.: 372
 Hershenson, H. M.: 374
 *Hicks, H. G.: 379
 *Highberger, J. H.: 368
 Hill, A. G.: 405
 Hill, T. M.: 370
 Hine, G. J.: 405
 Hine, J. S.: 377
 Hoch, F. L.: 368
 Holland, S. S., Jr.: 407
 *Holzman, G.: 372
 Horton, J. P.: 380
 Horwood, M. P.: 380
 Houghton, H. G.: 401
 Howell, J. S.: 405
 Hrones, J. A.: 394
 Huang, K.: 407
 Huckaba, C. E.: 376
 Hueter, T. F.: 403
 Huggins, W. H.: 385
 Hume, D. N.: 374, 375
 *Humphrey, M.: 375
 Hunsaker, J. C.: 366
 Hunter, D.: 408
 Huntress, E. H.: 375
 Hurley, P. M.: 391
 *Ingard, U.: 403
 Ippen, A. T.: 380, 381
 Irvine, J. W., Jr.: 374, 376, 406
 *Isakson, G.: 366
 Jacobsen, E. H.: 408
 *Jacobson, H.: 378
 *Jaffin, A. E.: 397
 *Jetton, M. R.: 390
 Joensuu, O. I.: 390
 *Kates, L. W.: 399
 Kaufmann, A. R.: 399
 *Kavanagh, G. M.: 372
 Kavanagh, K. E.: 385
 Kaye, J.: 394
 *Keating, D. T.: 408
 Keenan, J. H.: 394, 395
 Keller, A. L.: 380
 *Keller, H.: 378
 *Kells, M. C.: 372
 Kelly, B.: 379
 Kennedy, R. W.: 366
 Keyes, F. G.: 376
 Killian, J. R., Jr.: 409
 *Kimball, G. E.: 406
 Kindleberger, C. P.: 381, 382
 King, G. W.: 406
 Kingery, W. D.: 399
 *Kingsbury, R. N.: 372
 Kingston, R. H.: 405, 406
 *Kintner, E. E.: 405
 Kisner, W. M.: 400
 *Klemperer, H.: 386

*Not on Institute Staff, 1950-51.

- *Knudsen, V.: 391
 Koch, C.: 366
 Koechlin, B. A.: 368
 Koehl, R. L.: 387
 *Kolthoff, I., M.: 374
 Kopal, Z.: 383, 385
 Kritchevsky, T. H.: 368
 Ku, Y.-H.: 385
 Kulin, S. A.: 399
 Lambe, T. W.: 381
 *Landis, F.: 396
 Landrock, A. H.: 389
 *Langenhop, C. E.: 392
 *Larsen, B. M.: 398
 *Lax, B.: 403
 *Lax, M.: 404
 *Le Beau, D. S.: 371
 Lee, C. C.: 377
 Lee, Y.-W.: 385
 *Lement, B. S.: 397
 Lent, D.: 395
 Lephakis, A. J.: 385
 Lessells, J. M.: 395
 Lettau, H. H.: 401
 *Levin, J.: 405
 Levinson, N.: 392
 *Levy, H. A.: 375
 *Levy, L. I.: 366
 Lewis, W. K.: 371, 372
 Lickliger, J. C. R.: 385
 Liebenberg, W. R.: 390
 Liepmann, K.: 387
 Ligda, M. G. H.: 401
 *Lin, C. C.: 392, 393
 *Linn, F. C.: 394
 Linton, W. H., Jr.: 409
 Linvill, J. G.: 385
 Lion, K. S.: 368
 *Lippincott, E. R.: 376
 *Little, E. L., Jr.: 376
 *Livingstone, B. J.: 369
 Livingston, M. S.: 404, 406
 Locke, W. N.: 402
 Lockhart, E. E.: 389
 Loewen, E. G.: 396
 Loofbourow, J. R.: 368, 369
 *Loomis, C. C.: 407
 Lord, R. C.: 376
 Lord, S. S., Jr.: 376
 *Ludwig, G. D.: 403
 Lustwerk, F. L.: 395
 *Lynch, M. A., Jr.: 378
 McAdams, W. H.: 394
 *McCabe, C. L.: 375
 MacDonald, R. S.: 376
 MacGregor, C. W.: 395
 McKinney, R. E.: 380
 McMahan, H. O.: 406
 *McMahon, R. E.: 377
 Mahoney, T. H. D.: 387
 Maletskos, C. J.: 376, 406
 *Malm, R.: 404
 Maloof, C. C.: 397
 Mann, A. N.: 387
 Margolis, B.: 406
 *Marinsky, J. A.: 375
 *Marlowe, G. J.: 371
 Marple, S., Jr.: 372
 Marshall, E. R.: 396
 *Marshall, J. L.: 383
 *Martens, R. J.: 375
 Maurer, R. D.: 405, 406
 Mazur, R. H.: 377
 *Mead, C. D.: 389
 Merritt, M. C.: 389
 *Merz, W. J.: 384
 Michaels, A. S.: 371
 Milas, N. A.: 376
 Miller, R. H.: 366
 *Minch, V. A.: 380
 *Moles, O. W.: 399
 Moon, K. A.: 374
 Moon, Parry: 385, 386
 Morison, E. E.: 387
 Morse, P. M.: 406
 Morton, A. A.: 376, 377
 *Munn, G.: 372
 *Munsell, H. E.: 389
 Murphy, E. A.: 401
 Murray, J. A.: 369, 393
 Murray, W. M.: 395
 Myers, C. A.: 382
 *Nelson, C. M.: 375
 Neumann, E. P.: 395, 396
 Newman, R. B.: 403
 Newton, G. C., Jr.: 386
 Nielsen, E.: 376
 Nizel, A. E.: 389
 Norman, N.: 408
 O'Brien, T. F.: 366
 Ocampo, J.: 376
 *O'Meara, J. P.: 390
 O'Neill, R. C.: 376
 *Opie, W. R.: 398, 399

- Padelford, N. J.: 382
 Pappas, A. C.: 377
 *Peaceman, D.: 372
 *Pearson, E. A.: 381
 *Pease, R. L.: 404
 Perry, J. W.: 401, 402
 *Perry, K. E.: 406
 *Peterson, A. P. G.: 383
 *Pevear, P. P.: 371
 *Philbrook, W. O.: 398
 *Pian, T. H. H.: 366
 *Pigors, F.: 382
 Pigors, P.: 382
 Pigott, J. D.: 396
 Pitts, W.: 387
 *Posthill, B. N.: 380
 *Potter, R. D.: 399
 *Powsner, E. R.: 368
 *Preston, W. M.: 404, 405
 Prince, M.: 405
 Proctor, B. E.: 388, 389, 390
 *Pulk, E. S.: 401
 Putman, J. W.: 399
 Rae, J. B.: 387
 *Ranganathan, S. R.: 402
 Rapson, R.: 366
 *Rasmussen, H. F.: 381
 Rathbun, K. C.: 395
 *Redfield, R. C.: 391
 *Reed, F. E.: 403
 Reese, D. J.: 399
 *Reimer, C. B.: 369
 Reissner, E.: 393
 *Rengstorff, G. W. P.: 398
 *Renhult, W. B., Jr.: 384
 Resnick, H.: 372
 Reswick, J. B.: 394
 *Revelle, R. D.: 391
 *Richardson, L. P.: 396
 Roberts, B. W., Jr.: 406
 Roberts, C. S.: 397
 Roberts, J. D.: 377
 Robnett, R. H.: 370
 *Rocca, R.: 397, 398, 399
 Rodwin, L.: 379
 Rogers, L. B.: 376, 378
 Rohsenow, W. M.: 395
 Rorschach, H. E., Jr.: 405, 406, 407
 Rostow, W. W.: 387, 388
 Rudin, W.: 393
 Rugo, H. J.: 367
 Rule, J. T.: 391
 *Sabeau, D. W.: 369, 393
 Sagalyn, P.: 403
 *Salo, T. P.: 367
 Samuelson, P. A.: 382, 383
 Sandell, D. J., Jr.: 376
 Santelmann, W. F., Jr.: 386
 Satterfield, C. N.: 372
 *Savage, J. E.: 400
 Sawyer, C. N.: 381
 Scatchard, G.: 378
 Scattergood, A.: 374
 Scheinberg, I. H.: 378
 Schell, E. H.: 370
 Schmitt, F. O.: 368
 *Schmitz, W.: 372
 Schuhmann, R., Jr.: 399
 Schulz, G. J.: 407
 Schumb, W. C.: 378
 Schwarz, E. R.: 396
 Scott, C. B.: 378
 Scott, J. F.: 368
 Scott, R. E.: 386
 *Seabrook, J.: 399
 *Senftle, F. E.: 398, 405
 Servi, I.: 399
 Shank, M. E.: 396
 Shapiro, A. H.: 396, 401
 Shaw, M. C.: 390, 396
 Shea, H. J.: 381
 Sherman, C. W.: 398
 Sherman, H.: 390
 Sherwood, T. K.: 409
 Shrock, R. R.: 391
 Shultz, G. P.: 382, 383
 Shure, K.: 404
 *Siegel, J. M.: 374
 *Simon, I.: 406
 Singleton, H. E.: 386
 Sinsheimer, R. L.: 368
 Sizer, I. W.: 368
 Slater, J. C.: 407
 Slaunwhite, W. R., Jr.: 377
 *Smith, D. R.: 377
 *Snyder, T. M.: 408
 Soderberg, C. R.: 396
 Solow, R.: 383
 Spedden, H. R.: 399, 400
 *Spencer, D. E.: 385, 386
 *Sperduto, A.: 404, 407
 *Spiegler, K. S.: 374
 Springer, G.: 393
 Stanley, W. E.: 381

- Starr, V. P.: 401
 *Stein, M.: 393
 *Stelson, P. H.: 405
 Stevens, A. J.: 378
 Stevens, K. N.: 386
 Stever, H. G.: 395
 Stockmayer, W. H.: 378, 379
 *Strait, E. N.: 404, 407
 Strandberg, M. W. P.: 407
 Strang, C. D.: 394
 Straus, O. H.: 386
 Struik, D. J.: 393
 Stutt, C. A.: 386
 *Sugarman, N.: 373
 Swain, C. G.: 378, 379
 *Sweeney, M. P.: 372
 *Synerholm, M. E.: 373
 Szczesniak, A. S.: 390
 Tate, V. D.: 392
 Taylor, C. F.: 396
 Taylor, H. F.: 400
 *Taylor, K. L.: 402
 Telkes, M.: 400
 *Tetervin, N.: 392
 *Thimann, K. V.: 388
 Thomas, G. B., Jr.: 393
 *Thompson, J. B.: 391
 *Thompson, R. E.: 369
 *Thunaes, A.: 399
 *Thurston, R. T.: 400
 Tisza, L.: 407
 *Torok, M. E. W.: 402
 *Treuenfels, C. G.: 384
 Udin, H.: 400
 Uhlig, H. H.: 400
 Vallee, B. L.: 368, 369
 Van Patter, D. M.: 404, 407
 *Varnerin, L. J.: 403
 Vivian, J. E.: 372
 Von Hippel, A. R.: 386
 *Von Karman, T.: 393
 Voss, W. C.: 369
 Wagner, C.: 400
 *Wallace, J. F.: 400
 Warren, B. E.: 407, 408
 *Watanabe, W.: 377
 *Waters, D. E.: 375
 Watts, E. F.: 391
 Waugh, D. F.: 369
 Weber, H. C.: 372
 *Webster, J. C.: 385
 *Weimer, R. J.: 369
 Weisskopf, V. F.: 408
 Welchman, W. G.: 386
 White, R. M.: 401
 Whitehead, G. W.: 394
 Whitehead, W. L.: 391
 Wiener, N.: 394
 Wiesner, J. B.: 385
 Wilkes, G. B.: 396
 Wilkinson, G.: 376, 379
 Willett, H. C.: 401
 *Williams, C.: 386
 Williams, L. O.: 388
 Williams, R. W.: 408
 Wilson, E. A.: 390
 Wimett, T. F.: 403
 *Wright, D. McC.: 382
 *Wright, W. E.: 404
 Wulff, J.: 400
 *Wurzburg, F. L., Jr.: 405
 Wyckoff, C. W.: 384
 Yancey, J. A.: 377
 *York, J. L.: 371
 *Yoseph, R. S.: 380
 Youtz, P.: 386

INDEX OF AUTHORS OF DOCTORS' THESES.

- Adams, R. W.: 413
 Aldrich, H. P., Jr.: 412
 Ascoli, G.: 417
 Ashley, H.: 410
 Baddour, R. F.: 410
 Baker, A. W.: 411
 Baruch, J. J.: 413
 Battin, R. H.: 414
 Beasley, J. K.: 411
 Beatty, R. E., Jr.: 417
 Beers, R. F., Jr.: 410
 Beling, J. K.: 417
 Benedict, J. T.: 411
 Bergmann, R. H.: 413
 Bloom, B. M.: 411
 Bodurtha, F. T., Jr.: 416
 Bolton, F. H.: 411
 Brasunas, A. D.: 415
 Breck, D. W.: 411
 Brown, J. F., Jr.: 411
 Buffington, F. S.: 415
 Buttner, F. H.: 415
 Byrne, J. T.: 411
 Caswell, R. S.: 417
 Cave-Browne-Cave, G.: 411
 Chamberlain, M.: 411
 Chambers, V. C., Jr.: 411
 Chang, C.-S.: 416
 Chu, C.: 415
 Clough, R. H.: 412
 Cobb, C. M.: 411
 Coleman, P. D.: 417
 Cooley, W. C.: 415
 Corey, E. J., Jr.: 411
 Costas, J. P.: 413
 Cronemeyer, D. C.: 418
 Davis, R. B.: 414
 Davison, R. W.: 411
 Demos, P. T.: 417
 Devaney, J. J.: 417
 De Vries, B. A.: 413
 Dew, R. J., Jr.: 416
 Dias Carneiro, O. A.: 413
 Diran, L. M.: 416
 Ebel, A. A.: 417
 Ehrich, F. F.: 415
 Eldin, A. S.: 415
 Eshbach, J. R.: 417
 Esteve, R. M., Jr.: 411
 Fajans, J.: 417
 Feigenbaum, A. V.: 413
 Fulton, C. D., Jr.: 415
 Funk, E. R.: 416
 Gatos, H. C.: 411
 Gee, A.: 411
 Geller, L.: 415
 Gell-Mann, M.: 417
 Gokcen, N. A.: 416
 Gokhale, B. V.: 417
 Granlund, J.: 413
 Green, R. B.: 415
 Gurland, J.: 416
 Haas, V. B.: 415
 Hadden, F. A.: 413
 Hadley, C. P.: 417
 Ham, E. A.: 412
 Hance, H. V.: 413
 Harris, L. A.: 413
 Hauser, W.: 417
 Haven, A. C., Jr.: 412
 Heller, S. R., Jr.: 417
 Hipkin, H. G.: 410
 Hum, J. K.: 416
 Jarrett, H. S.: 417
 Jensen, M. L.: 414
 Kashmiry, M. A.: 414
 Keller, W. J.: 412
 Kingery, W. D.: 416
 Kingston, R. H.: 417
 Kinter, M. R.: 412
 Knowlton, S. L.: 413
 Kroll, C. L.: 410
 Kulin, S. A.: 416
 Kusko, A.: 414
 Landis, F.: 415
 Le Blanc, N. F.: 412
 Lees, S.: 410
 Levine, S. B.: 413
 Lingard, A. I.: 410
 Loomis, C. C.: 417

- Lovell, H. G.: 413
 McCulloch, D.: 410
 Machlin, E. S.: 416
 McKinney, R. E.: 413
 Mann, J. B., Jr.: 412
 Mason, E. A.: 412
 Mazur, R. H.: 412
 Metzner, A. B.: 410
 Moats, R. R.: 414
 Moore, L. D., Jr.: 412
 Mueller, E. A.: 412
 O'Neill, J. H., Jr.: 410
 Paynter, H. M., Jr.: 412
 Pease, J. A. S.: 417
 Perry, A. D., Jr.: 415
 Pohlman, W. B., Jr.: 418
 Prince, D. C., Jr.: 415
 Prince, M. B.: 418
 Rautala, P.: 416
 Reynolds, R. R.: 413
 Roberts, B. W., Jr.: 418
 Rocca, R.: 416
 Rose, D. J.: 418
 Ross, J.: 412
 Roy, T. K.: 410
 Ryan, F. A.: 410
 Schmitz, W. R.: 412
 Schwartz, B.: 416
 Schwartz, M. D.: 410
 Schweinler, H. C.: 418
 Seaman, R. E.: 415
 Seamans, R. C., Jr.: 410
 Seifert, W. W.: 414
 Sensiper, S.: 414
 Seraphim, R. H.: 414
 Servi, I. S.: 416
 Shapiro, M. M.: 418
 Shapiro, R.: 416
 Shaw, W. S.: 414
 Shearer, J. W.: 418
 Shuman, F. G.: 416
 Shure, K.: 418
 Simons, J. C., Jr.: 418
 Singleton, H. E.: 414
 Sinizer, D. I.: 415
 Smith, C. O.: 416
 Southwick, S. H.: 414
 Spetner, L. M.: 418
 Stelson, P. H.: 418
 Sterner, J.: 418
 Stewart, R. W.: 414
 Stewart, W. E.: 411
 Stokes, C. A.: 411
 Stutt, C. A.: 414
 Ticknor, L. B.: 412
 Tom, A. Q. Y.: 413
 Towse, D. F.: 414
 Truxal, J. G.: 414
 Tsao, C.-Y.: 414
 Van Orden, H. O.: 412
 Van Wylen, G. J.: 415
 Verma, R. P.: 412
 Walcott, F. J., Jr.: 415
 Walker, C. B.: 418
 Watson, R. T.: 418
 Weiss, M. T.: 418
 Westervelt, P. J.: 418
 Whiting, F. B.: 414
 Wick, E. L.: 412
 Wilkinson, M. K.: 418
 Willard, H. B.: 418
 Wittels, M. C.: 414
 Wygant, J. F.: 416
 Yeh, H.: 415
 Zaid, M.: 415
 Zillmann, R. W.: 416