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PRESIDENT'S REPORT ISSUE

november, nineteen fifty-three

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Massachusetts Institute of Technology, november, nineteen fifty-three

PRESIDENT'S REPORT

The Corporation, 1953–54

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Report of the President

To Members of the Corporation:

THE RESPONSIBILITIES OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY as a national center for education and research continued to grow during the past year. Thus it seems particularly appropriate to examine again the long-term policies and objectives which guide our current decisions and which keep us on our course. What is our grand plan and our philosophy of education? I venture a restatement of these policies and objectives to enable the governing bodies of the Institute to review them in the round, to provide a blueprint for consistent action, and to place in proper perspective recent modifications in our program.

UNCHANGING PREMISES — CHANGING METHODS

FIRST, WE ARE A PROFESSIONAL SCHOOL IN WHICH PROFESSIONAL standards of conduct, performance, and unselfish public service are controlling. Within the framework of these professional ideals, we seek to educate men and women who have the competence of specialists plus a sense of the first-rate which extends beyond their specialized interests. We believe that this combination of professional and general education has exceptional relevance and power for preparing men for careers of action and effective citizenship in our modern American society.

NEXT, WE CARRY ON OUR WORK IN THE SPIRIT OF THE UNIVERSITY, including in close relationship post-doctoral, graduate, and undergraduate learning, with the spirit of research and other forms of creative scholarship infusing all our educational activities. While working in the spirit and manner of the university, we do not encompass the variety of disciplines usually included in a university; as a "university bound in lesser volume," we embrace a few carefully selected objectives, concentrating our resources on fields involving science or which thrive in association with science. Indeed, since its beginning the Institute has been evolving into a new type of university, a modern university built around science and social technology rather than classical studies, but embracing the arts, the social sciences, and the humanities as essential partners in our corporate culture. Its present structure of five schools provides a logical association of disciplines and provides adequately for all our academic and research interests.

AS A PROFESSIONAL SCHOOL CONDUCTING ITSELF IN THE SPIRIT OF A university, the Institute designs its educational program for a highly selected group of students, young people of exceptional intellectual promise and personal qualifications. With a student body thus carefully selected, we believe that our undergraduate program can be more advanced, its standards higher, its scope greater, and its pace faster than in institutions where the student selection is not so great.

With this selectivity we also believe that our students should be given a maximum of choice consistent with the maintenance of professional standards and that they should accept unusual responsibilities for their own intellectual progress and for the development of mature and responsible personal and community conduct. They should also have unusual opportunities to follow their own bent and to move ahead faster than their fellows, if they have exceptional ability.

Our student body is not limited to any one type. We want students who can become successful leaders of men as well as students who can become brilliant specialized research scholars (the two are, of course, not mutually exclusive). One of our principal responsibilities is to educate managerial and leadership talent for our society. This means we must seek students competent intellectually but gifted and adept in human relations, men having the right combination of attractive personal traits to make them natural leaders.

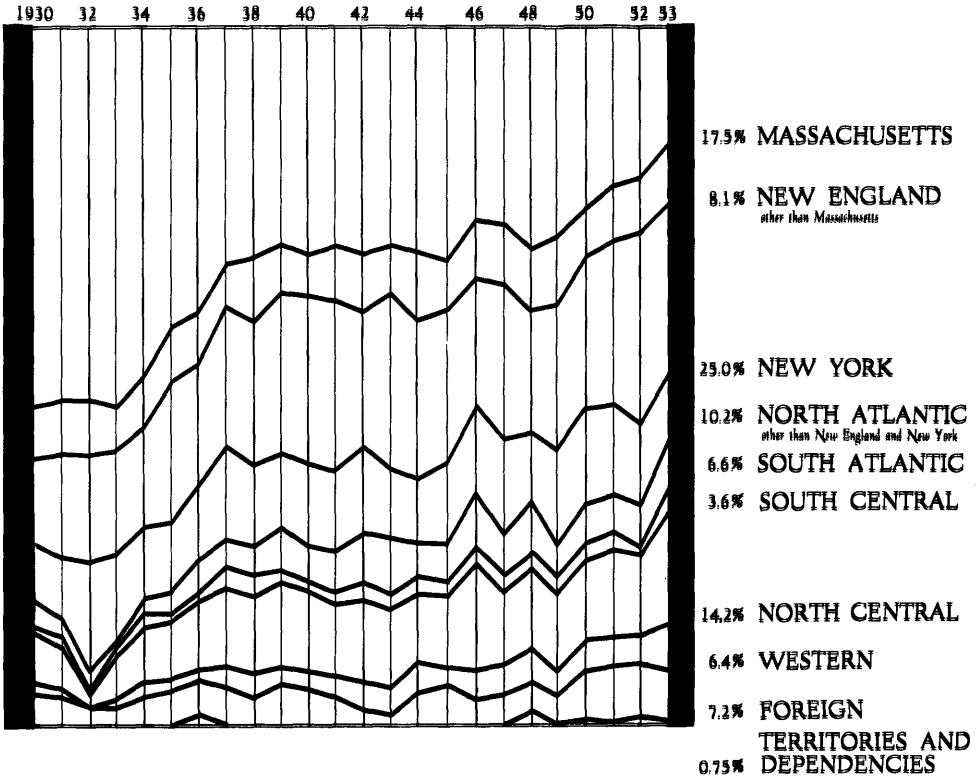
We already have what is probably the most cosmopolitan student body in America. M. I. T. continues to enroll the highest percentage of foreign students of any university in America. Since 1930 the number of freshmen entering from outside New England has increased from 38 per cent to more than 74 per cent and the number from outside the North Atlantic area has increased from 18 per cent to more than 39 per cent.

We seek a comparably wide range of able personalities, and we are looking anew at our selection procedures, searching for better ways of spotting potential leadership.

ANOTHER IMPORTANT POLICY OF THE INSTITUTE IS TO MAINTAIN THROUGH a unified faculty a symbiotic relationship between graduate and undergraduate study. It is our conviction that an undergraduate school flourishes best in the invigorating atmosphere of a powerful graduate school and that in turn a graduate school is the more powerful if it exists coordinately with a stimulating undergraduate program.

One of the current goals of the Faculty is to enrich the under-

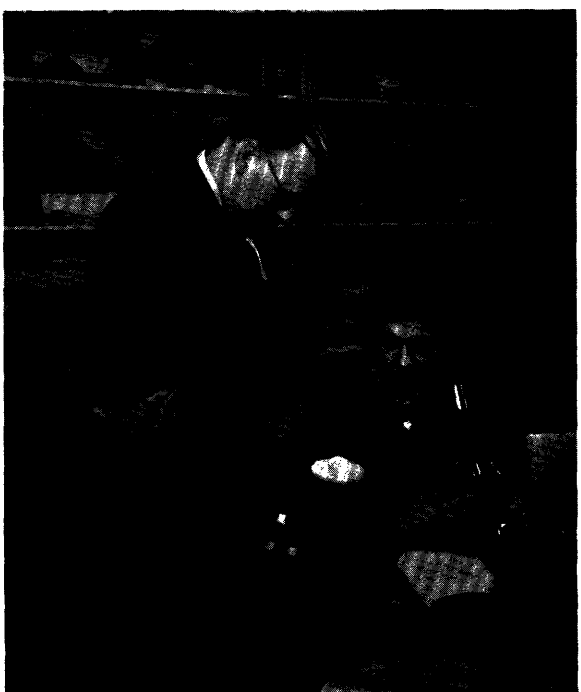
Geographical Distribution of Freshmen



graduate school by bringing into it more of the spirit of professional inquiry and independent scholarship which characterizes our graduate study. It is a primary objective of the Institute's administration to insure the continuing quality, vigor, and pioneering spirit of our undergraduate education.

IN BOTH GRADUATE AND UNDERGRADUATE STUDY AND IN OUR COMMUNITY life, the Institute stresses "learning by doing." This is more than a phrase; it is a philosophy of education. It means education for action. It means a feel for materials, an experimental attitude, theory tested by reality. It means emphasis on laboratory instruction, project courses, small classes, "whole" problems, practice schools, student self-government, and other activities whereby the student develops judgment and experience through practice. The Institute's large sponsored research activities provide exceptional opportunities for students to learn by doing. The project method of teaching engineering, which I described last year, as well as innovations in our laboratory instruction, represent extensions of our philosophy of learning by doing.

Students and faculty studying together: a laboratory in Geology and Geophysics.



Formal analysis
in an informal atmosphere:
a class in mathematics.

Future civil engineers
learning by doing
in the Structures Laboratory.

An Industrial Management
seminar in the Sloan
Building.

OUR UNDERGRADUATE EDUCATION INCLUDES THREE ELEMENTS: SCIENCE, applied science, and general education. As last year's Carnegie Visiting Professor in Humanities, Jacob Bronowski, recently wrote in *The London Observer*, "M. I. T. . . . gives the undergraduate in his first two years an extraordinary grounding in all of the sciences. You cannot become so much as a modest sanitary engineer here until you have first done the mathematics and the physics . . . from which any true understanding of science must spring. You cannot be a specialist until you are a scientist; this is the axiom I found at M. I. T." To this might be added the further statement that it is our conviction that you can be neither an effective scientist, engineer, executive, economist, nor architect without some understanding of our society and of human relationships. These objectives, which reflect themselves in our program at the Institute, usually surprise visitors from other lands and other types of institutions; they often come here thinking of M. I. T. as highly specialized in the field of technology, being unacquainted with our concept that a great institute of technology must have first-rate science and first-rate general education if it is to have first-rate technology.

IN ITS EXTENSIVE SYSTEM OF PROFESSIONAL COURSES, THE INSTITUTE believes that it has an exceptional educational method for motivating its students and for giving them a sense of direction and mastery of a subject. While our undergraduate professional courses prepare men for specific careers, they are not so specialized that they limit their graduates to narrow fields. Almost three years out of the four in our engineering undergraduate courses are given over to science, mathematics, basic engineering, social science, humanities, and to other material common or fundamental to all engineering. The facility with which some of our graduates in one field shift to another field of engineering or science is a good demonstration of the basic content of our professional courses. The large number of graduates who become executives and managers is more good evidence that our education provides a broad preparation for a career. Our undergraduate program exploits professional specialization to achieve a new kind of general education.

Similarly our general education in nonprofessional subjects exhibits the breadth of our program. In addition to the basic science he studies, the M. I. T. undergraduate devotes the equivalent of one day out of five to history, literature, and the social sciences, and he now finds these subjects as demanding, as mature, and we hope as bracing as his professional studies.

WE AT M. I. T. DO NOT ACCEPT THE PAROCHIAL VIEW THAT BREADTH and humanism in education are the exclusive property of a particular kind of education. Breadth and humanism may be achieved by students of law, of medicine, of engineering, of the liberal arts, and of the social sciences. Breadth and humanism may also be found lacking in any one of these fields. These qualities are not the monopoly of any one field of scholarship or any kind of institution. It is the outlook, the humanity, the wholeness of the teacher, the humane spirit of a community of teachers governed by ideal aims which are really important in achieving breadth and humanism in education. We are influenced by this conviction in selecting our teachers, since we seek gifted teaching as well as distinguished scholarship.

It is also our conviction that education which is truly humanistic must have social utility and relevance to the current needs of society. We seek this relevance and utility along with the generalizing benefits of perspective and theory.

In the Faculty, in the student body, and throughout the Institute we are preoccupied with a basic concern for the individual, his adjustment, his growth, his freedom, and his dignity. We can thus exemplify the liberal arts as well as teach them.

Right: *Carnegie Visiting Professor Jacob Bronowski with his graduate seminar on the use of scientific concepts, typical of the broadened outlook which visiting professorships make possible for our students.*

IN ITS RESEARCH POLICIES THE INSTITUTE PREFERS NOT TO LIMIT ITSELF to any narrow or doctrinaire definition of what is appropriate research for an educational institution. We seek to encourage the uncommitted scholar and the researcher who works alone. We believe in the free exercise of curiosity as the major long-term research responsibility of the Institute. We also believe in team research, when that seems best for attacking the problem at hand. We believe generally in concentrating on basic research, but we do not believe that the engineer should necessarily be constrained by what the pure scientist conceives of as basic research. We must have room for both approaches. We have found that team research on certain kinds of applied problems offers exceptional experience to graduate students, especially in engineering, and that experience in large projects can greatly accelerate the research development of young scholars and project engineers. Sponsored research also is exceptionally useful in introducing a larger measure of relevance and purpose in our teaching.

We know from extensive experience that sponsored research can enrich our educational program, and we do not share the extreme view sometimes expressed that sponsored research *ipso facto* is bad for education. All sponsored research should contribute to the educational objectives of the institution, should be something that the participating staff members wish to do, and should be open to graduate students. These considerations have governed our management of sponsored research.

In addition, we have recognized an inescapable responsibility in this time of crisis to undertake research in support of our national security which under normal conditions we would choose not to undertake. We propose to see this research through and to make our special competence available so long as national policy and need indicate that we should. When these conditions no longer hold, we shall withdraw from classified emergency research with enthusiasm and relief. In the meantime, we are finding ways to manage this research so that it does not, on balance, detract from our educational program.

I believe that the willingness of the Institute following the war to accept large sponsored research projects has made it possible greatly to increase our over-all contributions to the nation, enabled us in time of need to create the Lincoln Laboratory and similar projects, and made possible the maintenance of a scientific "fleet in being" of great importance to national security.

IN ADDITION TO ITS RELATIONSHIPS WITH GOVERNMENT, THE INSTITUTE cultivates wide contacts with industry. The flourishing state of technology in the United States reflects a close articulation and understanding between education and industry. We at M. I. T. seek to promote and extend this articulation and understanding. This objective finds application in our encouragement of industrial consulting by our staff, in the recent conception and development of our Industrial Liaison Program, in the establishment of our School of Industrial Management, in the increasing emphasis of our Summer Session on advanced conferences for representatives of industry, and in the wide contacts we maintain with industry. The Institute considers itself a partner in the furtherance of industry and enterprise.

WE SEEK ALWAYS TO PROVIDE EXCEPTIONAL FACILITIES FOR STUDY AND research. This means more than well-equipped laboratories and class rooms, which are vital; it includes an environment which places learning in a setting of beauty, dignity, and benignity, and which as a result gives a lift to the spirit. An institute of technology has a greater need for this kind of environment, even, than a liberal arts college.

Finally, I come to the key policy of all: the summation of policies governing the selection of our faculty. The success with which we make these selections determines our success as an institution. This is a truism that is easy to state and hard to follow. It involves adherence to standards as high as can be found in the academic world. It involves the maintenance of a salary scale, an environment and a freedom which makes M. I. T. attract-

ive to first-rate minds. It involves stability and steadiness of course and a climate invigorating to creative scholars. It involves all the subtle and imponderable factors which enable a group of scholars to make a great university where otherwise the same group might constitute a mediocre one. It involves an appointive process which does not compromise with expediency and which relentlessly avoids the second-rate in favor of the first-rate. It involves the selection, cultivation, and encouragement of men who teach with zest, dedication, and art but who also have the gift of creative scholarship. It involves finding and encouraging men who have the rare temperament or personality that emanates goodness and wisdom.

We seek these goals in our appointive process but of course we do not always achieve them. It is the combined responsibility of faculty and administration to attract and select the best.

Above: Typical of the kind of learning aids toward which we aim, the quiet, spacious Map Room (provided by the Boston Stein Club) in the Charles Hayden Memorial Library.

Left: Good music in colorful, relaxed surroundings: the music lounge in Charles Hayden Memorial Library.

The Exhibition Gallery
in Charles Hayden Memorial Library
for edification . . .
. . . and as a teaching tool.

MODIFICATIONS IN 1952–1953

WITH THE ABOVE CONCEPTS AND POLICIES BEFORE US, LET ME NOW list the following important modifications made during 1952–1953 in our program, organization, and environment:

1. Revision by the Faculty of our first-year curriculum to permit freshmen more choice and greater flexibility and to reduce the required number of contact hours. This revision also permits more effective counseling by our new Freshman Advisory Council, created by the Faculty.

2. A further recasting of our program in general education, including a thoroughgoing replanning of the two-year common core for freshmen and sophomores to provide a better integration of the humanities and social sciences. Beginning this fall, this core curriculum also will be given in French for a highly selected group of students, an experiment made possible by a grant from the Rockefeller Foundation.

3. Establishment of a Division of Biochemistry in the Department of Biology and the consolidation of the Department of Building Engineering and Construction with the Department of Civil and Sanitary Engineering. A decision was reluctantly reached to discontinue the Civil Engineering Summer Camp and to teach surveying at and around M. I. T.

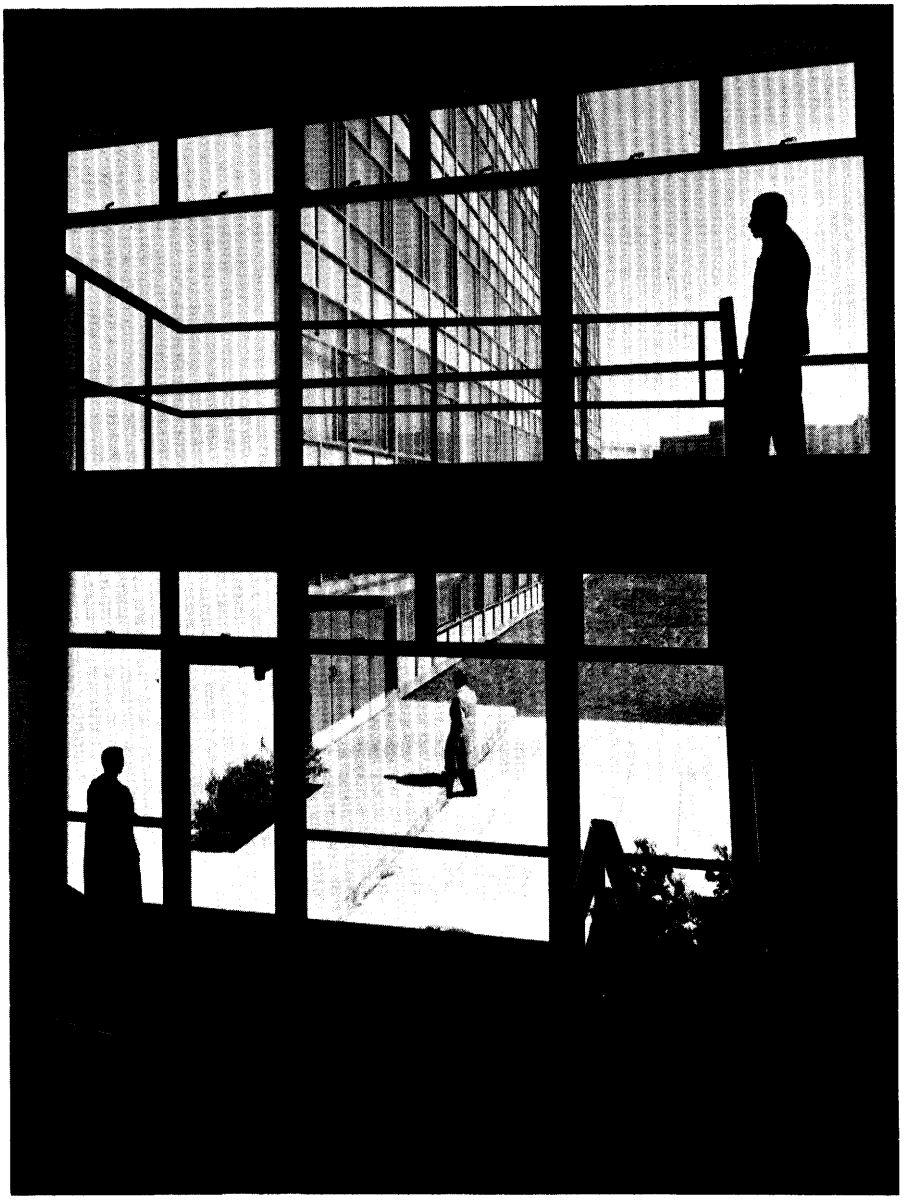
4. Other important changes in courses and curricula, including the replanning and re-equipping of freshman laboratory instruction in physics; a major reorganization of the curriculum in electrical engineering, deferring specialization until the senior year and including a fresh and more fundamental approach to the study of power; revision of the graduate program in physical chemistry; recasting of elective sequences in the School of Humanities and Social Studies; provision of new graduate subjects in the School of Industrial Management; and the decision of the Faculty again to require a thesis or project, representing independent work, for the S.B. degree.

5. Adoption of a new plan of stabilized enrollment providing for a limitation on the freshman class of 900. Studies of the present size of our staff and buildings show clearly that a student body of at least 5,000 can be amply accommodated. In 1940, with 3,100 students, we had 350 square feet of permanent instructional space per student. In 1953 we have 348; thus our new building has just kept pace with our increase in enrollment.

6. Acceptance by the governing bodies of the Institute of a new tenure plan, devised by a committee of the staff, relating the granting of permanent tenure to age as well as to length of service, providing for more administrative flexibility in the appointive process, and removing inequities in the old plan. The Institute has now reached a plateau where the number of permanent tenure appointments cannot be allowed to increase until additional appointments are funded. The new tenure policy will help in administering a stabilized staff appointment policy, but we must couple with it an administrative plan for giving departments opportunity for making commitments ahead.

7. Completion of a two-year plant modernization and space reallocation program involving an expenditure of $2,000,000; this included a much-needed modernization and consolidation of the electrical engineering teaching and research quarters. The year also witnessed the completion and dedication of the John Thompson Dorrance Building; construction of a new Combustion Laboratory; important improvements in the Engineering Library under the dome; and provision of three attractive new student-faculty rooms honoring Professor Erwin H. Schell, Professor Emeritus Charles M. Spofford, and the late William H. Walker. Construction of the new Auditorium made possible by the Kresge Foundation began, with completion expected by October, 1954.

8. Inauguration of the Division of Defense Laboratories for the purpose of segregating classified military research from the educational activities of the Institute, to afford specialized fiscal management of large off-campus sponsored research, and immediately



The new Dorrance Building viewed from the entrance corridor.

to provide for the Lincoln Laboratory, operated for the U. S. Government at Bedford.

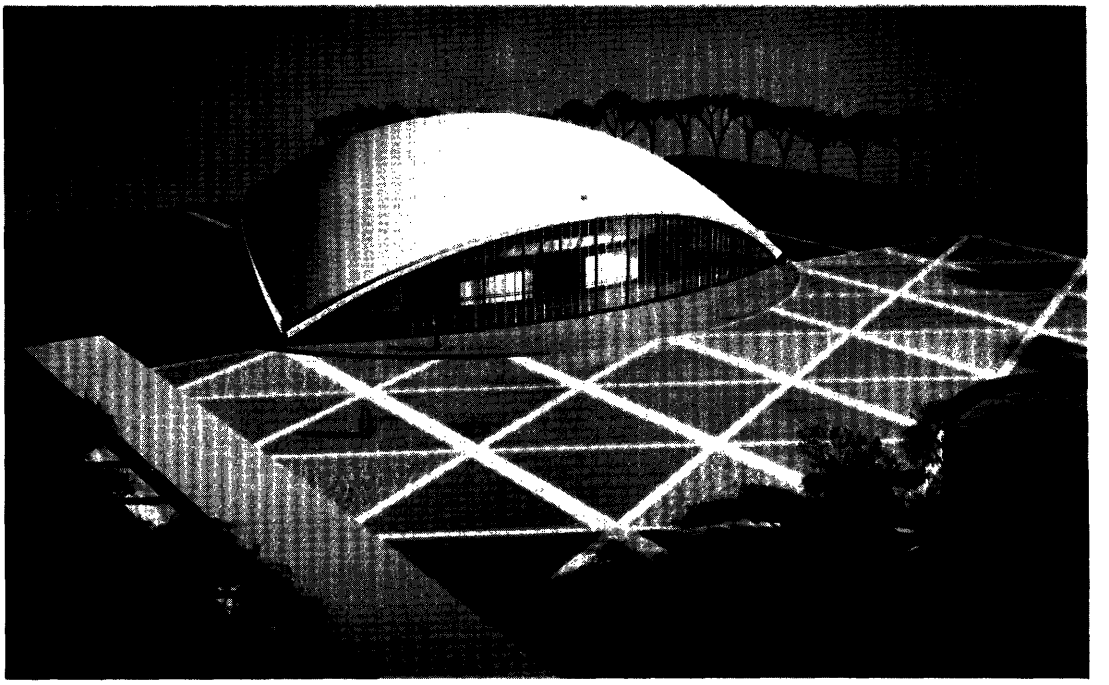
These changes during the past year serve further to emphasize the widening scope of the Institute. Since the end of World War II we have added or given formal recognition to the following new academic units: the Research Laboratory for Electronics, the Laboratory of Nuclear Science, a program in nuclear engineering, the Department of Food Technology, the Gas Turbine Laboratory, the Naval Supersonic Laboratory, the School of Industrial Management, the School of Humanities and Social Studies, the Center for International Studies, the Acoustics Laboratory, the Division of Biochemistry, the Aero-Elastic Laboratory, and the Combustion Laboratory.

Clearly the Institute is still opening up and occupying an intellectual continent.

Left: One of the Dorrance Building's completely equipped biology laboratories.

The main laboratory for foundry work in the new Metals Processing Building.

Model showing the design
of the auditorium now under construction,
as envisaged by its architect, Eero Saarinen.



Administrative Decentralization. A further decentralization of the Institute's administration was encouraged and accomplished during the year. The Vice President and Provost, together with the Vice President and Treasurer, have assumed increasing responsibility for our academic and business activities, respectively. In addition, the academic deans have assumed more complete responsibility for their schools and have used this increased autonomy effectively to promote the special characteristics and objectives of the departmental groupings they administer. Under this arrangement each school has a better opportunity to develop its own educational "personality."

In my judgment we can still further encourage this decentralization by schools. In the first place, the Institute is fortunate in having a group of deans with exceptional qualifications for intellectual leadership and skilled academic administration. The list is indeed impressive: Pietro Belluschi of Architecture, E. P. Brooks of Industrial Management, Edward L. Cochrane of Engineering, George R. Harrison of Science, and John E. Burchard of Humanities. The part these officers play in the leadership of the Institute is very great, and it is to the Institute's advantage to give them the fullest possible scope in the development of the groups they head.

In the second place, greater decentralization is made desirable by the present size of the Institute. There are many colleges which are not so large or complex as several of our schools. For example, the total budget of the School of Engineering is over $4,000,000, which is larger than that of the entire Institute in 1940.

While I favor this decentralization by schools, I assign great importance to our coordinating agencies. The Budget and Personnel Committee, which includes the academic deans, reviews all departmental budgets and personnel changes in accord with policies uniform for the institution as a whole. The Academic Council brings together the academic deans, the Dean of Students, the Dean of the Graduate School, the Executive Assistant to the President, the Vice President and Provost, the Chairman of the Faculty, and the President for the coordination of academic administration.

The development of school councils — the organization of the department heads of each school — which was recommended by the Committee on Educational Survey has been carried forward by the Deans. These councils promote the exchange of ideas, coordination of policy, and productive interrelationships among the departments.

Inter-school coordination among department heads is achieved through the Faculty Council, which includes all department heads and educational officers. During this past year, committees of the Faculty Council undertook studies of our annual salary plan and of the uniform administration of policies governing participation by officers and faculty members in business and governmental activities outside of the Institute. The Faculty Council and the school councils help in coordinating the Institute's strong departmental organizations. In our organizational scheme and in the trend toward decentralization, departments have great autonomy and our department heads great responsibility. Here, too, we are fortunate in having an extraordinary group of educational administrators.

Alongside this administrative structure is the Faculty and its organization, including some seventeen standing committees which formulate and legislate educational policy. It is the responsibility of the President, the Provost, and the Chairman of the Faculty to insure that the administrative and faculty organizations operate in harmony and with an interplay which makes the whole stronger than the sum of its parts. The "Andover Conferences," bringing together faculty members and administrative officers for uninterrupted week ends of free and leisurely exchange of ideas away from the Institute, have been most productive in the last two years.

Our unified faculty, broken up neither by schools nor by graduate and undergraduate programs, is the major coordinating agency for educational policy.

At another time I plan a discussion of the important responsibility of other Institute officers, such as the Dean of the Graduate School, the Dean of Students, and others. I venture this brief,

initial essay on our academic organization now to indicate the wide decentralization of responsibility we are achieving without sacrificing the closely knit, compact, and direct-acting characteristics of our administration.

Investigations. Three members of the Institute Faculty were involved in public hearings before the House Committee on Un-American Activities during the year and a fourth in private hearings. While it would of course have been better if M. I. T. had not been involved at all, I think that we met the investigations with candor, courage, unity, and patriotism.

After the open hearings, the following statement was issued in behalf of the Corporation Executive Committee:

"The Executive Committee of the M. I. T. Corporation decided today that Professors Martin, Amdur, and Levinson, who testified freely and co-operatively before the House Un-American Activities Committee, will be continued at the Institute without change of status and in good standing.

"The Executive Committee has examined the present position and recent conduct of the three professors in the light of its long-standing policy with respect to the conduct and responsibility of its Faculty members. The Institute is unequivocally opposed to Communism. It is opposed to regimentation or control which dictates to scholars the opinions they must have and the doctrines they must teach. It believes that the teacher must be diligent and loyal in citizenship and that he must teach in the clear daylight without hidden allegiance or obligations which require him to distort his research or teaching in accord with dictates from without.

"While we in no sense condone the earlier associations with Communism of the three professors, nor would we tolerate the presence of a known Communist on our Faculty, we are convinced that since the true nature of Communism became apparent to them some years ago, they have been free of any sympathy for it and have dissociated themselves completely from it. They have spoken with candor about their past activities, and we are convinced that they are teachers of integrity and loyalty.

"Because of our confidence in them, as well as the candid manner in which they have reported on their past associations, we find no cause to change their status at the Institute.

"This decision of the Executive Committee was reached after a thorough review of the records of the three men and after hearing the report of a Faculty committee which examined the cases."

At Commencement time, President Edwin D. Ryer of the Alumni Association made public the following statement addressed to the President:

"The Executive Committee of the Alumni Association has directed me to express to you on this occasion our whole-hearted support of the position taken by the Institute's Administration and Faculty with respect to the recent Congressional investigations.

"We know that the Massachusetts Institute of Technology stands unequivocally opposed to Communism.

"We subscribe to your stand that a member of our Faculty 'must be diligent and loyal in citizenship and that he must teach in the clear light without hidden allegiance or obligations which require him to distort his research or teaching in accord with dictates from without.'

"We feel it equally important that this policy be administered fairly and unemotionally; and we are confident that this has been done in the cases of the three members of our Faculty who testified freely and co-operatively before the House Un-American Activities Committee, and who have been continued at the Institute without impairment of their official status."

In recording our involvement in these investigations, I wish to emphasize the sense of responsibility shown by our Faculty. Indeed, the unity, teamwork, and unflinching public responsibility demonstrated by the Corporation and Faculty alike gave new strength and unity to M. I. T.

UNSOLVED PROBLEMS — UNFINISHED BUSINESS

SO FAR I HAVE BEEN REPORTING ITEMS OF POLICY, CHANGE, IMPROVEMENT, and progress. I must also report certain failures and numerous items of unfinished business.

I do not believe that we have yet devised an adequate method for recognizing and rewarding exceptional and imaginative teaching in the undergraduate school. Everyone wants to do something about this, and some progress has been made — but not enough.

We should constantly be making and recognizing innovations and advances in teaching as well as in research.

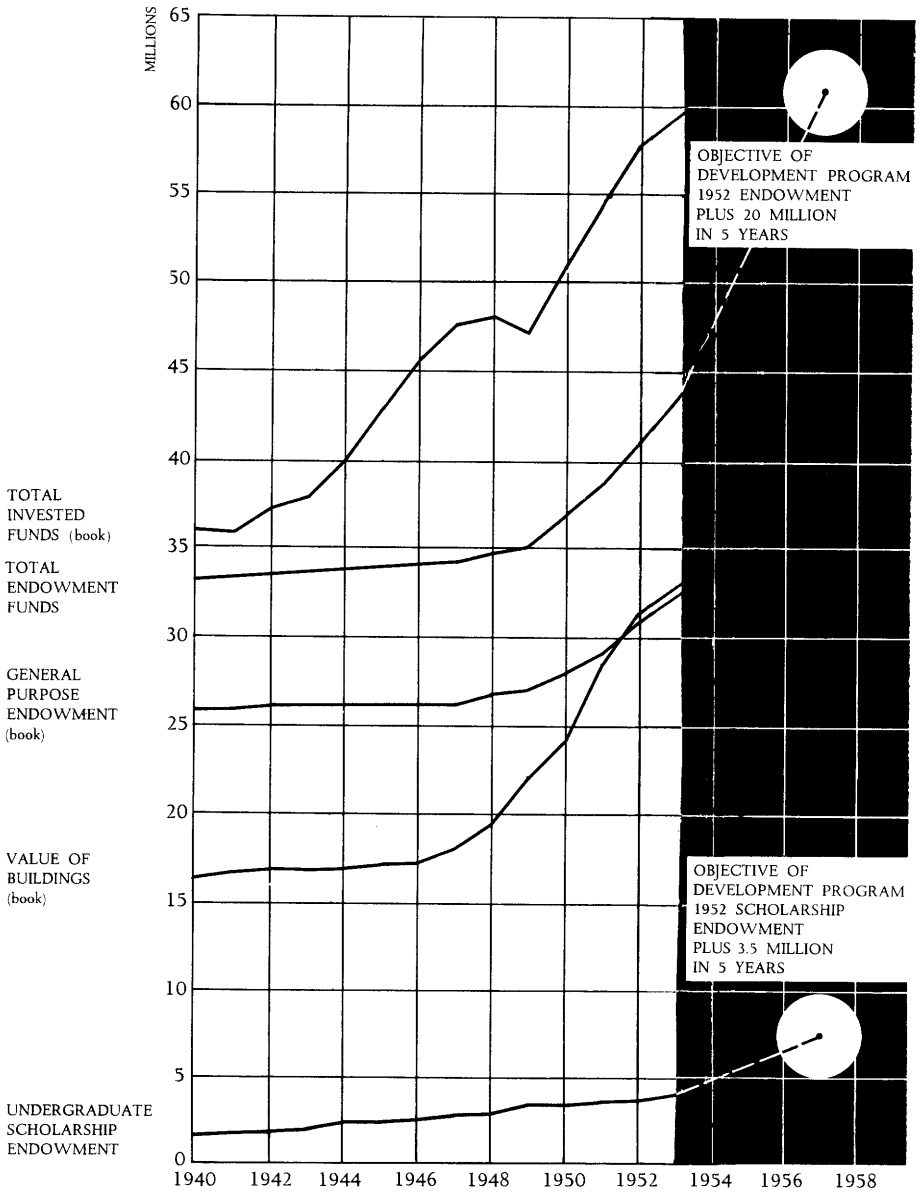
The Institute has critical need for a physical sciences building. We have not yet found the fund sources to provide the $2,000,000 needed for the building and an equal amount for endowment. We should not build additional plant without additional endowment to maintain the additions.

While our level of gifts is gratifyingly higher than before the Development Program, we have not yet found an approach to long-term development which promises greatly to increase funds available for endowment. Under the fine leadership of Mr. Marshall B. Dalton and Professor Walter Gale, diligent and effective efforts are now being made to step up our activity. We need to be adding $4,000,000 a year to permanent funds; for the past two years we have averaged nearly $2,500,000.

Neither have we been able to increase our scholarship funds adequately. M. I. T.'s scholarship aid to undergraduates compares unfavorably with that given by other institutions. This year, for example, a sister institution completed a survey of undergraduate scholarship awards granted during 1951–1952 by eight leading technical schools and four well-known universities.[1] One school in this group awarded scholarships which amounted to 27.8 per cent of the total undergraduate tuition income. M. I. T., where

[1] These schools included, with one omission, California Institute of Technology, Carnegie Institute of Technology (College of Engineering and Science), Case Institute of Technology, Cornell University (College of Engineering), Harvard University, Illinois Institute of Technology, Massachusetts Institute of Technology, Northwestern University (Technological Institute), Princeton University, Rensselaer Polytechnic Institute, and Yale University.

Growth of Endowment and Plant Value 1940-1953



7.5 per cent of tuition fees was awarded in scholarships, stood at the bottom of the list, though this kind of analysis ignores the great assistance provided by our Loan Fund.

Recent increases in undergraduate scholarships have been made possible, to a large extent, by a decision to use the accumulated income of our scholarship funds at an accelerated rate. If the present scale of awards is to be maintained in the future, it becomes mandatory that our capital endowments for scholarship be augmented to provide the necessary income.

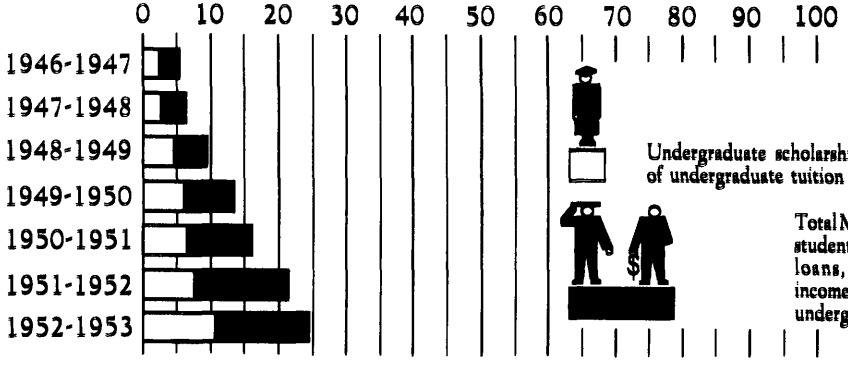
In common with many colleges and universities, our scholarship applications from entering freshmen continue to show a sharp upward trend. For the class entering in the fall of 1953, more than 1500 requests, a 50 per cent increase over the previous year, were processed and considered.

For these reasons, it is clearly incumbent on us to find the means not merely to maintain but to extend our undergraduate scholarship aid.

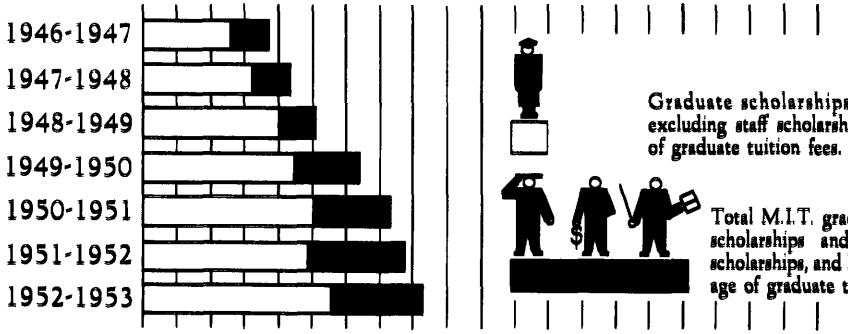
A review of Corporation Visiting Committee reports reveals many recommendations which we are still unable to put into effect for various reasons. These include: completion of basic equipment for the Hydrodynamics Laboratory ($50,000); relief of space congestion in the Department of Geology and Geophysics; equipment changes necessary fully to implement the new branch libraries; reconstitution of our program in Shipbuilding and Ship Operation; provision of more adequate scholarships and fluid funds for the School of Architecture and Planning; provision of program and means for a Center of Urban Studies; further adaptation and decentralization of student government to meet needs of our enlarged residential system. To these should be added $50,000 for equipment for Food Technology, $85,000 for the Metals Processing Laboratory, $25,000 to complete the equipment modernization of the electrical engineering laboratories, and some $200,000 for improvements in buildings and grounds. These items must be cared for out of new capital funds not now in hand.

In speaking of new monies needed, I must also emphasize the need for economy in all our activities. As a result of inflation and

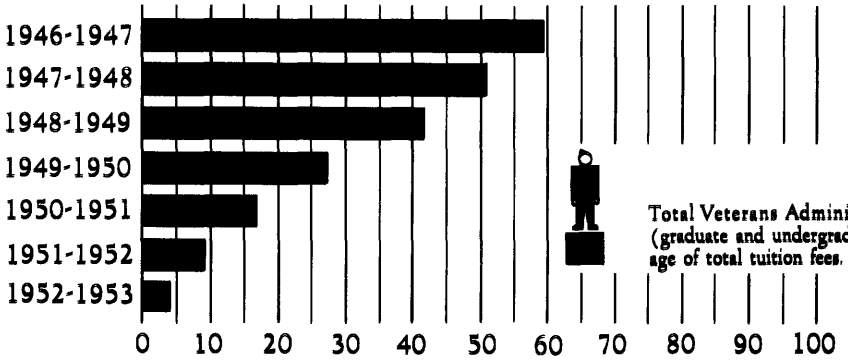
Undergraduate Student Aid



Graduate Student Aid



Total Veterans Administration Payments



NOTE: *Student employment income is reported for the academic year only. A number of our students also have earned, through their services to many departments and to other divisions of the Institute, income not recorded by our student personnel office.*

other factors we face a period of austerity and budget reductions. We seek to handle these reductions without doing injury to our academic work. Toward this end we have made a start, but much remains to be accomplished. One of the jobs ahead is to review subjects of instruction to see whether our present offering is unjustifiably large.

In his annual report Dean Burchard calls attention to our need for "freedom money" to assist faculty members to do many things contributing to their professional development and teaching which cannot be financed out of regular budgets or through grants for research projects. The need for such fluid funds is not limited to the Humanities and Social Studies. A small amount would go a long way.

Dean Harrison, in his report, emphasizes our responsibility at M. I. T. to do our part in helping to encourage more able people to go into secondary school science teaching. The dearth of such teachers is increasing, and there is danger that science in America will suffer.

We have already made two moves: establishing the Westinghouse Summer Program for Teachers of Science and Course IX-C for students wishing to go into science teaching. Both of these are good but not enough. Our association with *The Boston Globe* in holding in Rockwell Cage the annual Massachusetts Science Fair has been important in acquainting us with science teachers and their problems. We need particularly to encourage more students to go into Course IX-C. We should consider a special graduate degree for secondary school teachers. I am happy to report that Dean Harrison has volunteered to explore ways for M. I. T. to help make careers in secondary school teaching more attractive.

STATISTICS OF THE YEAR

THE STUDENT BODY NUMBERED 5,074 IN 1952–1953, AS COMPARED with 4,874 in 1951–1952. The estimated enrollment for 1953–1954 is 5,175. Seven per cent of last year's total were veterans, compared with 15 per cent the previous year. Sixteen per cent were married, compared with 21 per cent in 1951–1952. Ninety-six women were enrolled, 38 of whom were graduate students. Foreign students numbered 464, and they represented 86 foreign countries.

Enrollment in the Graduate School reached a new high of 1,921, compared with 1,720 the previous year. There were 218 officers from the Armed Services enrolled for advanced degrees, in addition to 37 who registered as special students.

Students enrolled at M. I. T. during 1952–1953 held degrees from 392 other colleges and universities, 245 American and 147 foreign.

There has been a steadily declining enrollment of veterans receiving benefits under Public Laws 16 and 346; the peak was during 1946–1947, when 60 per cent of our student body was enrolled under one of these laws. We estimate that less than 100 undergraduates will receive Veterans Administration assistance through these laws during 1953–1954; undergraduates and graduate students in this group will probably number less than 5 per cent of our total student body.

In September, 1952, 23 entering freshmen became the first group of students to register under Public Law 550, the Korean "G.I." Bill. During the Spring Term, this number increased to 35 and during the Summer Session, 21 were here. Our total enrollment during the coming year under this law will be about 65.

Student Aid. Scholarship grants to undergraduates totaled $265,990 to 636 students in 1952–1953, compared with $188,311 to 533 students the year before. Some undergraduates held both scholarships and loans. A total of 283 undergraduates received loans as of June, 1952, amounting to $167,540.

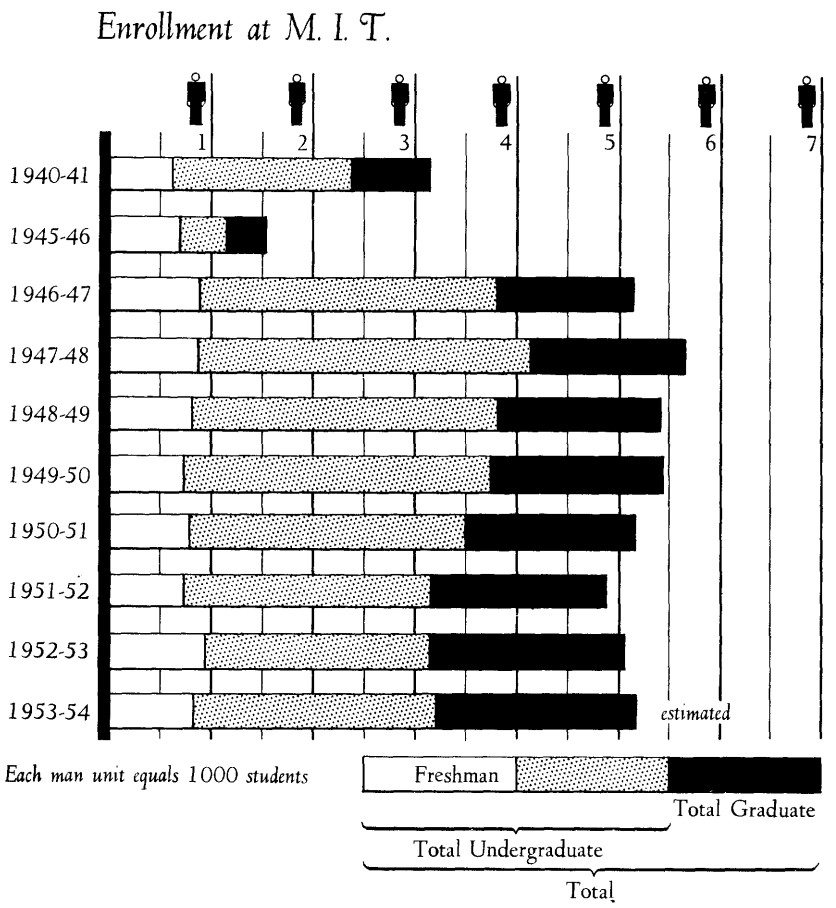
given, M. I. T. has been selected as a place to study by a larger number of these Fellows than any other institution.

From both graduate and undergraduate students the Loan Fund Board received 427 applications during 1952–1953, and acted favorably on 390, or 91.3 per cent, lending $217,268. In 1951–1952, 376 students, 93.2 per cent of those who had applied, received $198,781 from the Loan Fund. Last year's activities brought the cumulative total of Loan Fund operations to 4,017 men aided over a period of 23 years, with loans during that period of $2,730,149.

The Student Personnel Office placed 1,208 students in jobs over the twelve-month period. During the academic year, approximately 1,000 students earned about $190,000, and more than 200 students were placed in vacation jobs with estimated earnings of $95,000. This total of earnings ($285,000) compares with the $300,000 reported last year for a twelve-month period.

Finances. During 1952–1953 the sum of our academic budget plus the budgets of research projects managed by M. I. T., a total of $43,000,000, almost equaled the peak which we reached in the last year of World War II. The year ended with an excess of revenues of $20,573.

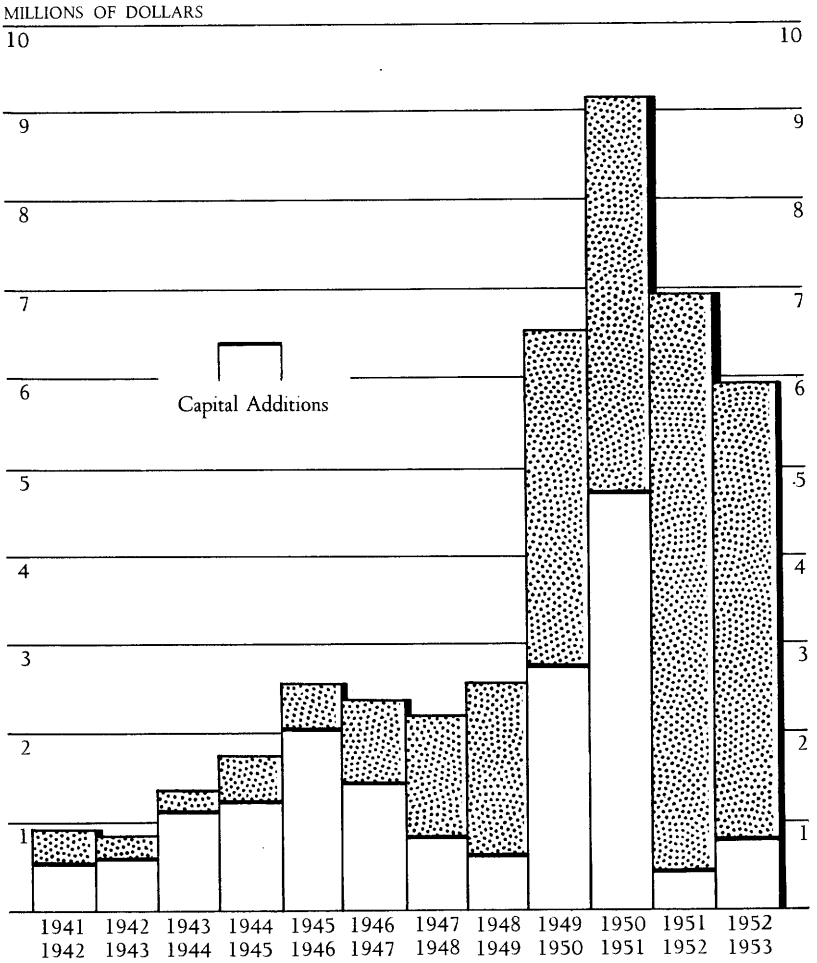
The Institute's endowment and other funds now have a total book value of $59,940,000 invested in securities and other assets with a market value of $73,080,000. Plant assets stand at $33,065,000, about $1,700,000 above last year. For the sixth successive year the income allocation to funds sharing the general investments was at 4.0 per cent of book value. Unallocated investment income in the amount of $500,000 was added to the balance of undistributed investment income, bringing this reserve up to $1,797,000.



Total graduate scholarships and fellowships for 1952–1953 amounted to $332,013, and these scholarships and fellowships were granted to 227 recipients. This compares with $260,836 granted to 207 recipients in 1951–1952. A total of 97 fellowships was sponsored by industrial companies, compared with 86 in 1951–1952. Staff tuition was paid from departmental funds in the sum of $113,543 in behalf of 301 other graduate students holding part-time service appointments.

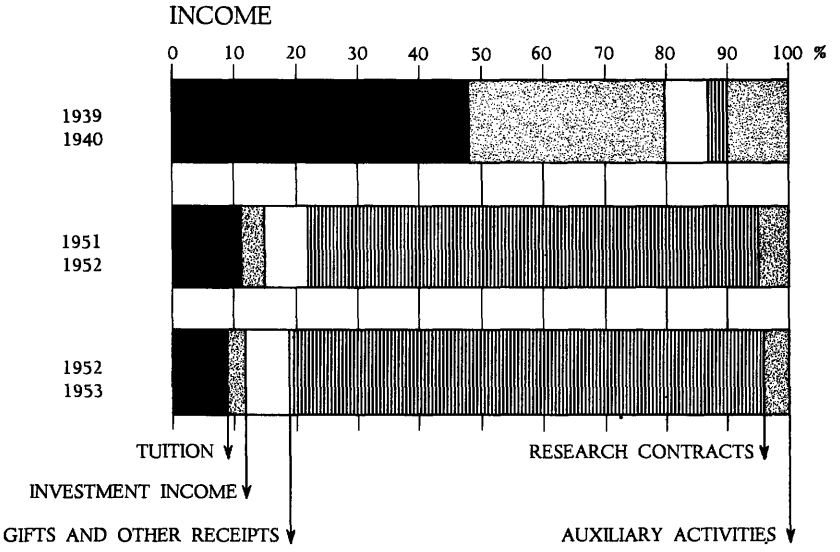
It is a striking fact that in 1953–1954 we shall have 63 National Science Foundation Fellows at M. I. T., or 11 per cent of all selected for these Fellowships. Although we do not offer work in a number of the fields in which these Fellowships are

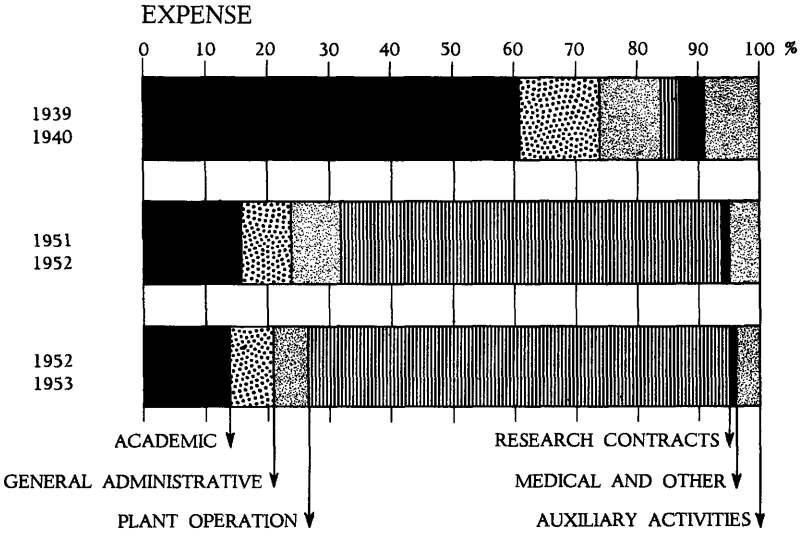
Total Gifts received each year since 1941



The 1952-1953 figure includes maturing pledges to the Development Campaign.

Distribution of Major Elements of Income and Expense





PERSONNEL AND ADMINISTRATION

IN 1952–1953 THE TOTAL OF STUDENTS, STAFF AND OTHER PERSONNEL which make up our community exceeded 11,000, the largest population in the history of the Institute.

Members of our faculty and staff have continued to take active roles in the larger affairs of their professions while meeting their responsibilities as members of our own Institute community. Dr. Walter G. Whitman, head of the Department of Chemical Engineering, returns to M. I. T. this fall after two years of arduous service as Chairman of the Research and Development Board in the Office of the Secretary of Defense. Many of the committees advising the Atomic Energy Commission, Defense Department, National Advisory Committee for Aeronautics, and National Research Council have included members of the M. I. T. faculty. Professor Jerome C. Hunsaker continues his long-time service as Chairman of the N.A.C.A.

Professional societies have honored faculty members in many ways; seven are serving as heads of their respective groups this year: Dean Harrison is Chairman of the American Institute of Physics; Associate Professor Cecil E. Hall, President of the Electron Microscope Society of America; Associate Professor Leo L. Beranek, President of the Acoustical Society of America; Professor Bernard E. Proctor, President of the Institute of Food Technologists; Dr. Dana L. Farnsworth, President of the American College Health Association; Professor Philip M. Morse, President of the Operations Research Society of America; and Professor Lawrence B. Anderson, President of the Association of Collegiate Schools of Architecture.

National and international professional awards have also come to members of our faculty and staff: the honorary Medal of the City of Paris to Emeritus Professor Turner; the Gold Medal of the University of Copenhagen to Dr. Jørgen Rathlev; the Collingwood Prize of the American Society of Civil Engineers to Associate Professor T. William Lambe; the Clemens Herschel Prize of the Boston Society of Civil Engineers to Assistant Professor Henry M. Paynter; the David A. Wells Prize of Harvard University to Assistant Professor Robert M. Solow; the Franklin L. Burr Award

of the National Geographic Society to Professor Harold E. Edgerton; the Wallace Clark International Award of the National Management Council to Professor Schell; a prize of the Institution of Mechanical Engineers (England) to Assistant Professor Leonard Maunder; the Junior Award of the Heat Transfer Division and the Gold Medal Award of the American Society of Mechanical Engineers, both to Associate Professor Warren M. Rohsenow; the Certificate of Honor from the American Society of Mechanical Engineers to Professor C. Fayette Taylor; the Losana Gold Medal of the Italian Metallurgical Association and the Albert Sauveur Award of the American Society for Metals, both to Professor John Chipman; the Kamani Medal of the Indian Institute of Metals to Professor Morris Cohen; the Trinks Award of the Industrial Furnace Manufacturers' Association to Professor Frederick H. Norton; the Award of the Society of Women Engineers to Dr. Maria Telkes; and the President's Award of the Society of Naval Architects and Marine Engineers to Professor Laurens Troost.

In addition, members of our faculty have been honored by other educational institutions, with honorary degrees awarded to Dean Burchard by Union College; to Horace S. Ford by Middlebury College; to Professor Robert S. Harris and Dr. James R. Killian, Jr., by the University of Havana; and to Associate Professor William W. Buechner by the University of Mexico. In addition, Professors Buechner and Harris hold honorary professorships at the Universities of Mexico and Havana, respectively.

The new Division of Defense Laboratories has Mr. Ford, Treasurer Emeritus, as acting director, Paul V. Cusick as associate director, and Henry W. Fitzpatrick as assistant director.

Professor Albert G. H. Dietz will be Acting Head of the course in Building Engineering and Construction within the Department of Civil and Sanitary Engineering; Professor Walter C. Voss, head of the Department of Building Engineering and Construction since 1940, reached retirement age this year.

Other retirements this year included those of Professor Earle Buckingham and Associate Professor John M. Lessells of the Department of Mechanical Engineering and Dr. Earl B. Millard, Professor

of Chemistry and Secretary of the Faculty. Professors Buckingham, Lessells, and Voss will continue as lecturers during the coming year.

Dr. John M. Buchanan has been appointed Professor of Biochemistry and will head the new Division of Biochemistry in the Biology Department. This group occupies new and spacious quarters on the sixth floor of the Dorrance Building.

Continuing its program of maintaining close contact with business and industry, the School of Industrial Management has had a distinguished list of visiting professors and faculty appointments this year. The British economist, John Jewkes, Professor of Economic Organization at Oxford University, was visiting lecturer in the School and the Department of Economics and Social Science during one month in the late fall. Dr. Eli Shapiro, as Professor of Finance, assumed responsibility for teaching and research in such fields as corporate finance, consumer credit, and business financial policy. Professor Elting E. Morison, formerly in the School of Humanities and Social Studies, joined the faculty of the School of Industrial Management in a new post as Professor of Industrial History; he will direct studies in the significant effects of technological change on industrial development. Professor Mason Smith, formerly a partner of A. T. Kearney and Company, Chicago management consultants, has also joined the faculty of the School, and Wroe Alderson, partner of Alderson and Sessions, Philadelphia marketing and management counsel, is Visiting Professor during the current year.

The Department of Economics and Social Science has also had an important roster of guests this year; the Honorable Arthur Tyndall, Judge of the Court of Arbitration of New Zealand, was visiting lecturer for six weeks late in the winter. Edward G. Bennion, head of the General Economics Division of the Standard Oil Company of New Jersey, is Visiting Professor in the Department during the term now beginning.

Grants from the Carnegie Foundation to the School of Humanities and Social Studies made possible the appointment of two distinguished Visiting Professors during the year 1952–1953.

Sir Richard Livingstone, President of Corpus Christi College in Oxford, England, was Visiting Professor of Classical Literature in the Department of Humanities during the first semester, and Dr. Jacob Bronowski, British scientist and man of letters, was Visiting Professor of Humanities during the second half of the year.

In recognition of its increased emphasis on teaching and research in geophysics, the Department of Geology was renamed the Department of Geology and Geophysics during the past year. The department now offers two separate courses, one leading to an undergraduate degree in geology, and the other to a degree in geophysics. Similarly, in recognition of the increasing scope of its activities, the Department of English and History was renamed the Department of Humanities.

A major change in the administration of student affairs was realized with the establishment of a new Student Aid Center under the direction of Dean Thomas P. Pitré. Here are concentrated all M. I. T.'s expanding resources devoted to scholarships, loans, and student employment.

I report with sorrow the deaths of Emeritus Professors George B. Haven and Herman R. Kurrelmeyer of the Departments of Mechanical Engineering and Modern Languages, respectively.

The Corporation. The Institute was honored by a distinguished group of appointments to its Corporation during the past year. New life members are: Lloyd D. Brace, President and Director of the First National Bank of Boston; Thomas D'A. Brophy, Chairman of the Board of Kenyon and Eckhart, New York advertising agency; William A. Coolidge, President of New Enterprises, Incorporated (Boston); and Mervin J. Kelly, President of the Bell Telephone Laboratories. Term members nominated by the Alumni Association are: General James H. Doolittle, Vice-President and Director of the Shell Oil Company; the Right Honorable Clarence D. Howe, Minister of Trade and Commerce and Minister of Defense Production of the Dominion of Canada; Robert C. Sprague, President of the Sprague Electric Company; and Edwin D. Ryer, Vice-President and Director of the Barbour Stockwell Company. Theodore P. Ferris, Rector of Trinity Church, Boston, became a

special term member for five years. Harry J. Carlson, a life member of the Corporation, transferred to emeritus status. These nine new members are heartily welcomed; the Institute is fortunate in having them accept trusteeship responsibilities.

It is with regret that we record the deaths of Victor M. Cutter, emeritus life member, and Charles E. Spencer, a life member of the Corporation. Both served the Institute with dedication and public spirit.

IN CONCLUSION

WITHOUT BREAKING STRIDE, DR. COMPTON REACHED THE INSTITUTE'S age of retirement this past year. As do other members of the staff past 65 and under similar arrangements, he continues to serve the Institute — fortunately as continuing Chairman of the Corporation and thus as the Institute's senior officer and leader. I mention this milestone by way of expressing the delight and satisfaction we all feel in serving under his continuing leadership.

We have another milestone to note. This new academic year is the twenty-fifth that our fellow member, Mr. Walter Humphreys, has served the Corporation as Secretary. We celebrate his quarter century of devoted service.

As a member of the Corporation and in its behalf I speak with enthusiasm and appreciation of the dedicated work of the Institute's Faculty, its administrative officers, and its students. I also speak for all the Institute in thanking those members of the Corporation who have completed their terms or who have transferred to emeritus membership.

Finally I express gratitude for the assistance, wise counsel, and cordial encouragement which the Corporation has generously provided its President.

Yours respectfully,
J. R. KILLIAN, JR., *President.*

Cambridge, Massachusetts
October 5, 1953

CHANGES IN CORPORATION MEMBERSHIP

Year ending October 1, 1953

LIFE MEMBER APPOINTMENTS, *June*, 1953:

Lloyd D. Brace
Thomas D'A. Brophy
William A. Coolidge
Mervin J. Kelly

TERM MEMBER APPOINTMENTS, *June*, 1953:

Special, for five years:
Theodore P. Ferris

Alumni, for five years:
James H. Doolittle
Clarence D. Howe
Edwin D. Ryer

for two years:
Robert C. Sprague

TERM EXPIRATIONS:

(*Elected Life Member*) William A. Coolidge
(*Elected Life Member*) Thomas D'A. Brophy
Raymond H. Blanchard
Thomas H. West

TRANSFER TO EMERITUS STATUS:

Harry J. Carlson

FACULTY CHANGES

Year ending October 1, 1953

PROMOTIONS

To Professor:

Bisplinghoff, Raymond L., *Aeronautical Engineering*
Brown, Comdr. James A., *Naval Architecture and Marine Engineering*
Deutsch, Martin, *Physics*
Hurley, Patrick M., *Geology and Geophysics*
Lin, Chia-Chiao, *Mathematics*
Morison, Elting E., *Industrial Management*
Shaw, Milton C., *Mechanical Engineering*
Uhlig, Herbert H., *Metallurgy*

To Associate Professor:

ADELMAN, MORRIS A., *Economics and Social Science*
AVERBACH, BENJAMIN L., *Metallurgy*
CLARK, W. VAN ALAN, JR., *Industrial Management*
GANGEMI, MAJOR VINCENT J., *Air Science and Tactics*
HARTLEY, E. NEAL, *Humanities*
HAYNES, MAJOR CHARLEY W., *Military Science and Tactics*
KUSKO, ALEXANDER, *Electrical Engineering*
LINVILL, WILLIAM K., *Electrical Engineering*
MUELLER, ROBERT K., *Aeronautical Engineering*
NICHOLS, MAJOR EDGAR W., *Air Science*
POWELL, S. CURTIS, *Naval Architecture and Marine Engineering*
REINTJES, J. FRANCIS, *Electrical Engineering*
SATTERFIELD, CHARLES N., *Chemical Engineering*
STRANDBERG, MALCOLM W. P., *Physics*
SWAIN, C. GARDNER, *Chemistry*

To Assistant Professor:

BOURNE, HENRY C., JR., *Electrical Engineering*
BOYCE, JAMES E., *Economics and Social Science*
CHADDOCK, JACK B., *Mechanical Engineering*
CHANDLER, ALFRED D., JR., *Humanities*
COOK, NATHAN H., *Mechanical Engineering*
DRELL, SIDNEY D., *Physics*
EPSTEIN, DAVID J., *Electrical Engineering*
FELBECK, DAVID K., *Mechanical Engineering*
FOSTER, EUGENE L., *Mechanical Engineering*
FUERSTENAU, DOUGLAS W., *Metallurgy*
GOULD, LEONARD A., *Electrical Engineering*
GRETTER, RALPH W., *Mechanical Engineering*
JENERICK, HOWARD P., *Biology*
KELLER, EARL W., *Electrical Engineering*
LEMESSURIER, WILLIAM J., *Building Engineering and Construction*
LI, YAO T., *Aeronautical Engineering*
MACMASTER, ROBERT E., *Humanities*
MAUNDER, LEONARD, *Mechanical Engineering*
NASH, JOHN F., JR., *Mathematics*
NOISEUX, DENIS U., *Electrical Engineering*
O'DEA, THOMAS F., *Humanities*
REETHOF, GERHARD, *Mechanical Engineering*
REZA, FAZLOLLAH M., *Electrical Engineering*
ROBINSON, ROMNEY, *Economics and Social Science*
SMITH, PAUL E., JR., *Electrical Engineering*
STINCHFIELD, ROGER M., *Food Technology*
STOFT, PAUL E., *Electrical Engineering*
WALKER, DONALD R., *Mechanical Engineering*
WHITMAN, ROBERT V., *Civil Engineering*

APPOINTMENTS

Professors:

BUCHANAN, JOHN M., *Professor and Head, Biochemistry*
COLEMAN, COLONEL GLENN C., *Professor and Head, Air Science and Tactics*
SMITH, MASON, *Industrial Management*

Visiting Professors:

ALDERSON, WROE, *Industrial Management, for the fall term 1953*
BENNION, EDWARD G., *Economics and Social Science for one year*
BRONOWSKI, JACOB, *Carnegie Visiting Professor in English and History for the spring term 1953*
LERNER, DANIEL, *Economics and Social Science, for three years*
TUSTIN, ARNOLD, *Edwin Sibley Webster Visiting Professor in Electrical Engineering*
YATES, J. G., *Electrical Engineering, Visiting Assistant Professor for one year*
YOST, DON M., *Arthur D. Little Visiting Professor in Chemistry, for the fall term 1953*

Associate Professors:

BLUM, JOHN M., *Humanities*
ISARD, WALTER, *City and Regional Planning*
KEATING, MAJOR WILLIAM J., *Military Science and Tactics*
KREBS, WILLIAM A. W., JR., *Industrial Management*
MATTIS, MAJOR WILLIAM, *Military Science and Tactics*
MENCHER, ELY, *Geology and Geophysics*
PECHMAN, JOSEPH A., *Industrial Management*
POOL, ITHIEL DESOLA, *Economics and Social Science*
WILLIAMS, GORDON R., *Civil and Sanitary Engineering*

Assistant Professors:

ALLMENDINGER, ELMER E., *Naval Architecture and Marine Engineering*
BEECHER, NORMAN, *Chemical Engineering Practice*
D'ARCANGELO, AMELIO M., *Naval Architecture and Marine Engineering*
ELIAS, PETER, *Electrical Engineering*
FETTER, ROBERT B., *Industrial Management*
FURCHES, MAJOR DOUTHIT L., *Military Science and Tactics*
GREGORY, ROBERT H., *Industrial Management*
HUFFMAN, DAVID A., *Electrical Engineering*
KING, THOMAS B., *Metallurgy*
MCKINNEY, ROSS E., *Civil and Sanitary Engineering*
MANN, ROBERT W., *Mechanical Engineering*
RATHBONE, ROBERT R., *Humanities*
ROSEN, CHARLES W., *Modern Languages*
SMITH, LACEY B., *Humanities*
WHITIN, THOMSON M., *Industrial Management*
WURTELE, MORTON G., *Meteorology*

RETIREMENTS

Professors WALTER C. VOSS, *Head of the Department of Building Engineering and Construction;* EARLE BUCKINGHAM and JOHN M. LESSELLS, *Department of Mechanical Engineering;* and EARL B. MILLARD, *Department of Chemistry.*

LEAVES OF ABSENCE

Leaves for varying lengths of time have been granted to Professors WARREN AMBROSE, BERNARD T. FELD, ROGERS B. FINCH, MURRAY P. HORWOOD, WITOLD HUREWICZ, CHARLES P. KINDLEBERGER, CHARLES KINGSLEY, JR., GEORGE C. MANNING, WALTER W. ROBERTSON, RAPHAEL SALEM, FRANCIS W. SEARS, KENNETH R. WADLEIGH and ROBERT W. WILLIAMS.

RESIGNATIONS

Associate Professors ALLAN T. GIFFORD, JOHN D. ROBERTS and AMOS J. SHALER.

Assistant Professors JAMES N. ADDOMS, GEORGE H. ALLEN, ERNEST J. ANGELO, JR., ARTHUR D. BRICKMAN, RUDOLPH J. CYPSER, WILBUR B. DAVENPORT, MAJOR AUGUSTINE M. FRAGALA, MAJOR NAT GIAMBELLUCA, MAJOR JOSEPH F. GRICIUS, LIEUTENANT COLONEL SAMUEL L. HALL, ROBERT G. JAMES, ARTHUR E. JOHNSON, JOHN C. JOHNSON, JOHN M. KEMPSTER, WILLIAM A. LEARY, EDWARD A. MASON, MAJOR T. MULLER, PEKKA RAUTALA, WILLIAM E. RITCHIE, ROBERT A. SATTEN, JAN R. SCHNITTGER, GIBBS W. SHERRILL, MORTON SILBERSTEIN and JOSEPH N. ULMAN, JR.

ADMINISTRATION CHANGES

Year ending October, 1953

APPOINTMENTS

DIETZ, ALBERT G. H., *in charge of course in Building Engineering and Construction*
HEWES, ROBERT E., *Associate Registrar*
PITRÉ, THOMAS P., *Associate Dean of Students*
SPEER, WILLIAM, *Associate Dean of Students*
BEAN, MISS RUTH L., *Assistant to Dean of Students*
HARVEY, GEORGE G., *Associate Director, Research Laboratory of Electronics*
ZIMMERMAN, HENRY J., *Associate Director, Research Laboratory of Electronics*
FORD, HORACE S., *Acting Director, Division of Defense Laboratories*
CUSICK, PAUL V., *Associate Director, Division of Defense Laboratories*
FITZPATRICK, HENRY W., *Assistant Director, Division of Defense Laboratories*
FLEMINGS, MERTON C., JR., *Industrial Liaison Officer*
FULMER, VINCENT, *Industrial Liaison Officer*
CRANE, THOMAS J., *Assistant Fiscal Officer, Division of Industrial Cooperation*
HOLDEN, ROBERT J., *General Secretary, Technology Christian Association*
BARTLETT, ELEANOR L., *Special Collections Librarian*
HERMAN, HAMILTON, *Special Assistant*
ROBIE, BURTON ALDRICH, *Humanities Librarian*
HUNTRESS, ERNEST H., *Secretary, Graduate School*

RETIREMENTS

HEDLUND, OSCAR H., *Track and Cross Country Coach*
JOHNSON, SANFRID K., *Athletic Trainer*
LANE, RUTH McG., *Vail Librarian*
SMITH, MIRIAM S., *Reference Librarian*

Reports of the Deans of the Schools

School of Engineering

THE SCHOOL OF ENGINEERING has continued to follow during the past year philosophies of engineering education so ably set forth by my immediate predecessor, Professor Thomas K. Sherwood, in his report to the President for 1951–1952 as Dean of Engineering.

More and more the necessity for and the wisdom of providing a broad scientific base for engineering education is recognized. More and more, too, is evident the desirability of cultural development if engineers are to assume and discharge creditably their share of the duties of citizens in civic life and of leadership in business and industry. The need for physical training demands a share of attention as well.

The total of these demands for student time forces the most critical review of curricula in the various professional departments on a continuing basis. The faculty of the Institute sitting as a single body has given the most searching consideration during the past year to the freshman curricula. Two able faculty committees, the Committee on Undergraduate Policy, under Professor John A. Hrones as Chairman, and the Committee on the First Two Years, of which Professor Patrick M. Hurley has been Chairman, canvassed the problem from every angle and presented proposals which have been adopted and which for the first time give to freshmen some latitude in the selection of subjects to be taken and in the number of hours for which they will be registered.

A number of new freshman elective subjects will be available in the coming year. Unfortunately, the demands of most of the departments in the School of Engineering reduce the scope of election of students planning to follow one of the engineering professions, so that these students will continue in the main to take the same curriculum that was standard for all freshmen heretofore. Even for them, however, the scheduled hours of classroom work are reduced to give more time for consultation and study.

The demand for graduates of all of the departments has continued high, influenced to some extent no doubt by the heavy demands of the mobilization program for national defense. The need for men well trained in the fundamentals of engineering is developing more and more. This is especially true of young engineers who are capable of attacking new problems and of applying the newer scientific developments to the better solution of old problems. For this reason, throughout the school our emphasis

is not upon previous practice and stereotyped procedures but upon fundamentals.

This means that at the end of the four years of undergraduate work the newly graduated Bachelors of Science in the various engineering specialties are not prepared at once to undertake independently important professional responsibilities. They are grounded, however, so that they may quickly acquire such competence in the present state of these professions and continue to keep abreast, and in many cases to take the leadership, in their specialties and in broader fields in the years ahead.

Graduate work is as essential in vigorous engineering education as it is in other fields of specialization. Programs are available in all the engineering departments for advanced specialized study. Depending upon the ability and resources of the individual, these studies can be carried to the level of Master of Science, to a professional degree, or to a Doctorate in Science for those having special bents in engineering research.

We are fortunate that this graduate work can be grounded on a substantial program of research, much of it sponsored by various government agencies or by commercial interests or made possible by grants-in-aid from various foundations or corporations.

Such research is invaluable as a stimulus to faculty and students alike in opening to them the problems of the hour and the possibilities of the future. Through direct participation in the work, either on a part-time or a full-time basis, students are able to share in the responsibilities and also to earn funds for their educational expenses. Great care is exercised in the selection and approval of the sponsored research projects to assure that the advantages from the academic viewpoint dominate any administrative difficulties. Projects estimated to cost more than $35,000 are reviewed by a Committee on Sponsored Research of which the Provost, Professor Julius A. Stratton, is Chairman.

FACILITIES

During the year the new Metals Processing Building was put into service, having been provided by the generosity of Mr. Alfred

P. Sloan, Jr., a Life Member of the Corporation. The Division of Machine Tools and Metal Cutting of the Department of Mechanical Engineering occupies the two lower floors in this building, and the Metals Processing Division of the Department of Metallurgy occupies the two upper floors. In both areas the arrangements and facilities are ideal for their purpose, and in both areas vigorous research is in progress. New knowledge is being gained in the field of metal cutting which will be of great value in future production in permitting greater speed, in improving quality and in machining the new engineering materials as they become available to industry. In metallurgy, too, improvements in quality, in reliability and in facility of forming new materials by casting, welding, rolling, extruding or forging are being studied. A substantial sponsored research program is under way in each of these divisions.

Incident to the move of the Department of Biology from Building 10 to the new Dorrance Building, it has been possible to reorganize and rearrange most of the laboratories of the Department of Electrical Engineering and, in some cases, to re-equip them. At the same time, incident to the changes in Building 8 to provide access to the Dorrance Building and the transfer of the heavy equipment to the Metals Processing Building, a number of the other laboratories in the Department of Metallurgy have been relocated and improved as to arrangement and equipment to meet current developments.

A new Combustion Laboratory for research in very high rates of combustion under various atmospheric conditions has been completed for the use of the Department of Chemical Engineering. The space in which this new laboratory is housed was provided largely by adding a third floor on the Gas Turbine Laboratory Building. The special equipment was, however, provided under a research contract with the Navy Bureau of Ordnance.

The ship model towing tank in the Hydrodynamics Laboratory has been equipped with a wave-making device which will permit research not only in the still-water performance of ships but in rough water as well.

STAFF

Professor Walter G. Whitman of the Department of Chemical Engineering has returned from two years' leave of absence while serving as Chairman of the Research and Development Board of the Department of Defense and has resumed his duties as Head of the Department. Professor Gordon R. Williams, one of the country's leading hydrologists, has joined the staff of the Department of Civil and Sanitary Engineering. Professor Arnold Tustin of the University of Birmingham (England) has accepted appointment as Visiting Webster Professor of Electrical Engineering. He will be the first incumbent of this recently endowed chair. He brings to the Massachusetts Institute of Technology special talents in the important field of control and conversion of energy.

Professor Murray P. Horwood of the Sanitary Division of the Department of Civil and Sanitary Engineering continues on leave of absence as the leader of the Institute group at the University of Rangoon (Burma) in connection with the U. S. Technical Cooperation Program. Professor George C. Manning, Department of Naval Architecture and Marine Engineering, is on a year's leave of absence to serve as a Visiting Professor of Naval Architecture at Kings College, Durham University (England).

With the retirement of Professor Walter C. Voss, formerly Head of the Department of Building Engineering and Construction, Professor Albert G. H. Dietz has been designated Acting Head of the course which has been transferred to the Department of Civil and Sanitary Engineering. With the resignation of Professor William M. Pease, formerly Director of the Servomechanisms Laboratory in the Department of Electrical Engineering. Professor John F. Reintjes has been designated as the Director.

We have continued to take advantage of the Fulbright program for the exchange of faculty members with English and Dutch universities. This is a fruitful avenue of broadening experience, travel and international understanding and friendship.

AERONAUTICAL ENGINEERING

Under Professor C. Stark Draper, the Department of Aeronautical Engineering has made steady progress toward a comprehensive revision of both undergraduate and graduate courses. Sponsored research in the departmental laboratories has continued at substantially unchanged levels and over a wide range of specialities. The Naval Supersonic Laboratory has become almost completely self-supporting on commercial work and projects from governmental agencies other than the Navy Bureau of Ordnance. A flight control laboratory has been established under the direction of Professor Robert C. Seamans, Jr., for research on airborne control problems.

While in the years since World War II there had been a gradual drop in the undergraduate enrollment, the number of freshmen selecting Course XVI made a heartening rise of 50 per cent in last year's entering class. The graduate work of the Department continues to be largely with young officers of the Navy and the Air Force. A number of new graduate subjects were given for the first time. Seminars led by representatives of industry, government and academic institutions continued to bring students and staff into contact with current problems and current leaders in the various fields outside the Institute.

CHEMICAL ENGINEERING

The Department of Chemical Engineering has continued its high level of instruction and research not only in the work with the regular course here at the Institute but in the School of Chemical Engineering Practice, all under the leadership of Professor Edwin R. Gilliland, who has been Acting Head of the Department during the absence of Professor Whitman.

In addition to the regular work, a substantial start has been made in developing a course in nuclear engineering under Professor Manson Benedict. During the summer of 1953 a summer nuclear engineering project, designated "Project Dynamo," was organized to carry out engineering studies for the Reactor Development

Division of the Atomic Energy Commission. The Project Dynamo staff, numbering about 30, was led by Professor Ascher H. Shapiro of the Mechanical Engineering Department and included scientists and engineers from industry and A.E.C. installations as well as from the Institute. The study covered various phases of the problem of generating power from nuclear energy in stationary installations. In addition to being of service to the A.E.C., Project Dynamo has been valuable in bringing staff members and graduate students into contact with recent A.E.C. developments and problems.

Professor Hoyt C. Hottel, in addition to directing the new Combustion Laboratory, has continued as Chairman of the Committee on Solar Energy Conversion. To facilitate the latter field of work, however, a reorganization of the Committee structure has recently been put into effect.

CIVIL AND SANITARY ENGINEERING

The activities of the Department of Civil and Sanitary Engineering have been materially expanded by the transfer to it of the Course in Building Engineering and Construction. Under Professor John B. Wilbur, this Department is also expanding its work in hydraulic engineering and is planning a broader interest in transportation, including highways, railroads, airports, shipping terminals, canals, etc. The interrelation of these various forms of transportation presents many important problems to the civil engineer.

Progress in teaching and in research has been made in all of the Divisions including particularly Structural Division work on the resistance of structures to high impulse loads; Hydraulic Division work on beach erosion, cavitation phenomena of unsteady flow, fluid friction studies; Sanitary Division studies on water treatment methods in removing radioactivity, effect of ultrasonic vibration on bacteria and suspended particles in polluted waters, the biology and chemistry of sludge process; Soil Mechanics Division work in soil stabilization and pressure attenuation in soft

mud; and in the Transportation and Surveying Division with a summer Conference on Modern Highways.

Upon the recommendation of a special committee and with the concurrence of the Visiting Committee, the Corporation has approved the discontinuing of the Summer Surveying Camp at East Machias, Maine. This decision came as the result of the lessening relative importance of routine surveying field work and the rising demands upon students for investments in time and money in other more critical fields.

ELECTRICAL ENGINEERING

Professor Gordon S. Brown served his first year as Head of the Department of Electrical Engineering with great success.

A major curriculum change was adopted this year. For some time electrical students have been expected to choose among several professional options during their sophomore year. The new program will maintain substantially a core curriculum, stronger in science than heretofore, through the end of the junior year. Thus undergraduates may defer a choice of field until the senior year, when they will have developed a wider perspective. All students will receive a broader general training which will increase their effectiveness as professional men in any of the fields of endeavor within electrical engineering.

A new subject called "Control and Conversion of Energy" will be offered during the junior year as part of the core program. It will coordinate with and be taken concurrently with a subject entitled "Electronic Circuits," which during the past three years has evolved a novel treatment of fundamental electronic circuit principles. The new subject will deal initially with magnetic, dielectric and conducting materials and lead up to a treatment of energy conversion systems. It aims to show a student how engineers exploit electromagnetic phenomena and materials in a creative way in the solution of broad engineering problems

Sponsored research activities continue to play an important part in the Department's educational program. A highlight of Professor von Hippel's insulation research was the establishment

of a new integrated crystal-growing laboratory, a notable accomplishment of which was the development of crystals transparent to 60 microns. The Digital Computer Laboratory has become an important integral part of Project Lincoln, devoting a great part of its efforts to urgent military problems. The Servomechanisms Laboratory has continued its broad investigations of multi-loop feedback control systems, control dynamics of underwater vehicles, digital techniques for machine tool control, fire control for military tanks, instrumentation for power-producing nuclear reactors, and new components for feedback control systems. The Laboratory has also engineered a precision pressure control system for an iron lung, equipment for assessing performance of airborne fire-control systems, an anti-aircraft fire-control computer, and a compact neutron source for geological studies in oil fields. The Stroboscopic Photographic Laboratory has conducted research on the design and application of photographic devices for underwater photography both for hand-held equipment and for independently submerged types.

Teaching laboratories were active this year as follows: Professor Samuel Caldwell presented a second term of graduate work in switching circuits. His new laboratory facilities completed, he plans to inaugurate a vigorous experimental program during the next academic year. In the Feedback Control Laboratory an Engineer's Degree thesis in distillation research indicated the soundness of a pilot plant for further investigations. Integration of the research activities of Professor Truman Gray's Nuclear Instrumentation Group with the instruction in the Electrical Measurements Laboratory has been accomplished successfully. The significant accomplishment in the Electrical Machinery Laboratory during the past year has been the organization of a research group working in the laboratory under Air Force sponsorship to study excitation and voltage control systems for A-C generators. The Department has continued to expand its program in acoustics. New one-term lecture courses have been added to the electrical engineering acoustics curriculum, one for seniors and one for graduate students, bringing the total number to six. About 60 students

were enrolled in electrical engineering acoustics courses last year.

On Alumni Day 1953 the Electrical Engineering Department sponsored a symposium-discussion on new methods of teaching professional work in modern electrical engineering as part of a program of dedication of the new and expanded laboratory facilities in Building 10. Vice-President and Provost Julius A. Stratton acted as master of ceremonies at the dedication exercises. Dr. Vannevar Bush was the keynote speaker, followed by the Dean of Engineering and by Professor Brown.

MECHANICAL ENGINEERING

The Department of Mechanical Engineering under Professor C. Richard Soderberg has achieved marked success in a readjustment of its activities to establish an atmosphere of professional creative activity for its students. This is stimulating not only for graduate students and faculty but for undergraduates as well.

The graduate work in the Department has increased very markedly in the past four years, the number of Doctor of Science degrees having increased from seven in 1949 to 16 in 1953 and the number of Master of Science degrees from 11 in 1945 to 40 in 1953. Such progress in advanced fields attracts a strong staff of younger men who are desirous of rounding out their own education by working in this environment.

The Department has been very successful in its effort to broaden the teaching by getting eminent visiting professors to come to the Department and by arranging for exchanges of faculty members with foreign universities. Professor C. B. Biezeno of the Technical University of Delft (Netherlands) was here during the Fall Term lecturing on Advanced Elasticity. During the coming year Professor F. K. G. Odqvist of the Royal Institute of Technology in Stockholm (Sweden), an authority in Applied Mechanics, will be here in the Spring Term. Professor Kenneth R. Wadleigh is to be a visiting professor at Cambridge University (England).

The Faculty of the Department, in addition to the work at the Institute, is participating widely in broad professional

activities for public service. Professor Soderberg, for example, is Chairman of the National Academy of Sciences — National Research Council Committee on Ship Structural Design, under which a comprehensive program on brittle fracture mechanism of steel ships is being formulated. He also served on an *ad hoc* Committee on Aircraft Nuclear Propulsion, and as Chairman of the Panel on Fuels and Propulsion of the Scientific Advisory Board to the United States Air Force. Many others have engaged in similar outside professional activities, including attendance and participation in international as well as national meetings.

The program of the Department is carried on in eight divisions, each headed by a professor of recognized ability. The Division of Applied Mechanics has developed a new undergraduate curriculum, to incorporate the latest knowledge, which was started last year for sophomores in mechanical and electrical engineering and will be extended this year. Extensive research is in hand looking, among other things, to improvements in the performance of gas turbine power plants.

The Division of Machine Design and the Dynamic Analysis and Control Laboratory have made progress in imaginative approaches to problems which have popular appeal and hence high stimulation to the students but which furnish as well high educational value. Changes in the Department of Defense program have had a marked effect on the operation of some of the equipment in the Dynamic Analysis and Control Laboratory, the ultimate results of which cannot be finally predicted so far.

The Machine Tool and Cutting Division is housed in the new Metals Processing Building, as mentioned previously. A strong research program is in hand.

The Division of Materials presented for the first time last year two subjects on "Mechanical Properties of Materials" by Professor Egon Orowan which included, in addition to the lectures on metals, lectures by experts on various non-metallic materials of interest to the engineer. The Division now possesses fairly complete laboratory equipment and is doing very important

research work, particularly in fatigue, brittle fracture of metals, and creep and plasticity of metals.

Professor Edward R. Schwarz has had to curtail the work in his Division of Textile Technology during the past year because of lack of staff personnel.

Work in the Division of Thermodynamics has continued at a high level of activity. The Cryogenic Engineering Laboratory was moved to new and more adequate quarters and a second liquid nitrogen plant of novel design has been completed. Investigations of the mechanical properties of metals at low temperature, which are of great interest in high altitude and Arctic operations, are now possible. The problems of heat transfer under conditions of supersonic flow and in electronic equipment are also receiving attention.

Work in the Gas Turbine Laboratory and in the Sloan Automotive Laboratory is proceeding, using some very effective techniques and unique devices.

METALLURGY

The activities of the Department of Metallurgy have continued in high gear throughout the year guided by Professor John Chipman, Head of the Department, although it was necessary to operate during the year with many of the laboratories upset by moving activity.

The very substantial research program sponsored by both government and industry has continued. As elsewhere at the Institute, this research is a vital part of the educational program. The major fields of research in this Department are in physical metallurgy, in high temperature metals, in corrosion, chemical and process metallurgy, metals processing, mineral engineering, and ceramics.

As a visiting professor, Professor Jan Th.G. Overbeek of the University of Utrecht (Netherlands) has taken an active part in the teaching and in the research programs in the Mineral Engineering Division.

Mr. A. J. Shaler resigned as Associate Professor of Metallurgy

here in March, 1953, to become Head of the Metallurgy Department at the Pennsylvania State College.

Mr. Reinhardt Schuhmann, Jr., Associate Professor of Process Metallurgy, plans to leave the Institute in January, 1954, to accept an appointment as Professor of Metallurgy and head of the Metallurgy Division of the Department of Chemistry and Metallurgy at Purdue University.

METEOROLOGY

The Department of Meteorology has continued to be largely a graduate department, although a freshman elective subject is being offered in the year 1953–1954 which may serve to stimulate greater interest in undergraduate work. In the graduate school a fairly large proportion of the students are Air Force officer trainees.

The past year was the twenty-fifth year of professional meteorology at M. I. T. The course was started by Professor C. A. Rossby in 1928 as a division of the Department of Aeronautical Engineering. The Department continues to advance under the leadership of Professor Henry G. Houghton. Subjects offered are under continuous review and the research program continues to show good progress on all projects.

NAVAL ARCHITECTURE AND MARINE ENGINEERING

The program for work in the Department of Naval Architecture and Marine Engineering has made excellent progress under the leadership of Professor Laurens Troost, whose appointment as Head of the Department was reported last year. The Department is continuing to attract students in both undergraduate and graduate work from many foreign countries as well as the United States.

Registration in Course XIII-C, Marine Transportation, has been suspended for the year 1953–1954 as it was for the year 1952–1953. A program for a new approach to this field which would give a broader base for the education of students for technical administrative work in either shipping or shipbuilding has been studied, and its possibilities appear very promising.

Space was allocated and progress has been made in equipping a ship structural laboratory which will permit the Department to carry on more effectively than has been possible heretofore, but still on a very modest scale, research work in structures peculiar to ship construction, i.e., those in which plating is the primary element of strength.

Several important additions have been made to the collection of ship models in the Francis Russell Hart Nautical Museum and space has been made available in the basement for the safe storage of Museum material and for model repair and secondary Museum display.

GRAPHICS

The decision to give to freshmen a choice of certain elective subjects, depending moderately upon the professional field which they plan to follow, will probably affect markedly the work load of the Section of Graphics. Professor John T. Rule, who is in charge, and the staff of the Section, have reviewed very carefully the content of subjects offered, working in cooperation with the interested departments with the purposes (a) of reducing the classroom hours required, and (b) of making the work more stimulating and more directly helpful in the subsequent professional work of the students.

SUMMARY

In summary, it can be said that the School of Engineering is fully awake to the changing situations in the various engineering professions, that it is contributing substantially to the progress being made in these professions through current research and that the graduates in all levels continue to go forth well prepared to carry the responsibilities of and for technological progress in the years ahead. We hope and believe that each class is better prepared in this regard than was its predecessor, due to advances in knowledge, advances in equipment and environment, and advances in the competence of the teaching staff.

E. L. COCHRANE

School of Science

A MAJOR HIGHLIGHT OF THE YEAR was the completion of the fine new John Thompson Dorrance Building, into which the Departments of Biology and Food Technology were transferred in September and October, although the laboratories were not fully completed until spring. The formal dedication, which occurred on June 25, proved a memorable event. The dedication exercises took place in Huntington Hall in the morning, under the chairmanship of the Dean, and the building presentation was made on behalf of the principal donor, the Campbell Soup Company, by the Vice-Chairman of its Board, Oliver G. Willits. Acceptance addresses were made by President Killian, on behalf of the Institute, and the heads of the two Departments involved, Professors Francis O. Schmitt and Bernard C. Proctor. The major address was delivered by Detlev W. Bronk, President of the Johns Hopkins University and of the National Academy of Sciences. After luncheon in Walker Memorial the guests, numbering about eight hundred, attended two symposia dealing respectively with modern developments in biology and food technology. The laboratories were open for inspection during the entire day.

Addition of the Dorrance Building to the available space at the Institute finds the science departments excellently housed, with the exception of many of the research projects carried on by members of the Physics Department in the Laboratory of Nuclear Science and the Research Laboratory for Electronics, both of which are now in unsatisfactory temporary quarters constructed during the emergency period of the 1940's. Outstanding among the space needs of the school is a new physical laboratory, which has been placed by the Institute administration among its objectives of highest priority.

Availability of the Dorrance Building has made possible the establishment of a new Division of Biochemistry, greatly needed at the Institute for proper development of this important and rapidly growing field. An integral part of the Department of

Biology under Professor Schmitt, this Division is directed by Professor John M. Buchanan, who designed in detail the sixth floor laboratories of the Dorrance Building to suit its needs. These laboratories have now been completed and most of the major equipment has been installed. Professor Buchanan, who comes to us from the University of Pennsylvania, and a number of members of his staff are now in residence, and scientific work has begun in the laboratories.

Of major importance to the two departments occupying the Dorrance Building is the installation of excellent shop facilities in four large bays in the basement. By mutual agreement the Biology Department will supervise the work of the shop, while the Food Technology Department will supervise the animal farm, which is located on the eighth floor.

COURSES AND CURRICULA

The major revision of the freshman curriculum at the Institute has made it possible for the first time to offer terminal elective courses in human biology and in geology, available to any student at the Institute. The course in biology will be offered for the first time in the next spring term by Professor Richard C. Sanborn. That in geology will be given during the fall term by Professor Robert R. Shrock, head of the Department.

A major curriculum change undertaken during this academic year was revision of the graduate program in physical chemistry. In recognition of the broadening of the field of physical chemistry and chemical physics that has occurred in recent years, the curriculum of graduate courses to be taken by students majoring in physical chemistry will permit a choice of two of three sequences of one year each, one dealing with chemical thermodynamics, another with statistical mechanics and kinetic theory, and the third with structural chemistry. These sequences of advanced subjects follow fundamental courses in thermodynamics and atomic structure and spectra that are taken by all graduate students in physical chemistry, and are supplemented by subjects in mathematics and physics.

Two new courses in biochemical engineering, a field of in-

creasing importance in the border region between microbiology and chemical engineering, have been added to the curriculum as Course XX-B, Food Technology, during the past year, under the immediate direction of Professor Roger M. Stinchfield, newly added to the staff. A very successful Summer Session program on food technology for persons in industry and from other educational institutions was held during June and July.

In June, 1953, the first seniors in Course XII-B, Geophysics, were graduated with the new degree, Bachelor of Science in Geophysics. A new graduate degree, Master of Science in Geophysics, was authorized beginning June, 1953, and about half of the students starting graduate study in geophysics will be registered for this degree during the coming year.

Further revision of the subject schedules of Courses XII-A and XII-B, Geology and Geophysics, respectively, were approved and went into effect in June, 1953. These revised course schedules are arousing widespread interest in the United States and Canada, and the Department has had many inquiries about them from other institutions in which educational programs are being revised.

The M. I. T.-Nova Scotia Centre for Geological Sciences, directed by Professors Walter L. Whitehead and Roland D. Parks, was well attended and highly successful. Seven senior and graduate geophysicists again participated in the Student Cooperative Plan of Geophysical Service, Inc., working as helpers on geophysical field parties in widely separated areas across the western part of the country. A week of intensive orientation lectures and visits to research laboratories in Dallas, Texas, preceded field assignments.

Enrollment in mathematics subjects, both undergraduate and graduate, continued at a high level. The two subjects, Advanced Calculus for Engineers and Methods of Applied Mathematics, continued to show increased enrollments. The first of these now draws students from essentially every department at the Institute. While many students in engineering take the subject as part of their graduate program, an increasing number of undergraduate students are adding it as part of their program. Thus a substantial number

of undergraduate students now take three years of mathematics instead of the two-year program previously required. This fact enabled the Department of Mathematics to make certain alternatives available to students taking this three year sequence. At present the four-term sequence is three terms of Calculus, M11, M12 and M21, followed by Differential Equations, M22. This may be followed by one or two terms of Advanced Calculus for Engineers, M351, M352. Next fall the Department will offer not only M21 but also a slightly revised version, M211. Those students who take M211 will have the choice of following it by either M22 or M351. With this possibility many superior students will be able to complete most of the essentials of the former six-term sequence, M11, M12, M21, M22, M351, M352 in five terms by taking M11, M12, M211, M351, M352.

The Mathematics Department offered a new elective subject last fall, M411, Numerical Analysis, given by Professor Francis B. Hildebrand. Each student in the subject, in addition to his regular class work, spent two hours a week in performing mathematical operations on calculating machines. For this purpose a mathematical laboratory was set up with a number of electrical desk calculators.

The undergraduate teaching program of the Physics Department continues to improve in effectiveness and to provide a challenging problem to which a large majority of the Department gives its attention. Progress in first and second year physics instruction is most gratifying. An excellent start has been made in the long-range program of improving the laboratory facilities and instruction at this level, in spite of the unexpectedly large number of freshmen. During the Spring Semester a special version of freshman physics offered by Professors Frank, Zacharias, and Feld and Mr. King was elected by some 65 students. It is interesting that this more difficult and challenging subject attracted more freshmen not majoring in physics than those who intend to pursue Course VIII.

The three laboratory subjects in the third-year physics curriculum, while retaining their nominal identities, will be consolidated into a closely integrated and unified program of experimental

physics. Professors Strandberg, Frisch and Kraushaar are working as a team to plan and administer this phase of our undergraduate work. The program of improvement and modernization of lecture demonstration equipment will be extended during the coming year to the third and fourth year subjects to admit of a stronger experimental approach to these subjects than has thus far been possible.

A committee consisting of Professors Zacharias, Strandberg, Harvey and Friedman has investigated the whole undergraduate physics curriculum thoroughly and has evolved an excellent forward-looking revision which will be presented for approval during the coming year. This revised curriculum has much of the spirit of the new first-year Institute program. In addition to a greater amount of elective time, it enables a student to progress more rapidly than at present without taking an overload but allows a more leisurely pace for those who prefer it. This new curriculum will open the way for a really sound exposition of quantum mechanics at the undergraduate level.

The fifth Westinghouse Summer Program for secondary school teachers under the direction of Professor Francis W. Sears of the Department of Physics, assisted by Professor Arthur W. Davis of the Department of Chemistry, was extremely successful, with capacity enrollment. The usual group of fifty was joined this year by a group of fifteen secondary school teachers from France, and much was accomplished by this international intermingling of educational groups.

GRADUATE STUDY

Graduate study and the participation of graduate students in research activities continues to be very effective in the School. The pressure for admission to the Graduate School from a large number of exceptionally qualified students continues great in most of the science departments; this insures an excellent group of entering graduate students which reflects the current trend toward study for the doctorate as the normal professional training in scientific fields. The Departments of Chemistry and Geology have both been authorized to increase the number of graduate students enrolled

in their curricula, which are subject to quota limitations; and it has been necessary for the Department of Physics to turn away many desirable graduate students to stay within its quota. It is interesting to note that the number of graduate students in the Department of Chemistry continues to be large, contrary to a trend (now apparently being reversed) toward a smaller number of graduate students specializing in chemistry throughout the country. Opportunities for scientists in industry, in academic careers, and in government continue to be great, and the nation still suffers a marked shortage of scientists which can be expected to continue for some years. The Departments of Biology, Food Technology, and Geology and Geophysics could accept graduate students beyond their present enrollments, and graduate study in mathematics could be expanded somewhat without difficulty, but the Departments of Physics and Chemistry cannot now handle additional graduate students without major additions to space and facilities.

PERSONNEL

Details of promotions, leaves of absence, publications, and special honors having to do with staff members of the School of Science will be found tabulated elsewhere in this volume. Special note should, however, be taken of a number of distinguished visitors who contributed to our educational program.

Mention has already been made of the symposia held in connection with the dedication of the Dorrance Building, which brought to our community a number of outstanding workers in the fields of biology and food technology. Dr. E. R. H. Jones of the University of Manchester (England) held the first Arthur D. Little Visiting Professorship in Chemistry, and delivered a series of twenty lectures in the fall term of 1952. His lectures were divided between two subjects of current interest in his own research group: acetylene chemistry and the chemistry of triterpenes. The lectures and the presence of Professor Jones on our staff proved most stimulating to graduate students and staff members of the Chemistry Department. A similar Visiting Professorship is held during the

current term by Dr. Don M. Yost of the California Institute of Technology.

In early August members of the Department of Geology and Geophysics participated in an M. I. T. symposium on harmonic analysis of seismograms attended by representatives from more than a dozen major petroleum companies. The purpose of this symposium was to discuss preliminary results of a program of statistical analysis of seismic records that had been carried on jointly with the Department of Mathematics. As a result of this symposium a Geophysical Analysis Group was organized in the Department and commenced operations during the school year.

During the year Professor Arne Beurling of Uppsala University and the Institute for Advanced Study, Professor S. Bochner of Princeton University, Dr. Armand Borel of the University of Zurich and the Institute for Advanced Study, Professors Sydney Goldstein of Haifa Institute of Technology and Harvard University, Jean Leray of the College de France and the Institute for Advanced Study, M. J. Lighthill of the University of Manchester, T. Vijayaraghavan of Ramanugan Institute of Mathematics, Madras, India and the Institute for Advanced Study and Frantisek Wolf of the University of California each gave one or more lectures in the mathematics departmental lecture series. The lectures by Professor Lighthill were given under the joint auspices of the Department of Mechanical Engineering and the Department of Mathematics.

In the Summer Session the Mathematics Department was fortunate in having Professor Hans Rademacher of the University of Pennsylvania and Professor Albert W. Tucker of Princeton University as Visiting Professors. Professor Rademacher gave a course on Special Functions attended by students from various departments in the Institute. Professor Tucker's course in the Theory of Games attracted a number of persons from industrial companies and governmental agencies. This was the first time the Department had offered a course in game theory; the interest shown in this course indicates that it might well be given from time to time during the regular year.

In addition to the accessions to the science faculty already

mentioned, Dr. Ely Mencher, an outstanding authority on the geology of Venezuela and recently Research Geologist of the Socony-Vacuum Co. of Venezuela, was appointed Associate Professor of Geology and took charge of our work in Petroleum Geology.

Many members of our faculty accepted invitations to give special lectures and courses at other institutions in this country and abroad, and served as officers of national professional organizations, as detailed elsewhere.

RESEARCH ACTIVITIES

Of the 15,000 scientists in the United States doing fundamental research essential to opening new frontiers of knowledge, approximately 1 per cent are at the Institute in the School of Science. The research productivity of staff members of the School continues to be outstanding. Detailed perusal of the lists of publications given elsewhere in this volume reveals the great breadth of the attack being made on problems lying immediately in the front line of scientific research. This gives students at the Institute an unparalleled opportunity to participate in scientific activities whose immediacy and importance are unsurpassed. The presence at the Institute of staff members expert in almost every scientific field, our unparalleled facilities, and the strong financial support given by the Institute — with aid from governmental and industrial sources — to fundamental research make it possible to attract and hold staff members who are among the most able representatives of their respective professional fields.

INTERDEPARTMENTAL RESEARCH

An outstanding problem in research is that of overcoming the artificial limitations set by interdepartmental boundaries. This is solved to a considerable degree by the device of the Interdepartmental Laboratory, which we have successfully carried out during the years since 1945. Another device for inter-departmental cooperation is the position of Institute Professor. For example, Professor John C. Slater, former head of the Department of

Physics, has embarked with outstanding success on a very broad research program in the theory of molecular and solid state physics. With a group of about fourteen men, many of them post-doctoral research fellows, this program has attained international stature in a very short time, and to maintain the group at a reasonable size Professor Slater has been forced to refuse applications from many excellent physicists all over the world who wished to join it.

Other examples of arrangements involving interdepartmental co-operation are Professor P. M. Morse's Committee on Machine Methods of Computation and his new interdepartmental Committee on Operations Analysis. The stimulative co-operation of Professor Norbert Wiener of the Mathematics Department with medical, engineering, and scientific groups, not only at the Institute but throughout the world, continues as an outstanding example of personal research initiative.

More than in any other department, perhaps, the research activities of members of the Department of Physics are carried out in interdepartmental laboratories, including the Acoustics Laboratory, the Research Laboratory of Electronics, the Laboratory for Nuclear Science, and the Spectroscopy Laboratory. The outstanding functioning of these laboratories is made possible at present largely by government support, and the very great impetus given fundamental research by this support should be acknowledged. We have noted very little tendency for diversion of research efforts into new and less desirable directions as a result of government support, which in our experience has in general been enlightened and has demonstrated awareness of the importance of fundamental as well as of applied scientific research.

PROBLEMS

An outstanding problem of American science is the provision of a larger group of professional specialists in science to meet the growing needs of the nation. A similar need exists in engineering, and both of these lacks are increased by diminishing relative numbers of students interested in science being fed to the colleges by the secondary schools. An increasing tendency is noted for the

substitution, in high school courses, of courses in mental hygiene, elementary general science, etc., for the courses in physics, chemistry, and biology needed to motivate more of the available able prospective college students toward scientific careers. While numerous causes contribute to this, a principal one is the increasing dearth of able secondary school teachers of science. Present evidence indicates that within less than a decade there may be fewer than two-thirds as many secondary school teachers of science as are needed, a fact which ultimately will have a very deleterious effect on the production of professional scientists. This problem is under serious study at the Institute, with the object of assisting in increasing the attractiveness of secondary school teaching as a career.

GEORGE R. HARRISON

School of Architecture and Planning

THE SCHOOL OF ARCHITECTURE and Planning has continued its course based on policies set forth in last year's report. The continued respect in which the School is held by the profession of architecture and planning has been an incentive for us to uphold the highest standards. This in turn was reflected in the quality of the students entering the School. Unfortunately we have not had at our disposal enough scholarships to help the many gifted students unable to meet the high cost of an M. I. T. education. We hope that the appeal for funds now being made to the profession will bring results.

During the year the Dean of the School has spoken at many meetings and served on many juries throughout the country and in Canada. In June he delivered the major address at the convention of the American Institute of Architects in Seattle.

ARCHITECTURE

The past academic year saw the enrollment of the Department at 193, the largest post-war enrollment to date. Taking 1946–1947 as a base, this represents an increase of almost 50 per cent, whereas M. I. T. as a whole and colleges generally have subsided to approximately the enrollment of the base year.

Crowding in the drafting rooms continued to prevent improvement in the space and equipment made available to students.

For a number of years it has been felt that our curriculum, strong as it is in science, mathematics, and humanities, postpones too long the development of the student's esthetic vocabulary and his facility to manipulate and represent form. The appointment of Professor Richard Filipowski has been a major step in overcoming this weakness and will be followed later by adjustments in the curriculum.

During the year Professor Filipowski worked primarily with third-year students, taking small groups in scheduled alternation with architectural design, on projects in the visual design studios aimed at awakening the tactile senses. Their constructions in plaster, wood, cardboard, and metals made them concentrate on structure and space and helped them to think of materials as rigid members, as sheets, or as plastic masses. This is an excellent complement to the engineering studies of structural analysis and building materials.

As a further effort to prepare students for work in the design fields, the Department has collaborated with Professor John T. Rule, head of the Section of Graphics, in the preparation of a freshman elective in graphics. This elective will seek to develop skill in general representational drawing as a basic method of communication, and it should have appeal for students in various fields. Its value in the general education of architects is unquestioned.

Mr. Paul Weidlinger, appointed as a lecturer, introduced a seminar subject in structures as an elective for students who have completed the required work in structural analysis. In a somewhat philosophical exposition of structural method, this brilliant consultant and architectural collaborator helped his students to

understand the potential unity of structural and architectural thought. This work will be continued.

Mr. Marcus Whiffen served as replacement during the absence of Mr. John McAndrew, in presenting the course in the History of Architecture. Mr. Whiffen, one of the editors of the Architectural Review of London, was in the United States on a Smith-Mundt grant.

Mr. Serge Chermayeff continued his service as senior architectural critic during the absence of Professor Ralph Rapson. Mr. John Dinwiddie and Mr. Buckminster Fuller were visiting critics for graduate students. Professor Kay Fisker, senior faculty member of the Danish Royal Academy of Fine Arts and a leading practicing architect of Denmark, served as visiting critic for eight weeks. He delivered a series of extraordinarily valuable lectures on the development of modern architecture, illustrated with slide material accumulated by him over a long period of time. He also exhibited and commented on examples of the work done by students in the course at the Royal Academy. A program for further teacher exchange with the Royal Academy is under way.

Research work was inaugurated, under the grant-in-aid of the F. W. Wakefield Brass Company, in the field of architectural illumination. Two graduate students, Eng H. Ong and Derek R. H. Phillips, assisted by Mr. Richard Hamilton, research associate in the Bemis Foundation, prepared a research tool in the form of a simulated environment in which brightnesses of all surfaces can be varied at will. This tool will be used to obtain data on response of subjects to illumination variables in the environment.

At the annual professional meetings in Seattle, Professor Herbert L. Beckwith continued his service as Secretary of the National Architectural Accrediting Board. Professor Lawrence B. Anderson was elected President of the Association of Collegiate Schools of Architecture, and Dean Belluschi delivered a major address at the convention of the American Institute of Architects.

CITY AND REGIONAL PLANNING

Registration in the graduate program in city planning remained close to the quota of twenty-five full-time students, with additional registration in the lecture courses and seminars coming from other departments at the Institute and from Harvard University. Enrollment in the undergraduate curriculum continued at a low level, which has raised a question as to the desirability of retaining this part of the Department's program. However, because it is believed that graduate work in depth can best be stimulated by the development of undergraduate curricula in city and regional planning, and because the Institute pioneered in this field at the undergraduate level, additional efforts are to be made to attract prospective students to this course.

A new five-year curriculum is being developed which would provide considerable flexibility in the early part of the program through the introduction of a number of non-professional electives, to facilitate the transfer of interested students from other colleges or from other departments at the Institute into the sophomore or junior year. Such a curriculum would provide a broader educational basis for the technical work in the upper three years and would increase the opportunities for later specialization.

Qualified personnel in the field of city and regional planning are still in great demand, despite a substantial increase in recent years in the number of institutions offering professional courses. It is interesting to note that graduates of this Department now number nearly 150, the largest of any school and representing over 27 per cent of the alumni of all planning schools.

A major development during the past year has been the setting up within the Department of a Center of Urban and Regional Studies, under the direction of Professor Louis B. Wetmore. Associated with him is Professor Walter Isard, who is already engaged on research projects sponsored by the United States Department of Commerce and the University of Puerto Rico. Several other projects, in which various members of the staff in city planning and architecture would participate, are in the discussion stage. Full advantage will be taken of opportunities

for participation by graduate students in both departments. Through programmed staff-graduate student special studies, a major strengthening of the teaching program in the School is being sought. These studies will also lead to clearer definition of specific projects for sponsored research.

The special Conference on City and Regional Planning, held in September, attracted a diversified group from various parts of the country and abroad. Special emphasis was given to problems of urban redevelopment, in the presentation of which the staff had the collaboration of officials of the Division of Slum Clearance and Urban Redevelopment of the Housing and Home Finance Agency.

At the annual meeting of the American Institute of Planners held in San Francisco last June, Professor John T. Howard was re-elected Vice-President. During the year, Professor Wetmore served as Chairman of the Committee on Urban Redevelopment and as Vice-President of the New England Chapter. Professor Howard and Professor Burnham Kelly have been active as members of special committees of the Greater Boston Area Council, and Professor Roland B. Greeley has served in a similar capacity for the Housing Association of Metropolitan Boston.

Professor Lloyd Rodwin returned to the Institute after a year spent at the University of Liverpool under a Fulbright award and has completed the research he began in England on the New Towns program there. He has also served as consultant to the United Nations on European and Asian Housing Needs studies, and aided on a forthcoming bulletin on Urban Land Policies and on a technical paper on housing aspects of international definition and measurement of housing standards.

Professor Frederick J. Adams continued his study of Planning Education in the United States for the Alfred Bettman Foundation and is currently editing a bulletin for the United Nations on planning education with particular reference to the lesser developed countries.

The Department collaborated in June of this year with the Department of Civil and Sanitary Engineering in sponsoring a

three-day Conference on Modern Highways, at which Professor Adams gave a paper on "The Place of Highway Planning in City and Regional Planning."

ALBERT FARWELL BEMIS FOUNDATION

The interest of the Foundation in the design of mechanical equipment and services for houses produced in volume was carried on with the initiation of a survey of the overall design problems of incorporating air conditioning in the mass-produced small house. Tamas Vietorisz, whose background includes both chemical engineering and economics, is conducting this study.

The Foundation's increasing attention to prefabrication schemes in other countries was reflected in the publication of a preliminary research report entitled "Notes on the Export Trade in Prefabricated Houses," by Phyllis M. Kelly.

In the spring the Foundation sponsored a Conference on Economic Development and Housing Abroad, exploring the role of the architectural designer and community planner in economic development programs supported by the United States. Valuable aid was given by the Center for International Studies in assembling at the Institute an outstanding group of economists, developers, planners, and designers. Opening remarks were made by the Honorable Albert M. Cole, Administrator of the U. S. Housing and Home Finance Agency, and the principal evening address was made by His Excellency, Sir Percy C. Spender, Australian Ambassador to the United States.

In October, 1952, the Foundation supervised the completion of work and the preparation of final reports on the contract research on "Methods for Applying Climatological Data in Dwelling Design, Site Selection, and Planning" for the Housing and Home Finance Agency. Victor and Aladar Olgyay, who conducted the work on this project, presented many of the findings at the Building Research Advisory Board's conference on "Housing and Building in Hot-Dry and Hot-Humid Climates."

William H. Groves of London, England, spent the greater part of the year with the Foundation on a study of mechanical

facilities and new techniques in housing as a Smith-Mundt Fellow. Other visitors included representatives of governmental and private housing interests from Australia, Belgium, Canada, England, Greece, Italy, Japan and Sweden.

ROTCH LIBRARY

The Library continued, as reclassifying and recataloguing permitted, to arrange its books according to the present Dewey system. During the summer of 1952 all books within the architecture and fine arts fields were placed on the shelves in order following their classification numbers rather than remaining in groups scattered about the Library. Much remains to be done if the little miscellaneous collections that are scattered in various places are ever to be sorted for material worth keeping, catalogued and placed in logical order.

In the spring of 1953 requests were sent to 83 cities and towns in the metropolitan area for recent building codes and zoning ordinances in order to bring up to date the collection of both kinds of regulations. The response was so overwhelming that the library would not have been able to catalogue the material had it not had a cataloguer. And it is to cope with such exigencies as this which should and must be a normal part of the library's routine that a cataloguer is urgently required.

Rotch has asked Dewey Library to donate issues of the Public Affairs Information Service as rapidly as they are superseded by bound volumes, thus giving Rotch (with a time lag of some three months) a printed index, similar to the Art Index, to all major housing and planning periodicals. The Library has continued to index all periodicals that are not indexed in either the Art Index or the Public Affairs Information Service.

PIETRO BELLUSCHI

School of Humanities and Social Studies

THE YEAR HAS BEEN one of solid consolidation rather than of spectacular innovation or change. We have witnessed the maturing of the Center for International Studies, have made substantial changes in contents and difficulty of the underclass core curriculum, have completed arrangements for an experiment in teaching humanities in a foreign language, and have changed the name of the Department of English and History to the Department of Humanities. This Department is responsible for instruction in music and philosophy as well as in literature and history, and the previous name was the result of tradition rather than of logic.

The principal problems that are still unsolved or only partially solved are: how to improve the organization of our upperclass electives; what we are to do about art education; how we can obtain a satisfactory involvement of more of the senior faculty in all aspects of the general education program for undergraduates; and how we may find adequate financing for the educative as opposed to the research aspects of our effort.

UNDERGRADUATE EDUCATION

This year we began the new undergraduate humanities program, which provides for a two-year required common core for freshmen and sophomores and requires that juniors and seniors concentrate their electives essentially in one field of the humanities or social studies.

Professor John M. Blum has furnished understanding and vigorous direction of the committee on the underclass core. He has been assisted at one time or another by almost every member of the Department of Humanities and by many of those in the Department of Economics and Social Science, but more specific burdens have fallen upon Professors William C. Greene, Robert E. MacMaster, E. Neal Hartley, Arthur Mann, John B. Rae, and James G. Kelso.

Last year I referred to studies of what might be done to teach qualified freshmen the material of the core curriculum in a modern

foreign language. This year produced all the development that will make this a reality in the Fall Term of 1953. The Rockefeller Foundation has provided a grant for a three-year experiment. Professor Charles W. Rosen has been added to the staff to undertake the instruction. Volunteers will be solicited from among freshmen entering in the autumn.

The situation with respect to the upperclass electives is less satisfactory. The offerings are substantial and good, but shaking down must still occur. At the outset we had little to tell us what our juniors and seniors would elect to study. Accordingly we encouraged the faculty to follow their interests and to provide a variety of offerings that we knew must ultimately be consolidated. The present situation is that slightly more than half of the students elect their sequences in the Department of Economics and Social Science and slightly less than half in the Department of Humanities, which, however, including underclassmen enrolls about 2,000 different students each semester. In the Department of Humanities, subjects in literature and music have by far the largest enrollments, subjects in history the smallest. In the Department of Economics and Social Science, subjects in psychology and economics lead, and subjects in labor relations and political science have smaller elections. I am referring of course only to the subjects used in the general education program and not to those that are part of professional requirements.

We shall have to watch the registration in electives for a further year, and then it will undoubtedly be desirable to effect some consolidation — including even elimination of some subjects which, for whatever reason, are not chosen by enough students.

Several new subjects have been successfully introduced into the general education group. Experimental Psychology has had a surprisingly large enrollment. Others were: Current Economic Problems, Great Books and Authors (in German), and seminars on Twentieth Century Music and The Classic String Quartet. Attendance at the latter was limited to fifteen qualified students, and many applications were received which could not be accommodated.

The new German course, combined with a similar one in French to begin next year, epitomized the principal change in the Department of Modern Languages, namely the increasing share the Department is taking in the new humanities program.

Enrollment in Spanish courses has shown a steady decline from fifty-five in *all* Spanish courses in 1947–1948 to eleven in 1952–1953. Useful as Spanish may be to many Americans, it is clear that neither professional requirements nor student desires justify us in continuing the formal study at M. I. T.

The Institute has for some years tried different expedients to help the substantial number of its American students who feel handicapped by their inability to read English texts with sufficient speed and comprehension. M. I. T. undergraduates as measured this year are not inferior to the national college norm in this particular, although they are somewhat below it in vocabulary. But the national norm is quite unsatisfactory, as the existence of "remedial reading" classes in so many universities attests.

This year the Department of Humanities made instruction in reading techniques an integral part of the work in the Fall Term for three experimental sections of freshmen in the regular core curriculum.

The results of the experiment — as indicated by performance on standardized reading tests given at the beginning and end of the reading instruction, compared with performances on the same tests by three sections that did not receive any reading instruction — were not impressive. All the instructors involved in this experiment agreed that the gains were not commensurate with the expense involved either in dollars or in the loss of time from regular classroom instruction.

Thus we have decided that in the future it will be wiser to provide reading instruction as we used to do — on a voluntary basis for students who register for it and who pay at least part of the cost. It also seems wiser to divorce this type of assistance from any one department and to make it part of the activities of the Freshman Advisory Council or some other Institute group primarily

concerned with the student's adjustment to the demands made upon him by the M. I. T. environment and academic program.

Aside from the use of exhibits of art which Professor Beckwith continues to supervise so well, we have not made as much progress as we hoped for in the use of visual aids in core instruction. We began this year a program of film previews arranged by Mr. Bowles for members of the staff. The number of films that have both relevance to our subjects and university standards of content and treatment is small; incidentally, more of them come from commercial than from educational sources. Although the response to the film showings was disappointing, Mr. Bowles performed an important service in discovering the problems that exist when a serious effort is made to find and sell adequate films for use in college courses. The program should be continued, for many members of the staff seem sincerely interested in the use of suitable visual aids in the core curriculum. Now that the planning of subjects has for a time been crystallized, the selection of visual aids can be approached with more enthusiasm and a smaller expenditure of time. Meanwhile substantial additions have been made to the collection of pictures, slides, maps, and records, and the equipment necessary for their successful use in classrooms.

DEPARTMENTAL RESEARCH

Research continues at a high and productive level in all departments of the School. In the Economics Department, it has gone on at about the same scale as in recent years. Professor Charles A. Myers and his assistants have continued their study of the utilization of human resources in India. Professor Morris A. Adelman has developed his investigations into industrial concentration. Professor Robert M. Solow is preparing a publication on the statistics of income distribution. Professor Paul Pigors has been giving special attention to the problem of human relations in hospitals. Professor Herbert A. Shepard has been studying twenty industrial laboratories in order to gain more insight into the components of research activity and research organization.

The members of the Psychology Section of the Economics Department have pursued a program of research supported primarily by a contract with the United States Air Force. Their principal accomplishments were: (1) extension of the theory of information transmission, (2) development of techniques of measurement, and (3) development of the theory of speech intelligibility.

Related work has gone on in the Department of Modern Languages in the field of analysis and measurement of speech sounds, principally by Professor Morris Halle and Miss Carol Schatz. Professor William N. Locke demonstrated some of the equipment in Paris and Strasbourg.

Professor Elting E. Morison, with the assistance of Professor Blum and Professor Alfred D. Chandler, Jr., completed the task of editing the letters of Theodore Roosevelt. The final two volumes of the eight are now scheduled to appear in February, 1954. Professor Hartley continued his research on the early American iron industry in connection with the restoration of the first iron works at Saugus, Massachusetts, under the sponsorship of the American Iron and Steel Institute. Dedication of the restored iron works is planned for the autumn of 1954. Professor Karl W. Deutsch has furthered his studies in nationalism, while spending a year at the Center for Research on World Political Institutions at Princeton University. Professor Walt W. Rostow devoted nearly full time to planning and research in the Center for International Studies. Professor Carvel Collins pushed forward his work on William Faulkner. Professor Rae has received a grant from the Harvard Research Center in Entrepreneurial History to make a preliminary investigation of the role of the engineer in business management. Professor Chandler has received aid from the same Center for the completion of his study of the railroads as a young industry.

The impressive accomplishment of the Faculty of the School in publication can be observed in the chapter entitled "Publications of the Staff," elsewhere in this volume.

Effective relations continue to exist between the regular academic staff of the School of Humanities and Social Studies, the Center for International Studies and the School of Industrial

Management. The latter has made many demands upon the faculty of this School for instruction, notably in the Executive Development Program, and on the other hand has made substantial contributions to the research interests of the same faculty through grants from the Sloan fund. The relation is healthy and profitable to all concerned.

CENTER FOR INTERNATIONAL STUDIES

The Center for International Studies, directed by Dr. Max F. Millikan, Professor of Economics, is an interdepartmental research group in the School of Humanities and Social Studies with a very considerable staff of its own. In many respects it resembles a large department of the School, save that its interests are in research and that it has no direct teaching responsibility. The aim is that this effort and the departmental efforts shall supplement each other. Thus members of the regular teaching staff should and do participate in the research activities and share in the opportunities provided by the Center, and senior staff members of the Center should share in some of the teaching responsibility. As the Center has this year built its staff to the point where it contains a number of people eminently qualified for this teaching task, we have come to the stage where planning of how this shall effectively be developed has become of primary importance. There is every reason to believe that in the coming year the beginnings of the completed co-operation will be evident.

The activities of the Center are extensive; it is quite impossible to do them justice in a report of this length. Those interested in detail are privileged to write directly to the Director and to receive appropriate reports.

The Center was established early in 1951 with the purpose of applying the academic and other intellectual resources of the Boston area to problems of policy and action arising out of the international position of the United States. With generous financial support and co-operation from the Ford Foundation, the Center has developed two long-run programs of research to complement its government work. These two programs, one on eco-

nomic and political development and one on international communication, together with the work for the Federal Government on problems of U. S.-Soviet Bloc relations, constitute the extent of the Center's current research activities.

The objective of the program on economic and political development is to gain insight into processes of development and apply such insight to project alternative possible courses of development in selected countries and to isolate the strategic variables subject to policy. Specifically, the Center has under way intensive studies of India, Italy, and Indonesia which present different stages of development, pose major policy problems for the United States, provide dynamic settings for study, and have been less extensively studied by American scholars than other critical areas.

Work is concentrated in all three studies on the various aspects of the process of capital formation and on the emergent alignment of political forces as conditioned by sources of political and social disaffection.

Much of the work on these countries is being carried forward in Cambridge, supplemented by detailed investigations in the field. Currently the Center has a team of social scientists making a community study in Indonesia, two economists beginning industry studies in India, and two senior staff members in Italy establishing contact with interested organizations. As the program develops it is planned to undertake other more extensive field work, wherever possible with the co-operation of local research institutions.

In order to widen the range of comparable data, the Center is supplementing the three intensive country studies by small-scale comparative investigations of particular problems in other countries (e.g., Burma), and by some functional multi-country investigations focused on particular problems (e.g., world raw material needs and supplies.)

Because of the ramifications of this work, the Center has been visited by many distinguished foreign visitors, both statesmen and scholars, and has made connections with an extensive number of Indian, Italian, and Indonesian financial and scholarly institutions.

Since the social sciences do not now provide a generally

agreed-upon intellectual framework for the analysis of problems of economic development, the Center has felt the need of securing outside advice, on a fairly regular basis, on its theoretical and analytic problems. To meet this need, the Center has organized a development seminar of distinguished and mature scholars from the Boston area who meet approximately once a month throughout the academic year to discuss a prepared paper and issues raised by the development staff. Each member of the seminar is committed to regular attendance and to contributing an occasional paper on a topic of importance to the program.

The Ford Foundation (Behavioral Sciences Division) grant to the Center for a four-year program of research in the field of international communication specified that the first year was to be devoted primarily to planning. A committee of seven, chaired by Dr. Hans Speier of the Rand Corporation, has advised Professor Millikan on the character of the program. The committee, which included, in addition to Dr. Speier, Jerome Bruner, Wallace Carroll, Harold D. Lasswell, Paul Lazarsfeld, Edward Shils and Ithiel Pool, met six times and charted a course in line with the fundamental purposes of the Center to ensure that the program would not only produce work of scientific merit but also develop material which might prove helpful to policy-makers.

Following their recommendations, the Center is drawing up a research program focused on two or three comprehensive field studies. It is planned to conduct a study in France on the relationship between communication and attitudes about European unity on the one hand, and relevant action or the lack of it on the other; a study in India on reactions of leading individuals to communication from the Soviet and Western worlds (eventually to complement work on Indian development); and some research on the formation of foreign policy attitudes among leading groups in the United States. The last will focus on attitudes toward renewal, a year hence, of the reciprocal trade acts. Other smaller studies include one on the recent Italian elections, for which a survey was made in Italy, and some work in Indonesia, both complementary to the Center's development program.

Completed projects under the U.S.-Soviet Bloc Relations program include a study, directed by Professor Rostow, of the cohesive and disruptive forces at work within the Soviet Union and its European satellites; a study, directed by Professor Clyde Kluckhohn of Harvard University, of social and psychological factors relevant to the resettlement of refugees; and a study directed by Professor Alex Bavelas of M. I. T. and Dr. Margaret Mead of the American Museum of Natural History covering Soviet communications.

Projects currently under way include an examination, similar to that completed on Russia, of Chinese society and Russo-Chinese relationships; an examination of processes and techniques of Russian take-over of the European satellites; and a pilot examination of the level and thoroughness of technical education on the high school as well as on the university level in the U.S.S.R.

STAFF

The complete list of staff resignations and additions will be found elsewhere in this volume. The most severe loss to this School was suffered when Professor Morison left the Department of Humanities to accept an appointment in the School of Industrial Management, though this is but a partial loss since he will still be at M. I. T. Other losses will be felt from the resignation of Professor Joseph N. Ulman, Jr., who has done distinguished work in the teaching of report writing and who is now employed by Arthur D. Little, Inc., and of Mr. Ralph C. Patrick, Jr., who on completing his term as a Carnegie Fellow in Anthropology has accepted an appointment as Assistant Professor of Sociology at Washington University in St. Louis.

In accordance with policy, the Department of Humanities is strengthening its staff year by year through carefully selected appointments of young men and through advancing them — rather than by seeking mature and fully developed scholars from other institutions. There has never been a time in the history of the Department when it has had such a promising and able group of younger men among whom it would be invidious to elect any one

as outstanding. This policy has clearly been followed in the new appointments for next year. It is fair to say that the program at M. I. T. is now one which interests the ablest young graduates in the fields of humanities and social studies and, perhaps equally important, interests their professors. Today M. I. T. has a choice of young men in these fields which it has not always enjoyed. The distinguished graduate program in the Department of Economics continues to interest most able young men.

The staff of the Center for International Studies has also added an important dimension to our academic resources. This senior staff, in addition to Professors Millikan and Rostow, now consists of Dr. Paul Rosenstein-Rodan, until recently Director of Research of the International Bank for Reconstruction and Development; Dr. Wilfred Malenbaum, formerly Chief of the Economic Development and Investment Staff, Department of State; Dr. Benjamin Higgins, formerly Bronfman Professor of Economics at McGill University and recently Economic Advisor to the Government of Indonesia; and Dr. Everett Hagen, most recently senior economic advisor to the Government of Burma.

The most notable development in the Center's communications program was the assumption of its direction by Dr. Ithiel DeSola Pool, formerly of Stanford University. Dr. Pool was executive secretary of the Center's Research Planning Board on International Communication and is generally considered one of the outstanding students of the communication aspect of political processes. In addition to Dr. Pool, the program will be carried forward by Dr. Daniel T. Lerner, formerly visiting Professor of Sociology at Columbia University, and Dr. Raymond Bauer, formerly co-director of the Russian Research Center at Harvard.

Visitors have played an important role in our instruction. The Department of Economics and Social Science has benefited by the visits of John Jewkes, Professor of Economic Organization at Merton College, Oxford, England, who came to the Institute under joint appointment of the Department and of the School of Industrial Management; and of Mr. Justice Arthur Tyndall, Judge of the Court of Arbitration of New Zealand, who gave a series of distinguished

lectures on compulsory arbitration as practised in New Zealand. The Department of Humanities has profited by lectures from Dr. David Riesman, Professor of Sociology at the University of Chicago, and Dr. Sigfried Giedion of the Eidgenössische Technische Hochschule in Zürich, a former Carnegie Visiting Professor at M. I. T.

Funds from the Carnegie grant made it possible for the Department of Humanities to have two well-known visiting professors in residence during the year. Sir Richard Livingstone was with us from the opening of the term until the Christmas holidays as Carnegie Visiting Professor of Classical Literature. During the second term, Dr. Jacob Bronowski, Director of the Central Research Establishment of the British National Coal Board, was a member of the staff as a Carnegie Visiting Professor of History.

Many members of our faculty accepted invitations to give special lectures and courses at other institutions in this country and abroad, and served as officers of national professional organizations as detailed elsewhere.

Mr. Joseph N. Scanlon organized a series of meetings for officials of the United Steel Workers' union, on Unionism and Collective Bargaining. This is the first time we have arranged a conference especially for union representatives. The Industrial Relations Section staged another conference on the Scanlon Plan which was attended by 120 representatives of industrial companies.

On a very different front, the work of the music group, directed by Professor Klaus Liepman, continued to attract outside favorable attention. The outstanding musical performances were those of Handel's "Judas Maccabaeus" by the combined forces of the Glee Club, Choral Society, and the Orchestra, and an all-Bach concert in Sanders Theatre by the Choral Society and the Zimbler Sinfonietta, the latter concert including two seldom-heard Chorales and the Magnificat. All the local papers provided critical and favorable reviews. One paper said, "Not only . . . a well-trained, responsive chorus, but one capable of navigating the demanding music of Bach. That is an impressive achievement, and it is, as I understand, but one of the aspects of musical progress at

the center of learning across the Charles. As usual in such matters, we all benefit by it."

UNFINISHED BUSINESS

The work in psychology has grown in scope and effectiveness at M. I. T. of recent years under the stimulus of research projects and some able members of our staff but largely without having a long-range plan in mind. It is time we had such a plan. An *ad hoc* committee under the chairmanship of Professor Donald G. Marquis of the University of Michigan has accordingly been asked to look into this question and make recommendations.

The problem of what M. I. T. ought to do about art instruction, both in the core curriculum and in the upperclass sequences, is a thorny one. It is a problem that has not in general been well solved in American education, which has done better by verbal than it has by visual stimuli. The complications are so extensive and the importance of a good solution is so great that we have had a special committee working on this problem for more than a year, and their report will be in hand by the time this account reaches print. The committee is headed by Bartlett H. Hayes, Jr., Director of the Addison Gallery of American Art, and includes John P. Coolidge, Director of the Fogg Art Museum; James Johnson Sweeney, Director of the Solomon R. Guggenheim Museum; Charles H. Sawyer, Dean of the School of Fine Arts of Yale University; and Robert Iglehart, Chairman of the Department of Art Education of New York University.

Finally, the general education program at M. I. T. shares in common with programs of general education and humanities throughout the United States the need for freedom in the use of funds. The nature of the problem is often misunderstood.

It is not a problem of the allocation of academic budgets, which at M. I. T. are at least on an equal footing with any other faculty budget. Our professors are not underpaid or overworked. It is not a matter of competition for rank or prestige, in which they are always equally treated. It is not a matter of outside income, because — though many other kinds of people may have more

lucrative consulting arrangements — people study and teach the humanities or social studies because they like to. It is not a matter of support for explicit research projects, because there are substantial resources in the social sciences and adequate ones in the humanities for those who want to *draw up explicit projects*. Of recent years M. I. T. has shared generously in such grants.

The problem is more subtle. It might be expressed this way: If a young scholar in psychology or electronics needs to go to England for consultation, under the modern organization of research he can usually find a way without preparing a special proposal for it. This is not the case for a young humanist who needs to consult the letters of Burke in the same country. A scholar in the humanities or in history who is doing his scholarship within the local resources and without a project and a team cannot readily make such a trip, which is likely to sound to many like the junket it is not. It is fairly silly for professors of humanities to talk of the wonders of the Acropolis or the Uffizi throughout their lives without ever having visited them. This is more often the case now than it used to be. Yet the suggestion that they should travel looks like a boondoggle. There are areas of scholarship and of planning for general education where simple reflection, somewhere off the campus, is of the essence. Yet if every such effort must be routinized into a project for which a special grant is to be sought, there are risks that the projects will be inflated, that the proposals will even be cynical, and of course the probability that many will not come to fruition.

Thus a School of Humanities needs some "freedom money" from which a few hundred dollars can be spent here and there to bring about these fulfillments. This kind of money is simply not obtainable out of ordinary academic budgets which are hard enough pressed to pay the kind of salaries which must be paid. Yet there has been very little of this kind of money available for general education or the humanities. At M. I. T. we have benefited enormously from the grant by the Carnegie Corporation two years ago, which though geared to a widely planned program has had some of the aspects of "freedom money." We have husbanded it carefully but it will not last forever, and it is not enough. M. I. T. needs

more of this kind of grant and the universities of the nation need more, too.

In closing I cannot do better than quote my final paragraph of last year: "It might seem ironic to observers from other planets to notice how much everyone in the United States favors general and liberal education for undergraduates, how much we all profess to love the humanities, yet how seldom any individual or foundation has felt inclined to make an impressive contribution to such simple purposes. We share this shirt of Nessus with other institutions, but the centaur's blood is none the less painful for that." Nothing has happened this year to change that statement. I sincerely hope that the groove of this record does not have to be worn out before I retire, in a decade or so.

JOHN E. BURCHARD

School of Industrial Management

INDUSTRIAL MANAGEMENT, as the term has come to be used, is a new development in this country. Its beginnings go back many years in our industrial history, yet when compared to medicine, engineering and law, it has achieved professional status only in the last half century and prominence only in the last twenty-five years. Industrial management today is expected to be concerned with many more aspects of current business affairs than was its predecessor — often the proprietor of a business or the representative of a large ownership. The primary task of today's management is to make the enterprise economically successful, but management is expected while so doing to discharge a responsibility to its employees, its customers, and to the public at large. Management is expected to do not only these things, but it must concern itself also with the perpetuation of the enterprise. Our American indus-

trial companies, both large and small, must be managed to achieve success today and to be adaptable to a changing environment so that they will continue to live and be successful in the future as responsibility passes on to new executives.

It is against such a background that we undertake the building of this School. Our task is to develop an educational program to prepare men to enter the field of management and there begin the climb to wise leadership in industry. The educational program involves intellectual disciplines, knowledge in many fields, and — particularly — the encouragement of sound attitudes.

This has been the first year in which M. I. T.'s long-standing interest in management has been conducted under the name of the School of Industrial Management. The year has been marked by continuing studies as to how best to do our task. In a comparatively new field such as this we should proceed experimentally and not be afraid to try new ways which hold promise. In proceeding in this manner we seek and are receiving willing and very generous time and thought from men occupying prominent positions in industrial leadership. Often, wise counsel comes from men who have made careers in medium-sized businesses. Our staff is reviewing and questioning, endeavoring to improve methods and seeking new concepts. Enthusiasm on all sides marks the course of this developing effort.

In the undergraduate program of the School, generally known as Course xv, M. I. T.'s science and engineering continue to be the hard core on which the training for management rests. Students are admitted to the graduate program only after completing, here or elsewhere, major work in the sciences or engineering. The courses are being reviewed with the intention of bringing about closer ties between the subjects taught in the Schools of Science and Engineering and the work undertaken here in the School of Industrial Management. Several improvements have already been made.

In the School of Engineering, the practice of assigning a group of students to solve a complex engineering problem is becoming more common. Depending on the nature of the project, students

comprising such teams may come from different courses with different training and interests. Often there is an economic aspect to the problem. Marketing may be involved, or production, or finance. Students majoring in the management field can both gain and give by being members of such joint project teams. This is to be encouraged. Professor Edward Bowles, recently Consulting Professor in Electrical Engineering, is now attached to the staff of the School and will further this desirable close cooperation with the other Schools.

BRIDGING THE GAP

Much thought is being given to bringing the problems of the business and industrial world into the classroom. One facet of our program at the School is to teach students methods of attacking problems and to acquaint them with the kinds of problems that exist in business. Neither objective can stand alone. Methods of attacking problems can best be learned against a background of real problems; otherwise the study of method can easily become empty formalism. The problems of business can be studied most fruitfully by the student with an adequate grounding in method; prescribed solutions and easy rules of thumb seldom exist, and common sense unguided by an understanding of method is simply not enough.

Bridging the gap between school and managerial practice challenges our teaching abilities. Many decisions of the business executive do not rest solely on the results of cold reasoning. Human problems are usually involved and there are many imponderables and intangibles. There can hardly be laboratories of management as we have laboratories in the sciences and engineering fields. Yet our students must learn of these characteristics of management decisions. We believe they can do so only by exposure to the problems with which industry and executive leadership, at all levels, are faced.

We attempt to meet this requirement of our educational program in several ways. One is by having some members of the staff come to us from industry itself. Such an addition is Mr. Mason Smith, formerly a partner in the management consulting firm of A. T. Kearney & Company, Chicago, who comes as Professor of Industrial Management. Another appointment is that of Mr. Wroe

Alderson of the firm of Alderson & Sessions, who will be Visiting Professor for one term in the fields of distribution and market analysis. Other men from industry take classes or hold seminars for one or more sessions. There is a steady flow of men from industry and labor and government working with the students in seminars and round table discussions. More than 50 such men met with undergraduate and graduate students during the past year.

This bridging of the gap between the classroom and industry is also furthered by visits of students and instructors to a variety of industrial operations. Some visits are informational; others are designed to enable the students to detect problems facing the business. When such a problem is isolated, projects to find solutions result. In other cases the local management proposes subjects for the students to study. During the year students made 893 plant visits representing 11,700 student plant hours.

PERSONNEL

Management by its very concept deals with people as well as with techniques and processes and physical things. We regard the study of human behavior as of major importance in our developing educational program. Industry is taking an increasing interest in the progress being made by the social sciences in turning light on many aspects of the managerial function. To head this very significant area Dr. Douglas M. McGregor, for the past five years President of Antioch College and formerly Professor of Psychology at M. I. T., will join us next June. His contribution to the educational and research programs of the School, together with the work being done in complementary fields in the School of Humanities and Social Studies, should put M. I. T. in a forward position in this area, which is growing rapidly to become one of great significance to industry. Another appointment in a new area for the School is that of Elting E. Morison who comes to us from the School of Humanities and Social Studies as Professor of Industrial History. His research in this field has already indicated the unique significance of this activity to the rounded development of the School's educational and research program.

The developing program of the School takes shape as we make additions to the staff representing areas of importance. Dr. Joseph Pechman, until recently attached to the Office of the Secretary of the Treasury, joins the staff as Associate Professor of Finance; his appointment will supplement the work being done by Professor Eli Shapiro in developing new courses in industrial finance and its relation to the economic environment.

For the first time in several years we shall have a full time member of the faculty teaching in the field of law. Mr. William A. W. Krebs, Jr., presently General Counsel of the National Science Foundation, joins the staff as Associate Professor of Law.

Professor W. VanAlan Clark, Jr. was promoted to Associate Professor of Industrial Management during the year and Dr. Robert Fetter comes to us as Assistant Professor in this field. Dr. Robert Gregory and Dr. Thomas Whitin have been appointed Assistant Professors in the field of accounting. All of these men have had considerable experience in industry and have conducted extensive research activities.

EXECUTIVE DEVELOPMENT PROGRAMS

There is a growing insistence from organizations in industry that our schools of business and management assist them in the development of existing executive talent. Such courses — of varying lengths — are increasing in number throughout the country, and more and more aid is being sought by forward-looking managements. The M. I. T. program had its beginning in 1931 and has been known as the Sloan Fellowship Program since 1938. It was the first of such programs. Building from strength as we are endeavoring to do, and in response to the number of qualified men seeking to enter the twelve-month program, we have established a second group. Hence, on June 1, 1953, two groups of seventeen men each began a twelve-month Executive Development Program under the directorship of Professor G. B. Tallman with Professor C. C. Herrmann associated with him to help carry the increased load. The groups will maintain their individual identity, which

means that there will be two independent programs running concurrently.

The length of the twelve-month program prevents some companies from sending able young men to whom they would like to give further training. This is a particular hardship on smaller companies who cannot spare for this length of time their younger and most promising employees. We are experimenting with ways to meet this demand. During the past summer we inaugurated the first class in an important but limited area of management. Under the direction of Professor T. M. Hill, and assisted by Associate Dean Ronald H. Robnett, a three weeks' intensive course in "Control Problems for the Executive" was given for 25 selected men. The reactions to the program by industry and by its members merit serious consideration for its repetition. Other parts of the managerial field may similarly be developed into short period courses. This should become an important activity of the School in the future and can be undertaken as our staff increases and our regular courses are developed.

Along with programs for executive development, the School proposes to hold seminars of men from business and industry having interests in particular fields or subjects. Such seminars bring points of view and experiences which, while benefiting the participants, make a unique contribution to the School. Two such seminars are being planned by Professor Shapiro for this fall.

ENROLLMENT

During the first year of the School there was an enrollment of 238 sophomores, juniors, and seniors in the undergraduate program. This represented approximately the historical percentage of the total M. I. T. undergraduate body. Graduate students numbered 46, including 18 Sloan Fellows, which was an appreciable increase. For the present year, graduate students will number approximately 90, including the Sloan Fellows. The enrollment is likely to remain stabilized at about these levels for another year in order to maximize staff development and bring teaching and research activities into better balance.

One example of the cross-fertilization that goes on among the schools at M. I. T. is this: for every three students enrolled in the School of Industrial Management, the Faculty of this School teaches another two students registered elsewhere in the Institute. This is a *quid pro quo* for the large amount of instruction given in the other schools to the students registered in the fifth School.

FACILITIES

For a year now, the School has been occupying the Alfred P. Sloan Building. The decision to have the Department of Economics and Social Science located in the same building has proved to be a wise one. There is a sharp contrast between the harmonious working together of these two groups of M. I. T. faculty members and the comparable situation at some other institutions where similar accord has been slow in developing. The benefits to our situation are worthy of note.

The classrooms and seminar facilities which were carefully planned in the remodeling of the building are working out beneficially to the educational program. As the School grows in size, space now occupied by other activities must be taken over and rehabilitated. Particularly do we need a large and well designed lecture room. Space is available for this on the first floor when funds are found to make it possible.

During the year a committee of former Course xv students, aided by Miss Olive Barnard, undertook to raise funds to decorate and furnish a room in honor of Professor Erwin H. Schell. More than twelve hundred former students contributed generously and thus testified to the regard and affection they have for Professor Schell. The new room is located on the fourth floor; it will be used for meetings of the staff, students and visiting lecturers and will be a place for small informal gatherings of many kinds. The room represents a major contribution to the activities of the School of Industrial Management.

RESEARCH

The research fund made available to the School through a grant of the Alfred P. Sloan Foundation opens another dimension in the School's development.

Research in the broad field of industrial management can have great significance, not only as it contributes to our better understanding of the complex nature of management itself, but because of the influence of research studies on the educational program. Beginnings have been made, but — as yet — this important and exciting element in the School's program lags behind developments in other directions. With the staff additions already made and those contemplated we shall be able to bring our research activity more nearly into balance with progress made in other aspects of the program.

E. P. Brooks

Reports of the Interdepartmental Laboratories

Acoustics Laboratory. During its eighth year of operation, the Acoustics Laboratory, under the direction of Professor Richard H. Bolt, displayed more clearly than before its role as an interdepartmental and even an interschool research center. This diffusion of interest is inherent in the nature of acoustics, a field that springs equally from physical and biological science and that yields engineering solutions to problems in communications, the musical arts, instrumentation, and the control of noise for health, efficiency, comfort, and safety.

The solution of many problems in acoustics and in allied fields depends upon the analysis of signals so complex in character as to demand statistical representation. Our growing analog computer, supplemented by precision time delay equipment, correlation circuits, the axis-crossing interval meter, and an electronic distribution analyser, is being used to verify and extend statistical solutions derived from information theory. Similar techniques are being brought to bear on such diverse problems as the selective measurement of noise from an array of sources and the processing of ultrasonic signals transmitted through the cranium.

Basic physical problems in the generation and propagation of sound were attacked with increased interest during the year. A small diverging wind tunnel was built for studying turbulence noise in a boundary layer, and another experiment was devised for investigating thermoacoustic oscillations. From such experiments and related theoretical studies, progress was made in understanding the mechanisms of jet noise. Research on propagation in the atmosphere as related to meteorological conditions was initiated in a theoretical study of scattering from a vortex and in an experiment on shadow formation by thermal gradients. In addition to their fundamental physical interest, all of these subjects bear on aircraft noise and its intrusion into communities, a problem that is becoming serious with the current growth of aviation.

A group of architecture students made a field study of mechanical noises in buildings, and another group studied sound leakage through door structures using the anechoic chamber transmission facility reported previously. Continuing research on high-intensity phenomena produced a mathematical explanation for the reversal of steady streaming in a bounded sound field, and it was shown that the two directions of streaming correspond to low and high Reynolds numbers respectively.

In the medical ultrasonics program, a system was successfully completed to compensate for signals arising from bone thickness variations; the diagnostic possibilities of the ultrasonic ventriculography method are now being tested clinically at the Massachusetts General Hospital. The viscoelastic behavior of biological

substances was studied by measurements of ultrasonic absorption in blood plasma, milk albumen, and certain tissues, with particular interest in checking alternative theories on frequency dependence.

A study of the possibility of establishing bio-acoustic criteria for the damaging effects of intense noise was initiated in co-operation with the American Standards Association. Speech synthesis research, with emphasis on the reduction of bandwidth-time requirements for voice communication, was advanced with the help of an electrical analog of the vocal tract and a teletype-controlled vowel synthesizer. A preliminary study was made on the maximal syllabic rate of speech perception, and another psycho-acoustic investigation revealed that the threshold of audibility fluctuates from moment to moment over a range of about six decibels.

The population of the Laboratory remained about the same, and some additional space was made available. New support was received from the Air Force to pursue work on hydrodynamic and thermal aspects of noise generation, and from the National Advisory Committee for Aeronautics to study sound propagation through the atmosphere. A grant through the Industrial Liaison Program was received from the Owens Corning Fiberglas Corporation.

During October, the Laboratory was privileged to have Professor Erwin Meyer, Director of the Physical Institute, University of Göttingen, speak at two seminars and participate in many stimulating discussions. Dr. Chandra K. Narain of the All-India Radio, New Delhi, spent the year at the Laboratory on a fellowship from the American Association of University Women.

Fourteen student theses were completed, 15 journal articles were published, and 41 papers were presented before societies. At the International Electro-Acoustics Congress in Delft, Netherlands, Professor Richard H. Bolt delivered the opening address, and Professors Leo L. Beranek and Osman K. Mawardi contributed to the program.

A new course, "Physical Ultrasonics," was given by Dr. Theodor F. Hueter, using Laboratory facilities for experiments and demonstrations. Another new subject, "Hearing, Speech and

Language," was taught by Professor Walter A. Rosenblith in collaboration with Professor Morris Halle of the Department of Modern Languages. In this course, experimental evidence on hearing and speech was co-ordinated with recent developments in linguistics and information theory.

Research Laboratory of Electronics. A number of new faculty members joined the staff of the Research Laboratory of Electronics during the past year with the consequence that several new research activities have been initiated. A total of 44 faculty members and 95 graduate students from the Departments of Physics, Electrical Engineering, and Modern Languages were engaged in the research program. In addition, the Laboratory was host to four guests, visiting staff members from 11 countries, and four Foreign Student Summer Project visitors.

The physics staff has maintained the active program reported last year, and at the same time the electrical engineering program has grown considerably and altered somewhat.

The physics program of the Laboratory includes the nuclear resonance work of Professor Francis Bitter's magnet laboratory; the research on the properties of matter at very low temperatures directed by Professor Melvin A. Herlin; the studies of the properties of microwave gas discharges being conducted by Professors Sanborn C. Brown and William P. Allis; the microwave spectroscopy investigations conducted in Professor Malcolm W. P. Strandberg's laboratory; the work on the properties of emitting materials, the solid state and high vacuum research of Professor Wayne B. Nottingham and his large group of students; and the molecular beam research directed by Professor Jerrold R. Zacharias and Dr. Vincent Jaccarino.

Dr. Zacharias, assisted by Professor Henry J. Zimmermann and Visiting Professor James G. Yates, began the development of a new, precise frequency standard which will employ an atomic resonance for its fundamental standard.

With the return of several of the faculty and staff members from the Lincoln Laboratory and the addition of several new

members, the electrical engineering portion of the Laboratory has regained its former vigor. Professor Lawrence B. Arguimbau completed the development of the equipment for a new series of transatlantic frequency modulation tests; Professors Robert M. Fano and Peter Elias have reactivated the information theory research put aside three years ago; the network theory group under Professor Ernst A. Guillemin has continued to carry a heavy program; the microwave tube laboratory directed by Mr. Louis D. Smullin has continued its extensive research on electron stream noise; Professors Samuel H. Caldwell and David A. Huffman initiated a program of research on switching circuits; Professors Richard B. Adler and Jerome B. Wiesner began a research program on noise problems in semi-conductor materials and devices; a group directed by Professors Adler, Zimmermann, and Samuel J. Mason investigated transistor circuit and application problems; and Professor Lan J. Chu and his associates worked on radio propagation problems.

The meteor guidance program, directed by Professor Zimmermann, continued a high level of activity; it is expected that their activities will be completed during the next year.

The electro-neurophysiology laboratories of Professor Walter A. Rosenblith and Dr. Warren S. McCulloch continued to be extremely productive. Both laboratories have aroused international interest and have been host to a large number of foreign guests.

Dr. Yehoshua Bar-Hillel returned to Israel and his work on mechanical translation is being continued by Dr. Victor H. Yngve who came to M. I. T. from the University of Chicago.

The research on group communications directed by Dr. R. Duncan Luce has been completed.

During the past year most of the research activities undertaken for the Department of State were completed and final reports prepared. The construction of the low-frequency array was completed and tests are now being run. The Laboratory is not undertaking any new work in this field.

As in previous years the major part of the support for the

Research Laboratory of Electronics was provided by a three-service contract administered by the Signal Corps. In addition, special projects in the Laboratory received support from the Office of Naval Research, the Navy Bureau of Ordnance, the Air Force, the Bell Telephone Laboratories, the Rockefeller Foundation, and the Teagle Foundation.

Support for Research Laboratory of Electronics Industrial Fellowships was provided by the Radio Corporation of America, the Sperry Corporation, the Gabriel Company, and the General Communications Company.

Laboratory for Nuclear Science. The work of the Laboratory for Nuclear Science has continued along the lines of investigation laid down in the past in the fields of cosmic ray research, photomeson study and the examination of other photo-disintegration phenomena at both high and low energies, measurement of nuclear energy levels, the scattering of elementary particles, nuclear chemistry, and the theoretical prediction and correlation of nuclear behavior. Of note during the past year have been contributions extending throughout virtually the entire energy range of nuclear events. For example, contributions have been made at the higher energies concerning the V° and S particles of cosmic rays and the angular distribution of photomesons from hydrogen, and at the lower energies concerning the determination of energy levels excited by protons of bombarding energy up to 8 Mev, the angular distribution of fission fragments produced by photon bombardment as a function of the mass asymmetry of the fragments, the measurements on the fine structure of positronium, and the successful theoretical predictions of the so-called "optical" model of the nucleus for neutron-induced reactions.

In keeping with its already established tradition, the Laboratory was host last year to a number of visiting scientists from other universities, both foreign and local, all of whom have contributed actively to its research program. Besides an increased number of internal discussion groups, efforts to effect the dissemination of

scientific ideas included conferences attended by personnel from other laboratories and universities.

Support for the Laboratory, as in the past, has been received from both the Office of Naval Research and the Atomic Energy Commission.

Spectroscopy Laboratory. The research in progress in the Spectroscopy Laboratory has continued to include a wide range of studies on spectroscopic instrumentation as well as investigations of atomic and molecular spectra. Work on the large interferometrically controlled ruling engine proceeds very satisfactorily, as does the development of the echelle spectrograph recently devised here. Echelle spectrographs are now being manufactured commercially and are in wide demand for spectrochemical analysis. Investigations in molecular spectra have included studies on the structure of glasses by means of the Raman effect, low-temperature infrared spectroscopy, development work on infrared spectrometers, and a continuing program of studies of the vibrational spectra and structures of small molecules, particularly deuterium compounds. A group from the Department of Chemistry has been measuring vapor pressures of metals in alloys by line absorption spectra.

Report of the Treasurer

OPERATIONS

IN THE FISCAL YEAR 1952–53 EVERY MAJOR SOURCE OF REVENUE OF the Institute increased over the level of the preceding year. The total volume of operations was $43,036,000 as compared with $32,518,000 in 1951–52, $23,469,000 in 1950–51 and $21,470,000 in 1949–50. The continued growth in the scale of operations in the past two years has been due very largely to the expansion in the contract research of the Division of Defense Laboratories. Net contract research revenues were $33,115,000

for the year under review, rising from $23,488,000 in 1951–52. The revenues of the Division of Defense Laboratories increased more than two-fold in contrast with the 7% gain in the revenues of the Division of Industrial Cooperation and the 10% gain in academic and related revenues.

The combined volume of academic operations and auxiliary activities was $9,921,000 for the year, showing an increase from $9,029,000 in 1951–52. After declining for three successive years, tuition income increased to $3,751,000 from $3,628,000. To meet current expenses, gifts and other receipts were used in the amount of $2,985,000. This source of income was drawn on more heavily than in recent years with gifts and receipts used in 1951–52 at $2,433,000 and $2,183,000 in 1950–51. Overhead allowances on research contracts, including $914,000 for the use of plant and funds, were $4,687,000 for the year, with general and administration expenses somewhat higher than last year and with contract research up substantially in volume.

Salaries and wages for the year were $25,084,000. Research salaries and wages reimbursable directly by contract were 78% of the total of all academic and research salaries and wages, continuing the trend from 73% in 1951–52 and 66% in 1950–51. Academic salaries and wages of $4,401,000 reflected in part the upward revision of the staff salary scale in effect for the first year in 1952–53. With greater departmental research activity and the expense of equipping renovated laboratories, departmental expenses increased to $1,171,000 from $932,000 the year before. A larger staff and employee group at the Institute brought about an increase in the expense of benefits and retirement allowances and this was the main component in the increase in general and administration expenses to $3,064,000 from $2,552,000. The expense of normal plant operations was higher at $1,436,000 but was more than offset by a decrease in the expense for special building alterations so that total plant expenses declined to $2,656,000 from $2,722,000.

FUNDS

On June 30, 1953, the invested and other funds of the Institute were $63,833,000 at book value and on June 30, 1952, the funds were $60,632,000. The net increase in the funds during the year of $3,201,000 is comparable with the increases of $3,814,000 in 1951–52 and $135,000 in 1950–51. For the year the net increase consisted of increases of $1,249,000 in general purpose endowment, $1,154,000 in endowment for designated purposes and $798,000 in other classes of funds. The Faculty Salary Fund was increased by $1,014,000 to $4,115,000 and this was the principal change in endowment for general purposes. Funds for research of $566,000, for student aid of $329,000 and for professorships of $237,000 were added to endowment for designated purposes during the year. Building funds of $1,548,000 were used to meet construction expenditures and other charges, but unrestricted funds of $1,454,000 were transferred to building funds so that funds for construction at the close of the year were little changed from the funds on hand one year earlier. Invested funds for current designated purposes included major additions to the Teacher's Insurance Fund and the Alumni Fund. During the year, funds in the amount of $362,000 were applied to the transfer of unallocated construction costs and the cost of dormitory construction to educational plant assets. A substantial part of the funds of the Institute are temporarily invested or included with current assets that may be withdrawn and these funds were 27% of all funds on June 30, 1953. On the same date 73% of the funds were endowment funds or funds functioning as endowment.

PLANT

The book value of the plant of the Institute was $33,065,000 on June 30, 1953 and $31,365,000 on June 30, 1952. Construction during the year included the completion of the John Thompson Dorrance Laboratory and the extension and renovation of the steam supply lines to the west campus as the main additions to educational plant assets. The expense of space changes and build-

ing alterations included in plant operations was $922,000 compared with similar expenses last year of $1,088,000. The two-year program of major alterations was virtually finished by the end of the year and brought the total expenses of special alterations and space changes, largely for academic and research purposes, over the past five years to nearly three million dollars. Construction in progress on June 30, 1953, was covered by building funds on hand and funds receivable under the Development Program.

GIFTS

The gifts, grants and bequests received during the year were $5,982,000 and in the year before $6,953,000 was received by the Institute. Included in the gifts for the year was $1,780,000 in payments toward subscriptions to the Development Program in 1948–51. The bequest of Katie M. A. Grimmons for scholarships, the bequest of Gertrude Newman for student aid and further payments for the Edwin Sibley Webster professorship by the Webster Foundation made up the greater part of the endowment receipts for designated purposes of $538,000. The second distribution from the estate of Mrs. H. Sylvia A. H. G. Wilks of $818,000 and a third payment from the Ford Motor Company Fund were included with invested gifts for general purposes of $1,404,000. The Alumni Fund which increased to $189,000 from $122,000 last year and a grant of $500,000 from the Rockefeller Foundation for research in biology were gifts received and classified with invested funds for designated purposes of $1,109,000. Contributions received from the Alfred P. Sloan Foundation for the School of Industrial Management were $745,000 and for other purposes $132,000. Gifts for unrestricted purposes of $1,122,000 were added to general endowment and gifts of $540,000 for designated purposes with principal available for immediate expenditure were added to endowment for designated purposes during the year.

Contributions for current expenses of $2,796,000 exceeded by a wide margin contributions of this kind received in recent years, and included $1,101,000 in grants from the companies in

the Industrial Liaison Program. In 1951–52 total contributions for current expenses were $2,094,000 with $1,110,000 from the Industrial Liaison companies. Business corporations have contributed over $4,000,000 to the Institute through the Liaison Program in the past five years. During the year $990,000 in Liaison company grants was allocated to the support of current operations and $142,000 was added to funds for immediate use or to meet subsequent expenditures. On June 30, 1953, funds on hand of $2,096,000 for current expenses but reserved for future use were in the current assets of the Institute.

INVESTMENTS

The investments of the Institute had a book value of $59,940,000 and a market value of $73,080,000 on June 30, 1953. The distribution of the General Investments at market values in bonds, common stocks and real estate changed very slightly during the year. The investment in bonds increased to 29.5% from 27%, with a reduction in government securities and an increase in other bonds. Common stocks decreased to 45.1% from 46.9% and real estate increased to 17.0% from 15.6% of the General Investments. Funds held temporarily were invested for the most part in commercial paper which represented 8.5% of the portfolio at the end of the year.

Common stock dividends continue as the main source of income on the General Investments. In 1952–53 common stock dividends were 61.2%, bond interest 18.3% and real estate income 12.1% compared with 63.2%, 17.3% and 11.4% respectively in 1951–52. The rate of income earned on the funds sharing in the General Investments was 5.0% on the average book value of the funds. In 1951–52 the rate was 5.18% and in 1950–51 the rate earned was 5.02%. For the sixth consecutive year 4% was allocated to the funds and for the fourth year income over and above 4% was added to unallocated investment income.

Total investment income was $2,759,000 in 1952–53 and in 1951–52 investment income was $2,618,000. Investment income used for current expenses was $1,451,000 as shown in the

statement of Income and Expense and $808,000 was added to fund balances for redistribution against current expenditures, leaving $500,000 to be added to the reserve of unallocated investment income. At the close of the year this reserve was $1,797,000 and equivalent to 72% of the income on the General Investments of $2,508,000 for twelve months ended June 30,1953. Operations of the dormitories and related activities provided $137,000 to the reserve for investment amortization and allied purposes with this reserve at $468,000 at the year end. The accumulated reserve is slightly more than 10% of the unamortized investment in housing for students at the Institute.

GENERAL

The additions to educational plant over the past five years and construction in progress on June 30, 1953, have a combined value of nearly $15,500,000. To finance this expansion in plant, gifts for buildings have been available of $8,000,000 leaving a balance of $7,500,000 drawn almost entirely from unrestricted funds. During the same five-year period unrestricted funds of $5,637,000 have been transferred to endowment funds with the overall increase in endowment equal to $8,873,000. Thus 48% of the additions to plant and 64% of the increase in endowment since 1948 has been made possible through the use of unrestricted resources. Funds for designated current purposes often conserve unrestricted funds for allocation to endowment in that important educational or research activities may be undertaken that might otherwise require unrestricted funds. By minimizing the use of unrestricted funds in meeting current operating expenses, gifts for endowment have been supplemented and further progress made in securing the endowment capital required to stabilize the operations of the Institute.

JOSEPH J. SNYDER

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, 1953 (pages 116 and 117) and the related statement of income and expense (page 118) and summary of funds (page 128) for the year ended June 30, 1953. 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 statements present fairly the financial position of Massachusetts Institute of Technology at June 30, 1953, and the results of its operations for the year then ended on a basis consistent with that of the preceding year.

LYBRAND, ROSS BROS. & MONTGOMERY

Boston, Massachusetts, September 11, 1953

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, 1953 and their certificate is submitted herewith.

Respectfully,

REDFIELD PROCTOR
THOMAS H. WEST
HENRY E. WORCESTER, *Chairman*

SCHEDULE A

BALANCE SHEET

JUNE 30, 1953

INVESTMENTS

General investments:			
U. S. Government bonds		$13,304,921	
Other bonds		6,853,911	
Preferred stocks		252,794	
Common stocks		17,455,909	
Real estate (including $5,157,029 devoted to Institute use) and mortgages		11,484,088	
Commercial paper		5,641,128	$ 54,992,751
Less temporary investment of general purpose cash			485,214
	(A-1)		$ 54,507,537
Investments of funds separately invested	(A-2)		4,644,834
Students' notes receivable	(A-12)		787,220
			$ 59,939,591

CURRENT AND DEFERRED ASSETS

Cash:			
General purposes		$ 2,058,718	
Restricted to certain research contracts		647,765	
Students' safe-keeping deposits		94,529	$ 2,801,012
Temporary investment of general purpose cash			485,214
Accounts receivable:			
U. S. Government	(A-13)	$ 2,220,939	
Other	(A-13)	232,403	2,453,342
Contracts in progress, principally U. S. Government	(A-14)		3,169,920
Inventories, deferred charges and other assets	(A-15)		1,058,391
			$ 9,967,879

DIVISION OF DEFENSE LABORATORIES ASSETS

Cash ($1,714,951 in restricted accounts)	$ 1,881,177
Accounts receivable	1,477,203
Contracts in progress	2,477,774
Deferred charges	30,201
	$ 5,866,355

EDUCATIONAL PLANT

Land, buildings and equipment	(A-19)	$ 33,064,982
		$108,838,807

SCHEDULE A
BALANCE SHEET
JUNE 30, 1953
INVESTED FUNDS

Endowment funds:			
Income for general purposes	(A-3)	$32,444,757	
Income for designated purposes	(A-4)	11,206,642	$ 43,651,399
Student loan funds	(A-5)		2,684,926
Building funds	(A-6)		2,033,835
Other expendable funds:			
General purposes	(A-7)	$ 990,279	
Designated purposes	(A-8)	5,256,523	6,246,802
Unexpended endowment income for designated purposes	(A-4)		1,003,432
Agency and annuity funds	(A-9 & 10)		935,323
General investments—gain and loss account	(A-11)		3,383,874
			$ 59,939,591

CURRENT LIABILITIES, FUNDS AND SURPLUS

Accounts payable and accrued wages		$ 857,561	
Students' advance fees and deposits	(A-16)	288,199	
Students' safe-keeping deposits		94,529	
Withholdings, deposits and other credits	(A-17)	868,645	
Advances by U. S. Government for certain research contracts		4,036,486	
Total current liabilities			$ 6,145,420
Gifts and other receipts for current expenses	(A-18)		2,096,446
Investment income unallocated to funds			1,796,857
Deficit from operations			(70,844)
			$ 9,967,879

DIVISION OF DEFENSE LABORATORIES LIABILITIES

Accounts payable and accrued wages	$	586,509
U. S. Government advances		5,279,846
	$	5,866,355

EDUCATIONAL PLANT CAPITAL

Endowment for educational plant	(A-20)	$ 33,064,982
		$108,838,807

SCHEDULE B

STATEMENT OF INCOME AND EXPENSES FOR YEAR ENDED JUNE 30, 1953

REVENUES

Tuition and other fees	(B-1)	$ 3,751,168
Investment income used for current expenses	(B-2)	1,450,613
Gifts and other receipts used for current expenses	(B-2)	2,985,157
Reimbursement for direct costs under contracts (Division of Defense Laboratories, $14,431,322)	(B-3)	29,342,114
Contract allowances for expenses of administration and plant operation	(B-3)	3,772,878
Other income	(B-4)	55,152
Auxiliary activities — dormitories, dining services and housing projects	(B-13)	1,678,818
		$43,035,900

EXPENSES

Academic expenses:			
Salaries and wages	(B-5)	$ 4,405,790	
Department expenses	(B-6)	1,166,455	
Library and museum	(B-7)	265,635	$ 5,837,880
Direct costs under contracts:			
Salaries and wages	(B-3)	$16,104,649	
Materials and services	(B-3)	9,530,073	
Subcontracts, travel and other	(B-3)	3,707,392	29,342,114
General and administration expenses	(B-9)		3,063,934
Plant operation	(B-10)		2,656,110
Medical department	(B-11)		139,718
Undergraduate budget board	(B-12)		297,735
Auxiliary activities — dormitories, dining services and housing projects	(B-13)		1,677,836
			$43,015,327
Revenue in excess of expenses			$ 20,573

Note: Revenue in excess of expenses, and $50,000 appropriated from unrestricted funds, were applied to reduce the accumulated deficit from $141,417 at June 30, 1952 to $70,844 at June 30, 1953.

Statement on Accounts

SUPPORTING SCHEDULES for the Balance Sheet as of June 30, 1953, and the Statement of Income and Expenses for the year then ended as drawn from the Institute's books of account are presented in full in the Treasurer's Report issue of the Bulletin. Only those schedules of general interest are reprinted on the following pages. Copies of the complete Treasurer's Report for the year ended June 30, 1953, may be obtained from the office of the Treasurer, Room 4-110, Massachusetts Institute of Technology, Cambridge 39, Massachusetts.

SCHEDULE A-1

GENERAL INVESTMENTS

Par Value	U. S. GOVERNMENT BONDS			*Book Value*	*Net Income*
$1,000,000	U. S. Treasury Certificate of Indebtedness A	2¼s	1954	$1,000,000.00	.....
40,000	U. S. Treasury...	2s	1953	40,000.00	$ 59.74
6,400,000	U. S. Treasury...	2⅜s	1958	6,396,171.88	116,765.48
1,000,000	U. S. Treasury...	2¼s	1962–59	997,118.06	22,500.00
1,500,000	U. S. Treasury...	2½s	1968–63	1,469,218.75	37,500.00
3,000,000	U. S. Treasury...	2½s	1969–64	3,035,411.88	71,000.00
367,000	U. S. Savings "G"	2½s	1954–56	367,000.00	9,175.00
	Income from bonds sold.....			.....	100,311.45
	Total U. S. Government Bonds....			$13,304,920.57	$357,311.67
	CANADIAN BONDS				
$ 200,000	Aluminum Co. of Canada, Ltd....	3⅞s	1970	$ 202,500.00	$ 7,250.00
200,000	Bell Telephone Co. of Canada.....	4½s	1967	206,406.80	3,431.35
200,000	Interprovincial Pipe Line.....	3½s	1970	197,375.00	7,205.63
	Total Canadian Bonds.....			$ 606,281.80	$ 17,886.98
	PUBLIC UTILITY BONDS				
$ 200,000	Am. & For. Pr....	5s	2030	$ 197,182.41	$ 10,000.00
50,000	Am. Gas & Elec. Co.	3⅜s	1977	50,075.00	4,013.50
533,000	Great Lakes Pipe Line deb.....	3¼s	1957	533,999.37	3,633.33
152,000	Northern Natural Gas deb.....	4½s	1973	151,620.00	(1,007.00)
78,000	Puget Sound Pr. Lt.	4¼s	1972	79,279.53	3,115.00
100,000	Southern Natural Gas Co. 1st Pipe Line Sinking Fd.	4s	1973	99,000.00	(300.00)
200,000	Tennessee Gas Transmission Co. 1st Pipe Line...	4⅛s	1973	202,200.00	(1,627.50)
	Income from bonds sold.....			.....	2,456.25
	Total Public Utility Bonds.....			$1,313,356.31	$20,283.58
	RAILROAD BONDS				
$ 100,000	Baltimore & Ohio R.R.	4s	1975	$ 86,985.00	$ 4,000.00
50,000	B. & O., P., L. E. & W. Va. 5 yr.	4s	1980	48,643.75	2,000.00
115,000	Northern Pacific R.R	4s	1997	105,228.29	4,600.00
153,000	Southern Pacific Co.	4½s	1981	150,781.75	6,885.00
	Total Railroad Bonds.....			$ 391,638.79	$ 17,485.00

SCHEDULE A-1 — (Continued)

Par Value				*Book Value*	*Net Income*
	OTHER BONDS				
$1,000,000	Com'l Credit Co...	2¾s	1954–57	$1,000,000.00	$27,500.00
500,000	Com'l Credit Co...	3½s	1965	495,000.00	3,451.39
500,000	Com. Inv. Trust, Inc.	3½s	1959	500,000.00	(340.28)
200,000	J. I. Case Co. deb..	3½s	1978	191,029.00	(1,088.88)
1,000,000	Gen. Motors Accept.	4s	1958	1,000,000.00	(408.31)
500,000	Gen. Motors Accept.	3¾s	1965	500,000.00	
300,000	International Bank for Reconstruction & Develop..	3s	1976	300,000.00	9,000.00
250,000	Phillips Petroleum Company.....	3.70s	1983	252,915.52	(168.35)
85,000	Shamrock Oil & Gas Corporation	3½s	1967	85,400.00	2,525.00
76,000	Standard Oil Co. of Indiana.....	3⅛s	1982	78,290.07	687.88
140,000	Southern Production Company.....	3¾s	1967	140,000.00	5,245.86
	Total Other Bonds.....			$4,542,634.59	$46,404.31
Shares					
	PREFERRED STOCKS				
240	Christiana Sec. Co.	$7.00.....		$ 33,920.00	$ 1,470.00
602	Merck & Company, Incorporated....	4.00.....		64,373.97	2,408.00
1,500	N. E. Gas & Elec. Assoc.....	4.50.....		154,500.00	6,750.00
	Total Preferred Stocks.....			$ 252,793.97	$10,628.00
	INDUSTRIAL COMMON STOCKS				
	Agricultural Equipment				
4,000	International Harvester Company.			$ 53,274.83	$ 8,000.00
	Automobile				
4,275	Chrysler Corporation.....			150,144.60	25,650.00
52,796	General Motors Corporation.....			2,096,531.03	211,034.00
	Building Supplies				
6,000	Johns-Manville Corporation.....			187,886.86	25,500.00
12,604	National Lead Company.....			118,223.14	20,161.60
6,000	Pittsburgh Plate Glass Company...			83,197.11	12,000.00
2,000	Sherwin Williams Company.....			100,988.10	7,000.00
	Chemicals				
4,008	Allied Chemical & Dye Corporation			169,777.26	12,024.00
1,000	American Cyanamid Company....			50,919.54	2,000.00
268	Christiana Securities Company....			729,174.35	70,631.40
5,140	Dow Chemical Company.....			102,430.89	4,536.80
1,749	E. I. du Pontde Nemours & Company			147,135.50	5,934.95
30,279 80/100	Eastman Kodak Company.....			382,066.02	51,660.00
10,000	Hercules Powder Company.....			492,799.94	30,000.00
18,060	Merck & Co., Inc.....			108,717.47	14,448.00
4,100	Monsanto Chemical Company....			96,803.58	10,250.00
13,927	Union Carbide & Carbon Corporation			283,952.10	34,742.50

SCHEDULE A 1 — (Continued)

Shares		*Book Value*	*Net Income*
	INDUSTRIAL COMMON STOCKS — (*Continued*)		
	Containers		
13,200	American Can Company	$ 326,388.57	$18,480.00
6,070	Owens-Illinois Glass Company	348,022.10	24,280.00
	Electrical Equipment		
15,750	Thomas A. Edison, Inc.	180,000.00	15,750.00
9,171	General Electric Company	246,062.97	27,513.00
3,200	General Radio Company	73,850.00	.....
6,000	Westinghouse Electric Corporation	107,827.11	12,000.00
	Food and Beverages		
3,150	Liquid Carbonic Corporation	53,551.11	4,410.00
11,306	United Fruit Company	186,075.10	39,571.00
	Machinery		
4,000	Caterpillar Tractor Company	92,194.13	12,000.00
6,000	Draper Corporation	96,132.10	8,400.00
6,000	United Shoe Machinery Corporation	352,340.53	15,000.00
	Metal Mining		
4,850	International Nickel Company	163,067.43	12,610.00
3,943	Kennecott Copper Corporation	245,819.30	23,658.00
	Office Equipment		
1,229	International Business Machines Corporation	49,925.63	4,785.00
3,180	National Cash Register Company	96,166.04	9,540.00
	Oil		
7,280	Gulf Oil Corporation	184,894.62	14,280.00
16,000	Humble Oil & Refining Company	339,294.10	36,480.00
3,500	Ohio Oil Company	106,531.25	10,500.00
6,120	Phillips Petroleum Company	174,188.40	15,228.00
16,223	Socony Vacuum Oil Co., Inc.	299,239.00	31,708.50
11,350	Standard Oil Company (California)	343,751.66	34,050.00
7,100	Standard Oil (Indiana)	287,026.33	28,491.73
18,954	Standard Oil (New Jersey)	469,102.29	80,187.50
4,288	Texas Company	118,429.92	13,672.60
	Paper		
10,008	International Paper Company	180,484.79	30,024.00
	Retail Trade		
4,000	Montgomery Ward & Company	261,266.32	12,000.00
5,000	J. C. Penney Company	154,666.05	17,500.00
7,088	Sears, Roebuck & Company	169,059.79	19,353.50

SCHEDULE A-1 — (Continued)

Shares		*Book Value*	*Net Income*
	INDUSTRIAL COMMON STOCKS *(Continued)*		
	Soap		
7,500	Procter & Gamble Company.....	$261,143.86	$19,500.00
	Steel		
6,000	Inland Steel Company.....	198,474.49	18,000.00
6,600	National Steel Corporation.....	149,488.34	19,800.00
	Tobacco		
2,428	American Tobacco Company.....	175,740.75	9,712.00
2,625	Liggett & Myers Tobacco Company	183,606.14	13,125.00
	Miscellaneous		
2,500	Consolidated Rendering Company.	169,500.00	8,125.00
4,016	Minnesota Mining & Mfg. Company	74,380.40	4,016.00
	Income on stocks sold.....	.....	9,975.00
	Total Industrial Common Stocks...	$12,271,712.94	$1,219,299.08
	PUBLIC UTILITY COMMON STOCKS		
17,952	American Gas & Electric Company.	$ 340,850.07	$27,227.45
1,080	American Tel. & Tel. Company....	137,076.09	9,135.00
4,240	Boston Edison Company.....	155,855.44	11,578.00
8,185	Commonwealth Edison Company..	231,959.27	14,643.00
3,500	Illinois Power Company.....	127,251.83	7,700.00
4,000	Southern California Edison Company	141,089.14	8,000.00
6,000	Texas Gas Transmission Corporation	102,750.00	6,000.00
9,756	Virginia Electric & Power Company	191,625.93	13,658.40
	Total Public Utility Common Stocks	$1,428,457.77	$97,941.85
	RAILROAD COMMON STOCKS		
4,130	Atchison, Topeka & Santa Fe Railway	$ 188,798.69	$25,757.50
2,000	Great Northern Railway Co. Pfd...	95,877.13	8,000.00
1,000	Northern Pacific Railway Company	61,696.95	3,000.00
	Total Railroad Common Stocks....	$ 346,372.77	$36,757.50
	BANK STOCKS		
3,750	Bankers Trust Company, New York	$ 189,613.75	$ 7,875.00
3,031	Cont. Ill. Nat. Bank, Chicago.....	174,542.92	12,124.00
4,986	The First National Bank, Boston...	298,492.06	14,459.40
5,875	Guaranty Trust Co. of New York..	329,999.04	19,520.25
2,285	The Hanover Bank, New York....	233,581.79	9,140.00
1,000	Harris Trust & Savings, Chicago...	146,522.00	10,497.00
7,189	National City Bank, New York....	297,620.40	13,844.50
	Total Bank Stocks.....	$1,670,371.96	$87,460.15

SCHEDULE A-1 — (Continued)

Shares		*Book Value*	*Net Income*
	INSURANCE STOCKS		
8,334	Boston Insurance Company	$ 197,914.51	$11,250.90
2,125	Continental Ins. Co., New York	68,383.05	6,268.75
7,180	Fireman's Fund Ins. Co., Calif.	207,774.20	11,488.00
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
	Total Insurance Stocks	$ 748,255.00	$51,931.65
	OTHER STOCKS		
6,000	American Research & Development Corporation	$ 150,000.00	.....
10,250	Bond Investment Trust of America	200,084.00	$ 8,610.00
12,000	Century Shares Trust	200,040.00	2,520.00
360	Cochran Foil Company	6,680.00	450.00
16,522	Colonial Fund, Inc.	226,940.57	17,017.66
446	The Dewey and Almy Chemical Company	11,748.00	267.60
1,219	General Public Utilities Corporation	23,411.09	1,770.10
675	Photon, Incorporated	9,690.63	.....
500	Rockwell Manufacturing Company	10,000.00	1,000.00
735	J. P. Stevens and Company, Inc.	25,325.00	1,320.00
1,000	Stone and Webster, Inc.	29,507.65	2,000.00
	Investment in 17 other securities	97,311.30	4,120.05
	Income from stocks sold	.....	1,138.95
	Total Other Stocks	$ 990,738.24	$40,214.36
	MORTGAGE NOTES		
	Common Street, Belmont	$ 5,640.00	$ 269.44
	Park Avenue, Arlington	7,297.22	341.30
	Putnam Place, Roxbury	900.00	62.01
	Ruby Avenue, Marblehead	5,500.00	258.76
	Spear and Wibird Streets, Quincy	1,100.00	55.00
	Alpha Tau Omega	8,300.00	460.00
	Beta Theta Pi	15,000.00	887.50
	Delta Kappa Epsilon	9,000.00	389.59
	Kappa Sigma	9,000.00	450.00
	Lambda Chi Alpha	11,180.91	436.57
	Pi Lambda Phi	4,000.00	237.50
	Phi Kappa	13,875.00	734.38
	Phi Mu Delta	5,000.00	250.00
	Sigma Chi	3,500.00	175.00
	Income on paid up mortgage	.....	12.50
	Total Mortgage Notes	$ 99,293.13	$ 5,019.55

SCHEDULE A-1 — (Continued)

	Book Value	*Net Income*
REAL ESTATE DEVOTED TO INSTITUTE USE		
Dormitories and Housing		
111 Bay State Road, Boston	$ 16,200.00	$ 648.00
120 Bay State Road, Boston	28,000.00	725.00
Graduate House	647,951.94	1,622.25
Baker House	2,064,180.53	4,866.73
Burton House	1,423,219.59*	.....
Westgate Veterans' Housing	459,492.60	9,200.46
Total Dormitories and Housing	$4,639,044.66	$17,062.44
Research		
565 Memorial Drive, Cambridge	$ 200,560.50	$10,028.00
209 Mass. Ave., Cambridge	100,000.00	5,000.00
Wood Street, Lexington, Mass.	67,424.04	3,371.00
68–92 Albany Street, Cambridge	150,000.00	9,404.00
Total for Research	$ 517,984.54	$27,803.00
OTHER REAL ESTATE		
36–44 Memorial Drive, Cambridge	$1,421,016.35	$43,890.92
80 Memorial Drive, Cambridge	886,094.08	44,192.97
100 Memorial Drive, Cambridge	153,510.85	3,200.04
333 Memorial Drive, Cambridge	40,000.00	.....
500 Memorial Drive, Cambridge (Building and Fixtures)	67,543.94	3,249.34
540–550 Memorial Drive, Cambridge (Land)	351,524.51	12,948.45
640 Memorial Drive, Cambridge	454,545.48**	25,384.69
Gloversville, N. Y.	222,252.71	11,145.30
New London, Conn.	225,946.83	10,809.05
Plattsburg, N. Y.	167,485.85	7,709.69
Taunton, Mass.	184,779.12	8,414.06
Waltham, Mass.	639,425.48	32,046.71
Willimantic, Conn.	151,275.32	6,884.47
Main Street, Worcester, Mass.	182,964.49	8,330.38
Federal Street, Worcester, Mass.	355,441.83	17,187.60
Bexley Hall, Cambridge	140,280.61	11,089.63
76–94 Mass. Ave., Cambridge	433,678.74	2,196.02
Franklin Street, Boston	150,000.00	10,146.77
Total Other Real Estate	$6,227,766.19	$258,826.09

*Not including first mortgage of $383,045.66.
** Not including first mortgage of $457,500.

SCHEDULE A-1—(Continued)

Par Value		*Book Value*	*Net Income*
	COMMERCIAL PAPER		
$ 750,000	Com. Inv. Trust, Inc.....1953	$ 735,937.50	.....
1,000,000	Gen. Elec. Supply Corp....1953	991,753.47	.....
200,000	General Motors Acceptance Corp.....1953	196,450.69	.....
250,000	General Motors Acceptance Corp.....1953	245,277.78	.....
1,000,000	General Motors Acceptance Corp.....1953	996,062.50	.....
1,000,000	General Motors Acceptance Corp.....1953	987,083.33	.....
1,000,000	General Motors Acceptance Corp.....1953	988,562.50	.....
500,000	Industrial Acceptance Corp.....1953	500,000.00	.....
	Income from notes matured.....	$	110,790.80
	Total Commercial Paper and Notes	$ 5,641,127.77	$ 110,790.80
	Advances for current operations....	$ (485,214.33)	$ 84,416.00
	Total General Investments.....	$54,507,536.67	$2,507,522.01

(Schedule A)

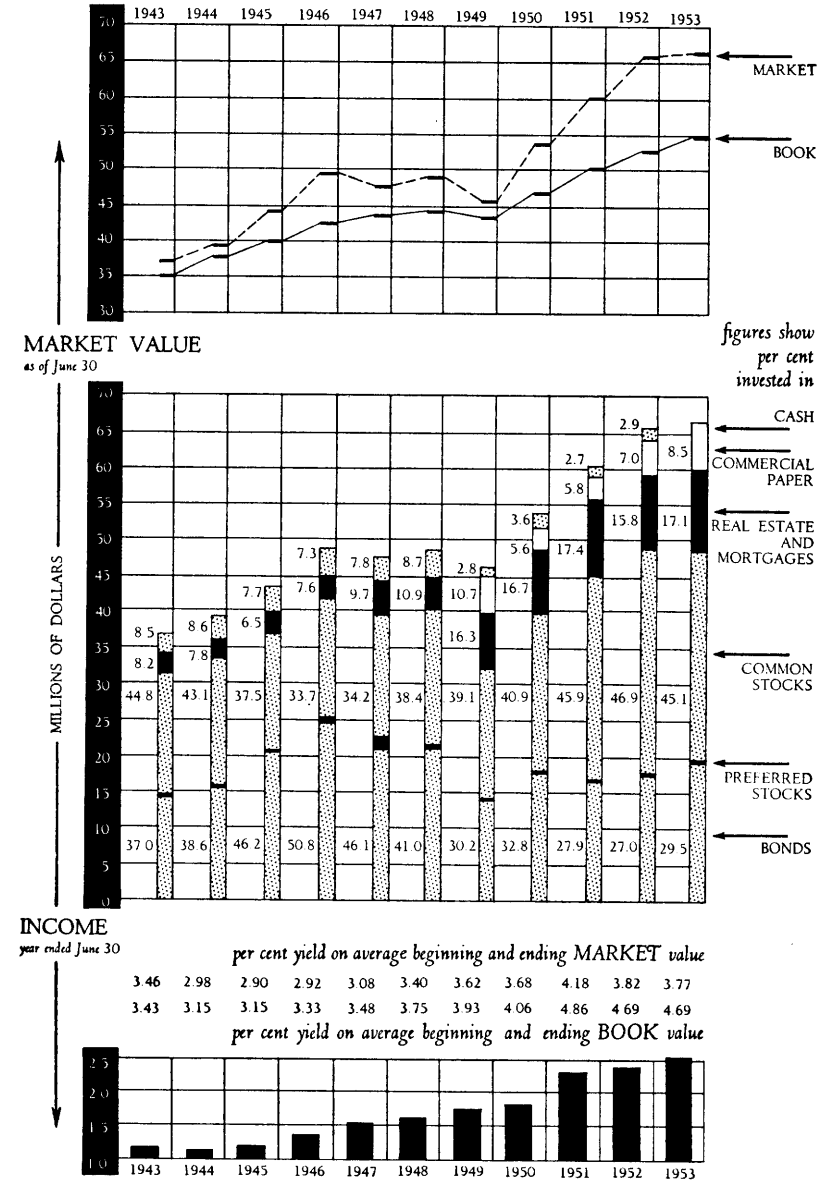
INVESTMENTS — SUMMARY

JUNE 30, 1953

General Investments	*Book Value*	*Market Value*	*Per Cent*	*Net Income*	*Per Cent*
Bonds					
U. S. Government	$13,304,921	$12,816,319	19.2	$ 357,312	14.2
Canadian	606,282	591,500	.9	17,887	.7
Public Utility	1,313,356	1,273,912	1.9	20,284	.8
Railroad	391,639	403,628	.6	17,485	.7
Other	4,542,634	4,629,490	6.9	46,404	1.9
Total	$20,158,832	$19,714,849	29.5	$ 459,372	18.3
Preferred Stocks	$ 252,794	$ 310,483	.5	$ 10,628	.4
Common Stocks					
Industrial	$12,271,713	$23,139,149	34.8	$1,219,299	48.6
Public Utility	1,428,458	1,753,007	2.6	97,942	3.9
Railroad	346,373	560,391	.8	36,757	1.5
Bank	1,670,372	1,992,176	3.0	87,460	3.5
Insurance	748,255	1,690,189	2.5	51,932	2.1
Other	990,738	940,664	1.4	40,214	1.6
Total	$17,455,909	$30,075,576	45.1	$1,533,604	61.2
Mortgage Notes	$ 99,293	$ 99,293	.1	$ 5,020	.2
Real Estate					
For Institute Use	$ 5,157,029	$ 5,157,029	7.7	$ 44,865	1.8
Other Property	6,227,766	6,227,766	9.3	258,826	10.3
Total	$11,384,795	$11,384,795	17.0	$ 303,691	12.1
Commercial Paper	$ 5,641,128	$ 5,641,128	8.5	$ 110,791	4.4
Advanced for Current Operations	$ (485,214)	$ (485,214)	(.7)	$ 84,416	3.4
Total General Investments	$54,507,537	$66,740,910	100.0	$2,507,522	100.0
Special Investments	$ 4,644,834	$ 5,552,123		$ 281,548 *	
Students' Notes Receivable	$ 787,220	$ 787,220			
Charge for financial services				$ (30,000)	
Total Investments	$59,939,591	$73,080,253		$2,759,070	

* Interest credited directly to student loan funds.

General Investments 1943-1953



RESEARCH CONTRACT OPERATIONS

Division of Industrial Cooperation
Division of Defense Laboratories

Revenues from research contracts			$34,029,147
Less appropriations therefrom:			
Reserve for use of facilities		$ 650,744	
Industrial fund		90,648	
Investment income for use of funds and amortization of facilities		138,537	
Other reserve		34,226	914,155
			$33,114,992
Direct expenses on research contracts:	*Division of Industrial Cooperation*	*Division of Defense Laboratories*	
Salaries and wages	$ 9,588,006	$ 6,516,643	
Materials and services	3,798,980	5,731,094	
Subcontracts	490,792	1,060,058	
Construction of major facilities	.....	275,947	
Travel	400,430	264,645	
Other	157,221	259,847	
	$14,435,429	$14,108,234	
Direct expenses of the Divisions:			
Salaries and wages	$302,461		
Materials and services	74,508		
Travel	9,220		
Vacation allowances — hourly employees	230,000		
Depreciation on equipment	42,472		
Insurance	36,598		
Outside rentals	2,144		
Instrumentation laboratory — expenses	18,238		
Servomechanisms laboratory — expenses	18,391		
Occupational medical service	44,435		
Unallowable contract expense	7,730		
Professional services	4,700		
Other	7,554		
	$798,451		
Allocation		475,363	323,088	
Total expenses (Schedule B)		$14,910,792	$14,431,322	$29,342,114
Contract allowances for expenses of administration and plant operation (Schedule B)				$ 3,772,878

SUMMARY OF FUNDS

Endowment funds:	*Balance, June 30, 1952*	*Gifts and Other Receipts*	*Investment Income*	*Transfers In-(Out)*	*Expenses*	*Other Charges*	*Balance, June 30, 1953*
Income for general purposes (A-3)	$31,195,467	$ 50,128	$ 1,247,414	$ 1,198,671	$ 1,246,466	$ 457	$32,444,757
Income for designated purposes (A-4)	10,053,044	542,764	.....*	611,364	.....	530	11,206,642
Student loan funds (A-5)	2,594,775	7,795	81,743	1,000	.....	387	2,684,926
Building funds (A-6)	2,059,622	15,004	53,624	1,453,519	.....	1,547,934	2,033,835
Other expendable funds:							
General purposes (A-7)	1,615,583	1,403,533	97,784	(1,994,344)	70,556	61,721	990,279
Designated purposes (A-8)	4,813,060	2,298,630	227,460	(1,193,447)	574,160	315,020	5,256,523
Unexpended endowment income for designated purposes (A-4)	983,183	6,048	510,561	(72,390)	140,501	283,469	1,003,432
Agency and annuity funds (A-9 and 10)	960,587	70,448	40,398	(57,459)	250	78,401	935,323
General investments gain and loss account (A-11)	3,496,008	(112,134)	.....	.....	.....	.....	3,383,874
Total invested funds	$57,771,329	$ 4,282,216	$ 2,258,984	$ (53,086)	$ 2,031,933	$ 2,287,919	$59,939,591
Gifts and other receipts for current expenses (A-18)	1,563,355	3,042,668	.....	53,086	2,403,837	158,826	2,096,446
Investment income unallocated to funds	1,296,911	(140)	500,086	.....	.....	.....	1,796,857
	$60,631,595	$ 7,324,744	$ 2,759,070	.....	$ 4,435,770	$ 2,446,745	$63,832,894

Gifts received during the year per list, page 102	$ 5,981,894
Other receipts (research contract allowances for use of facilities; sales of services, publications, etc.; royalties and miscellaneous receipts)	1,342,850
	$ 7,324,744

Investment income used for expenses per statement of Income and Expenses	$ 1,450,613	
Gifts and other receipts used for expenses per statement of Income and Expenses	2,985,157	
	$ 4,435,770	
Expenditures for buildings added to Educational Plant		$ 1,715,250
Scholarship and fellowship awards charged to funds		418,805
Other charges to funds not representing operating expenses		312,690
		$2,446,745

* Investment income on endowment funds for designated purposes is included below in "Unexpended endowment income for designated purposes."

SUMMARY OF GIFTS, GRANTS AND BEQUESTS RECEIVED

	1953	1952	1951	1950	1949
Gifts for Endowment					
Funds for General Purposes	$ 50,128	$ 7,740	$ 86,586	$1,030,511	$ 193,255
Funds for Designated Purposes	538,077	340,532	523,599	382,069	106,114
Gift of Plant	.....	.....	.....	.....	175,000
Gifts for Student Loans	905	2,973	227,756	10	115
Gifts for Building Funds	15,004	40,308	3,797,212	1,268,266	91,666
Other Gifts					
Unexpended balances of Endowment Fund Income	5,800	5,425	5,775	2,525	9,180
Funds for General Purposes — Invested	1,403,533	2,850,889	2,206,364	2,066,934	482,730
Funds for Designated Purposes — Invested	1,108,931	1,537,653	554,665	245,454	316,441
Funds for Designated Purposes — Not Invested	2,796,288	2,093,875	1,657,399	1,463,763	1,106,065
	$5,918,666	$6,879,395	$9,059,356	$6,459,532	$2,480,566
Miscellaneous Gifts					
Agency Funds	$ 38,728	$ 45,711	$ 38,751	$ 18,247	$ 22,436
Annuity Funds	24,500	28,000	47,000	50,310	33,800
	$ 63,228	$ 73,711	$ 85,751	$ 68,557	$ 56,236
Total	$5,981,894	$6,953,106	$9,145,107	$6,528,089	$2,536,802

GIFTS, GRANTS AND BEQUESTS RECEIVED DURING THE YEAR ENDED JUNE 30, 1953

GIFTS FOR ENDOWMENT

The income of the following gifts and bequests is for General Purposes:

HAL L. BEMIS '35		
Additional for Henry Ellsworth Bemis Memorial Fund	$	2,100.00
CLASS OF 1909		
Contributions		54.84
MRS. LAMMOT DUPONT		
For Faculty Salary Endowment		5,000.00
ESTATE OF MARY GRANGER		
For Eliot Granger ('04) Fund		288.76
MARY ELIZABETH LADD		
For Charles C. Ladd ('30) Fund		50.00
ESTATE OF HARRIET P. LAWS		
For Frank A. Laws ('89) Fund		35,237.75
CHARLES T. MAIN INC.		
Charles T. ('76) and Charles R. ('09) Main Memorial Fund		500.00
ESTATE OF HARRIETTE A. NEVINS		
Additional for George Blackburn Memorial Fund		236.27
PARAGON GEAR WORKS INC.		
For Richard Wastcoat ('00) Memorial		2,500.00
ESTATE OF EVERETT WESTCOTT		
Additional for Everett Westcott Fund		1,800.00
ESTATE OF MARION WESTCOTT		
Additional for Marion Westcott Fund		1,360.31
P. M. WISWALL '09		
For Class of 1909		1,000.00
	$	50,127.93

The income of the following gifts and bequests is for Designated Purposes:

JULIAN M. AVERY '18		
Assignment of royalties for Julian M. Avery Fund	$	3,170.70
ESTATE OF JASON S. BAILEY		
For Jason S. Bailey Scholarship		3,845.28
EVERETT MOORE BAKER MEMORIAL FOUNDATION		
Contributions		285.00
RICHARD T. CELLA '39		
For Allan Winter Rowe ('01) Memorial Fund		500.00
KARL T. COMPTON PRIZE FUND		
Contributions by Boston Stein Club members		3,434.68
DOUGLAS AIRCRAFT COMPANY		
For Anonymous Professorship		25,000.00
ELECTRIC REGULATOR CORPORATION		
For Electric Regulator Corporation Fellowship		1,000.00
BARNETT D. GORDON '16		
Additional gift for scholarships		3,000.00

ESTATE OF KATIE M. A. GRIMMONS	
For John A. Grimmons ('21) Scholarship Fund	$170,480.02
ERNEST E. VAN HAM '35	
For Allan Winter Rowe ('01) Memorial Fund	100.00
INDUSTRIAL RELATIONS COUNSELORS, INC.	
For Clarence J. Hicks Memorial Fund	300.84
DUGALD C. JACKSON. '21	
Additional for Dugald Caleb Jackson Professorship	30.00
THE KALES FOUNDATION	
For Allan Winter Rowe ('01) Memorial Fund	1,000.00
EDWARD J. KINGSBURY, SR.	
For Allan Winter Rowe ('01) Memorial Fund	100.00
EDWARD J. KINGSBURY, JR. '40	
For Allan Winter Rowe ('01) Memorial Fund	25.00
ESTATE OF JESSICA L. KNIGHT '01	
Additional for Louise Parks Knight and Charles F. Parks ('75) Fund	4,656.69
FRANCESCO MARCUCELLA '27	
For Scholarships	3,000.00
J. C. MOLINER '22	
For Allan Winter Rowe ('01) Memorial Fund	50.00
GILBERT P. MONET '43	
For the Kurrelmeyer Fund	60.00
ESTATE OF GERTRUDE NEWMAN	
For endowment for needy students	135,430.13
ESTATE OF ANNIE C. NORRIS	
For James F. Norris Fellowship	5,272.81
JOSEPH F. OWENS, JR. '40	
For Albert G. Boyden Fund	20000
MRS. ODETTE S. PRICE	
For Raymond B. Price ('94) Memorial Fund	1,000.00
WILLIS WARD REEVES	
For Willis Ward Reeves, JR. ('46) Scholarship	250.00
PAUL H. RICHARDSON '36	
For Allan Winter Rowe ('01) Memorial Fund	300.00
LAURANCE S. ROCKEFELLER	
For Anonymous Professorship	11,501.11
TUCKER-VOSS PRIZE FUND	
Contributions	5,738.11
EDWIN S. WEBSTER ('88) FOUNDATION	
For Edwin S. Webster Professorship	150,000.00
ESTATE OF EDITH CARSON WILDER	
For Stephen H. Wilder ('74) Fund for Research	8,196.28
Miscellaneous	150.71
	$ 538,077.36

GIFTS FOR STUDENT LOANS

ANONYMOUS	
For Dean's Fund	$ 900.00
LESTER PRESTON	
For Technology Loan Fund	5.00
	$ 905.00

GIFTS FOR BUILDINGS

Austin Y. Hoy '04		
For Chapel Building Fund	$	1,200.00
Elmer C. Ingraham '26		
For Electronics Laboratory Building		400.00
Kidder Peabody & Co.		
For Kidder Peabody & Co. Building Fund		2,500.00
Leon M. Kolker		
For John Picker Kolker Room		6,400.00
John R. Macomber '97		
For Faculty Club Building		741.25
Beauchamp E. Smith		
For Hydrodynamics Laboratory Building		3,762.50
	$	15,003.75

OTHER GIFTS — PRINCIPAL AVAILABLE

The following gifts are added to the Unexpended Endowment Income for Designated Purposes:

Charles Hayden ('90) Foundation		
For current use of Hayden Memorial Scholarships	$	5,000.00
M. I. T. Club of Chicago		
For current use as scholarships		800.00
	$	5,800.00

The following gifts are for General Purposes:

Anonymous		
Additional for Anonymous J	$	2,000.00
Catherine R. Binkley Trust		
For Catherine R. Binkley Fund		5,283.28
Estate of John Randolph Brittain '93		
Distribution under a residuary bequest		177.46
Estate of Arthur J. Conner '88		
Residuary interest in a trust created by will		2,457.46
Class Gifts		
Additional contributions to Class Funds		660.40
Ford Motor Co.		
Payment on subscription for unrestricted use		166,670.00
William T. Henry ('70) Trust		
Income of a trust		23,380.00
M. I. T. Little Trust		
Rental income and sale of machinery		109,407.37
Trust Indenture under the Will of Leonard Metcalf '92		
Balance of trust income after payments to life beneficiaries		2,953.68
E. Mortimer Newlin ('14) Trust		
Income of a trust		1,125.00
Estate of Edward A. Sumner '97		
Distribution of residuary bequest		1,892.15
Estate of H. Sylvia A. H. G. Wilks		
Distribution of bequest		817,900.00
Development Fund		
Contributions for undesignated purposes received during the current year under the Development Program		269,626.65
		$1,403,533.45

The following gifts are for Designated Purposes:

ALUMNI FUND 1952–53	$ 189,374.52
SAMUEL BERKE '15	
For Samuel Berke Humanities Fund	5,000.00
CLASS OF 1898	
Contributions	200.00
CURTIS UNIVERSAL JOINT CO., INC.	
For Ralph E. Curtis ('15) Scholarship Fund	3,000.00
THE GABRIEL CO.	
For Industrial Fellowships in Electronics	3,000.00
GENERAL COMMUNICATION CO.	
For Industrial Fellowships in Electronics	5,000.00
GENERAL FOODS CORPORATION	
For Food Technology Fund	10,000.00
GERBER PRODUCTS COMPANY	
For Food Technology Fund	10,000.00
GOODYEAR TIRE & RUBBER CO.	
For Industrial Economics Graduate Fellowship	2,500.00
LAWRENCE HARRIS '30	
For Research Laboratory of Electronics	80.00
INDUSTRIAL RELATIONS FUND	
Contributions from industrial concerns	19,900.00
ARTHUR D. LITTLE, INC.	
For Arthur D. Little ('85) Lectures	17,072.00
M. I. T. MUTUAL BENEFIT ASSOCIATION	
For Mutual Benefit Association	617.39
OSCAR MAYER & CO.	
For Food Technology Fund	10,000.00
ESTATE OF C. LILLIAN MOORE	
For John A. Grimmons ('21) Fund	5,386.76
ROCKEFELLER FOUNDATION	
Grant for research in Biology	500,000.00
HENRY L. SEAVER	
For "Tubby" Rogers Fund	300.00
ALFRED P. SLOAN ('95) FOUNDATION	
For School of Industrial Management	275,000.00
WESTINGHOUSE EDUCATIONAL FOUNDATION	
For Industrial Economics Graduate Fellowships	2,500.00
WESTINGHOUSE ELECTRIC CORPORATION	
For research in Electrical Engineering	50,000.00
	$1,108,930.67

UNINVESTED FUNDS

SUPPORT OF THE INDUSTRIAL LIAISON PROGRAM	$1,100,605.00

A partial list of companies making payments in 1952-53:

Allegheny Ludlum Steel Company
Aluminum Company of America
American Can Company
Anaconda Copper Mining Company
Armco Steel Corporation
Cities Service Research and Development Company
Combustion Engineering, Incorporated
Continental Can Company, Incorporated

Continental Motors Corporation
Continental Oil Company
The Dow Chemical Corporation
Electrolux Corporation
General Motors Corporation
The Gillette Company
Gulf Research and Development Company
John Hancock Mutual Life Insurance Company
Hercules Powder Company
Latrobe Steel Company
Lever Brothers
Liquid Carbonic Corporation
The Lummus Company
The Mead Corporation
Merck & Company, Inc.
National Aluminate Corporation
North American Aviation, Incorporated
Philco Corporation
Pittsburgh Plate Glass Company
Radio Corporation of America
Shell Oil Company
Socony-Vacuum Oil Company, Incorporated
Standard Oil Company of California
Standard Oil Company (Indiana)
Stone & Webster Engineering Corporation
Sylvania Electric Products, Incorporated

The following gifts are for Student Aid:

ALLOY STEEL PRODUCTS CO.	
Undergraduate Scholarship	$ 800.00
BOSTON STEIN CLUB	
For Boston Stein Club Technion Fund	8,460.50
BOSTON STEIN CLUB SCHOLARSHIP AND LOAN FUND	
General Fund	1,120.00
Special Funds	
Bernstein, David W. '31 and Irene	500.00
Cooper, Benjamin '23	500.00
Groisser & Shlager Iron Works	500.00
Horovitz, Oscar H. '22 and Mary C.	500.00
Marcus, Richard J. '32 and Diane L.	500.00
McGarrahan, Owen J., Company	1,000.00
E. FRANCIS BOWDITCH	
For Dean's Fund	100.00
BRUMBERGER FOUNDATION, INC.	
For Undergraduate Scholarships	500.00
CLEVELAND GRAPHITE FOUNDATION	
For Undergraduate Scholarships	1,000.00
ARCHIE P. COCHRAN '20	
For Undergraduate Scholarships	850.00
THOMAS C. DESMOND '09	
For Scholarships	1,200.00
PHILIP B. DOWNING TRUST	
For Philip B. Downing Scholarship	270.00

THE FRANK MEMORIAL SCHOLARSHIP CORPORATION		
For Undergraduate Scholarships	$	1,000.00
FRANCIS MORGAN FRASHER, JR.		
For Undergraduate Scholarships		800.00
FRIENDS OF ISRAEL FUND		
Miscellaneous		600.00
THE GARDNER FOUNDATION		
For Undergraduate Scholarships		1,000.00
JOSEPH T. GARENON		
For Undergraduate Scholarships		200.00
ALFRED T. GLASSETT '20		
For Undergraduate Scholarships		200.00
ERNEST A. GRUNSFELD FUND		
For Grunsfeld European Fund		2,000.00
For Grunsfeld Fellowship Fund		1,500.00
HOUSTON ENDOWMENT, INC.		
For William S. Knudsen Fellowship		2,500.00
JAKOBSON SHIPYARD, INC.		
For Undergraduate Scholarships		1,000.00
KNAPP FUND		
For Knapp Memorial Scholarships		1,500.00
THE KULJIAN CORPORATION		
For Scholarships		1,000.00
HOWARD H. LANGDON '33		
For Undergraduate Scholarships		1,000.00
LOOFBOUROW MEMORIAL FUND		
Contributions for student aid		342.00
M. I. T. CLUB OF CHICAGO		
For Undergraduate Scholarships		450.00
JAMES C. MELVIN TRUST		
For Scholarships		8,550.00
NATIONAL ASSOCIATION OF ENGINE AND BOAT MANUFACTURERS		
For Scholarships		1,800.00
GERTRUDE L. NELSON		
For Undergraduate Scholarships		50.00
NEW ENGLAND FOUNDRYMEN'S ASSOCIATION		
For Undergraduate Scholarships		1,000.00
THEODORE AND MARJORIE RHODES FOUNDATION		
For Undergraduate Scholarships		200.00
SKIDMORE, OWINGS & MERRILL		
For Undergraduate Scholarships		1,200.00
ALFRED P. SLOAN ('95) FOUNDATION		
For Sloan National Scholarships		16,650.00
TEAGLE FOUNDATION, INCORPORATED		
For Scholarships		17,950.00
UNION CARBIDE & CARBON COMPANY		
For Undergraduate Scholarships		800.00
WESTINGHOUSE EDUCATIONAL FOUNDATION		
For Science Teachers Fellowships		12,500.00
JULIA WHITNEY		
For Grangei Whitney ('87) Scholarship Fund		200.00
	$	93,792.50

The following gifts are for Designated Purposes:

ALLIED CHEMICAL & DYE CORPORATION	
For fellowship in Chemical Engineering	$ 2,300.00
For fellowship in Chemistry	2,300.00
ALLOY CASTING INSTITUTE	
For research in Metallurgy	8,000.00
AMERADA PETROLEUM CO.	
For Geophysical Analysis Research	4,000.00
AMERICAN CANCER SOCIETY INCORPORATED	
For research in Biology	10,400.00
AMERICAN CHICLE COMPANY	
For fellowship in Chemistry	2,918.80
AMERICAN CYANAMID COMPANY	
For Soil Stabilization Research	2,916.68
For fellowship in Chemical Engineering	1,800.00
AMERICAN FOUNDRYMEN'S SOCIETY	
For fellowship in Metallurgy	5,000.00
AMERICAN HEART ASSOCIATION, INCORPORATED	
For research in Chemistry	6,300.00
AMERICAN IRON & STEEL INSTITUTE	
For English and History	6,699.36
AMERICAN SMELTING & REFINING CO.	
For fellowships in Metallurgy	17,000.00
AMERICAN SOCIETY OF MECHANICAL ENGINEERS	
For research in Mechanical Engineering	900.00
ANONYMOUS	
For Enzymology Research in Biology	10,000.00
ANONYMOUS	
For Soil Stabilization Research	5,000.00
ANONYMOUS	
For Anonymous — Map service	1,000.00
SPECIAL ANONYMOUS — NAVAL ARCHITECTURE	
Contributions	3,979.50
ARMCO FOUNDATION	
For fellowship in Physics	3,000.00
ARMOUR & COMPANY	
For fellowship in Food Technology	2,500.00
For research in Biology	17,992.00
For research in Metallurgy	7,500.00
ATLANTIC REFINING CO.	
For Geophysical Analysis Research	4,000.00
AVIATION WEEK	
For fellowship in Aeronautical Engineering	1,800.00
EVERETT MOORE BAKER FUND	
Contributions	120.00
BARBER GREENE CO.	
For research in Soil Stabilization	5,000.00
WALTER J. BEADLE '17	
For Miller and Commons Room	3,000.00
R. L. BISPLINGHOFF	
For Aeroelastic Research in Aeronautical Engineering	310.00
BOSTON INSULATED WIRE & CABLE CO.	
For Balsbaugh Research in Electrical Engineering	2,000.00

C. B. Breed '97	
For Civil Engineering Summer Camp	$ 300.00
Bristol Laboratories Incorporated	
For research in Chemistry	5,000.00
Bryant Chucking Grinder Company	
For research in Mechanical Engineering	13,000.00
Buffalo Electric Chemical Company	
For research in Soil Stabilization	5,000.00
Godfrey L. Cabot Charitable Trust	
For equipment for Geology	5,000.00
Godfrey L. Cabot '81	
For research in Carbon Black	4,000.00
Calgon, Inc.	
For research in Civil Engineering	1,500.00
California Research Corporation	
For Geophysical Analysis Research	4,000.00
Campbell Soup Company	
For research in Food Technology	3,000.00
Carborundum Company	
For research in Mechanical Engineering	5,000.00
Central Violeta Sugar Company	
For Cuban Sugar Research	6,250.00
Cherry Burrell Corporation	
For research in Food Technology	3,271.60
Children's Medical Center	
For research in Biology	250.00
Jane Coffin Childs Memorial Fund	
For fellowship in Biology	5,312.50
Cities Service Oil Company	
For Geophysical Analysis Research	4,000.00
Climax Molybdenum Company	
For research in Metallurgy	10,000.00
Commonwealth Fund	
For research in Biology	35,500.00
For Medical Fellowship	4,000.00
Compania Azucarera Atlantica del Golfo	
For Cuban Sugar research	6,250.00
Dr. Karl T. Compton	
For Infirmary Nurses Special Fund	500.00
Continental Can Company	
For research in Electrical Engineering	2,000.00
Corning Glass Works	
For research in Metallurgy	2,000.00
Dow Chemical Company	
For fellowship in Chemical Engineering	5,000.00
E. I. duPont de Nemours & Company Incorporated	
For fellowship in Chemical Engineering	4,100.00
For fellowship in Chemistry	3,400.00
For fellowship in Mechanical Engineering	4,100.00
For fellowship in Physics	3,400.00
For research in Food Technology	2,500.00
For fundamental research in Chemistry	15,000.00

EASTERN LACQUER CORPORATION	
For structures Laboratory	$ 300.00
EASTMAN KODAK COMPANY	
For fellowship in Physics	3,050.00
H. E. EDGERTON	
For Film research in Electrical Engineering	2,500.00
ELASTIC COLLOID RESEARCH CORPORATION	
For Crawford Fellowship in Chemical Engineering	3,400.00
ENGINEERED PRECISION CASTING COMPANY	
For research in Metallurgy	2,000.00
EPISCOPAL DIOCESE OF MASSACHUSETTS	
For general purposes	250.00
ETHICON SUTURES LABORATORY INCORPORATED	
For research in Biology	5,000.00
ETHYL CORPORATION	
For research in Chemistry	8,000.00
For research in Mechanical Engineering	2,600.00
EXOMET INCORPORATED	
For research in Metallurgy	6,300.00
FIRST NATIONAL STORES	
For Campbell special fund in Food Technology	5,000.00
H. W. FLAGG	
For Structural Laboratory in Civil Engineering	110.00
FORD FOUNDATION	
For research in Economics	21,000.00
FORD MOTOR COMPANY	
For general purposes	500.00
FOREIGN STUDENT SUMMER PROJECT	
Miscellaneous contributions	3,175.00
FOUNDRY EDUCATIONAL FOUNDATION	
For fellowship in Metallurgy	5,000.00
FRIENDS OF MUSIC AT M. I. T.	
Contributions	525.00
GENERAL ELECTRIC COMPANY	
For Cascade Research in Aeronautical Engineering	15,000.00
GENERAL ELECTRIC COMPANY	
For fellowship in Mechanical Engineering	1,200.00
For fellowship in Electrical Engineering	1,200.00
For fellowship in Metallurgy	2,600.00
For fellowship in Chemistry	4,500.00
GERBER PRODUCTS COMPANY	
For fellowship in Food Technology	2,500.00
DONALD B. GILLIES, JR. '41	
For Donald B. Gillies Scholarship	1,000.00
GOODYEAR TIRE & RUBBER COMPANY	
For fellowship in Aeronautical Engineering	2,500.00
GREAT LAKES STEEL CORPORATION	
For research in Mechanical Engineering	1,000.00
CRAWFORD H. GREENEWALT	
For Edgerton Film Research	2,000.00
GULF OIL RESEARCH & DEVELOPMENT COMPANY	
For Geophysical Analysis Research	4,000.00

GULF AND SOUTH AMERICAN STEAMSHIP COMPANY		
For scholarships in Naval Architecture	$	10,000.00
HARVARD UNIVERSITY		
For Nova Scotia Coal Research		100.00
For research in History		1,700.00
HUMBLE OIL COMPANY		
For fellowship in Chemical Engineering		2,700.00
JEROME C. HUNSAKER '12		
For Aeronautical Engineering		1,000.00
GODFREY M. HYAMS TRUST		
For Hyams Radiation Research in Electrical Engineering		7,500.00
SCHOOL OF INDUSTRIAL MANAGEMENT MISCELLANEOUS GIFTS FUND		
Contributions		400.00
ELMER C. INGRAHAM '26		
For Research Laboratory of Electronics		3,000.00
I. B. M. CORPORATION		
For fellowships in Physics		7,600.00
For fellowships in Electrical Engineering		2,500.00
JOHNSON & JOHNSON COMPANY		
For research in Biology		5,000.00
M. W. KELLOGG COMPANY		
For research in Mechanical Engineering		3,000.00
CHARLES F. KETTERING FOUNDATION		
For research in Biology		16,471.65
For research in Chemistry		18,000.00
ESTATES OF CHARLES A. '96 AND MARJORIE KING		
For research in Biology		10,000.00
KNAPPEN, TIPPETTS, ABBOTT, MCCARTHY		
For Studies in City Planning		2,500.00
THEODORE H. KRUEGER '14		
For Industrial Management		500.00
ELI LILLY COMPANY		
For research in Biology		8,000.00
For research in Chemistry		6,000.00
LINDE AIR PRODUCTS COMPANY		
For research in Chemistry		825.00
LUCIDOL DIVISION		
For research in Chemistry		13,000.00
MAGNOLIA PETROLEUM COMPANY		
For Geophysical Analysis Research		4,000.00
MALLINCKRODT CHEMICAL WORKS		
For research in Chemistry		2,000.00
MANUFACTURING CHEMISTS ASSOCIATION INCORPORATED		
For research in Building Engineering and Construction		18,337.00
NEWMAN MARSILLIUS '17		
For Industrial Management		1,000.00
COMMONWEALTH OF MASSACHUSETTS		
For research in Civil Engineering		30,000.00
MERCK & COMPANY INCORPORATED		
For research in Chemistry		1,250.00
MERRILL FOUNDATION		
For research in Economics		5,000.00

NICHOLAS A. MILAS	
For research in Chemistry	$ 5,058.46
MILLER AND COMMONS ROOMS IN MECHANICAL ENGINEERING	
Contributions	4,864.50
MUCHNIC FOUNDATION	
For fellowships in Metallurgy	3,000.00
MUTUAL SECURITY AGENCY	
For Foreign Student Summer Project	20,250.00
NATIONAL ACADEMY OF SCIENCE	
For research in Physics	500.00
NATIONAL GEOGRAPHIC SOCIETY	
For Edgerton Film Research in Electrical Engineering	7,850.00
NATIONAL INSTITUTES OF HEALTH	
For Medical Fellowship	3,500.00
NATIONAL LIME ASSOCIATION	
For research in Building Engineering and Construction	10,000.00
NATIONAL LEAD COMPANY	
For fellowship in Metallurgy	600.00
NOVA SCOTIA RESEARCH FOUNDATION	
For research in Geology	5,000.00
NOVA SCOTIA TECHNICAL INSTITUTE	
For Structural Laboratory in Civil Engineering	75.00
OWENS ILLINOIS GLASS COMPANY	
For research in Chemistry	13,000.00
For research in Food Technology	827.77
PAN AMERICAN AIRLINES COMPANY	
For Foreign Student Summer Project	550.00
PAN AMERICAN REFINING CORPORATION	
For fellowship in Chemical Engineering	2,300.00
PANTEX MANUFACTURING COMPANY	
For research in Mechanical Engineering	1,000.00
PHILLIPS PETROLEUM COMPANY	
For Geophysical Analysis Research	4,800.00
PROCTER & GAMBLE COMPANY	
For fellowship in Chemical Engineering	900.00
For fellowship in Food Technology	2,700.00
For research in Food Technology	13,750.00
For fellowship in Mechanical Engineering	5,100.00
BERNARD PROCTOR '23	
For Medical Department fund	190.00
UNIVERSITY OF PUERTO RICO	
For research in City Planning	1,800.00
PUNTA ALEGRE SUGAR COMPANY	
For Cuban Sugar Research	6,250.00
QUAKER OATS COMPANY	
For research in nutrition	6,340.00
SIDNEY H. RABINOWITZ AND FAMILY FOUNDATION	
For Campbell Special fund in Food Technology	1,000.00
RAYTHEON MANUFACTURING COMPANY	
For research in Food Technology	7,500.00

RESEARCH CORPORATION	
For research in Vitamins A and D	$ 8,500.00
For research in Nutrition	10,000.00
For research in Physics	7,500.00
ROCHE ANNIVERSARY FOUNDATION	
For fellowship in Food Technology	2,500.00
ROCKEFELLER FOUNDATION	
For research in Biology	40,500.00
For research in Chemistry	2,307.55
For research in Geology	4,674.89
ROHM & HAAS COMPANY	
For research in Soil Stabilization	5,000.00
DAMON RUNYON MEMORIAL FOUNDATION	
For research in Biochemistry	11,000.00
SEAMAN MOTORS INCORPORATED	
For research in Soil Stabilization	10,000.00
SCHELL ROOM IN INDUSTRIAL MANAGEMENT	
Contributions	14,372.97
SHARP & DOHME, INCORPORATED	
For research in Chemistry	5,800.00
SHELL FELLOWSHIP COMMITTEE	
For fellowship and research in Mechanical Engineering	7,700.00
For research in Metallurgy	5,000.00
For fellowship and research in Physics	7,700.00
THOMAS K. SHERWOOD '24	
For research in Chemical Engineering	100.00
SHORTENING INSTITUTE	
For research in Food Technology	5,000.00
NELSON SLATER, JR. '50	
For Industrial Management	200.00
ALFRED P. SLOAN ('95) FOUNDATION INCORPORATED	
For School of Industrial Management	275,000.00
For executive development program	195,000.00
For Foreign Student Summer Project	105,540.00
For M. I. T. movie	10,000.00
SOCIAL SCIENCE RESEARCH COUNCIL	
For Faculty Research Fellowship	3,600.00
STANDARD OIL FOUNDATION, INCORPORATED	
For fellowship in Chemical Engineering	2,200.00
STANDARD OIL DEVELOPMENT COMPANY	
For Geophysical Analysis Research	4,000.00
STANOLIND OIL & GAS COMPANY	
For research in Soil Stabilization	2,000.00
For Geophysical Analysis Research	4,000.00
STRUCTURES LABORATORY CIVIL ENGINEERING	
Contributions	75.00
SUGAR RESEARCH FOUNDATION	
For research in sugar in Chemistry	4,000.00
For research in Food Technology	6,375.00
SUN OIL COMPANY	
For Geophysical Analysis Research	4,000.00
TEXAS COMPANY	
For Geophysical Analysis Research	4,000.00

TEXAS INSTRUMENT — GEOPHYSICAL SERVICE INCORPORATED	
For research in Geology and Geophysics	$ 2,000.00
For Geophysical Analysis Research	4,000.00
TEXTRON FOUNDATION	
For fellowship in Mechanical Engineering	1,800.00
THERMODYNAMICS LABORATORY	
Contributions	500.00
TIMKEN ROLLER BEARING COMPANY	
For research in Metallurgy	12,500.00
TITANIUM ALLOY MANUFACTURING COMPANY	
For research in Metallurgy	1,500.00
TUFTS COLLEGE	
For nutrition research in Food Technology	1,200.00
WILLIAM UNDERWOOD COMPANY	
For fellowship in Food Technology	2,500.00
UNION CARBIDE & CARBON COMPANY	
For fellowship in Chemistry	2,600.00
For fellowship in Metallurgy	3,300.00
UNITED ENGINEERING TRUSTEES, INCORPORATED	
For research in Metallurgy	5,500.00
For research in Civil Engineering	1,000.00
UNITED GEOPHYSICAL COMPANY	
For Geophysical Analysis Research	4,000.00
U. S. RUBBER COMPANY	
For fellowship in Chemistry	3,300.00
UNITED SHOE MACHINERY CORPORATION	
For research in Chemical Engineering	3,000.00
For research in Mechanical Engineering	1,500.00
VANADIUM ALLOY STEEL COMPANY	
For research in Metallurgy	3,500.00
VERTIENTES — CAMAGUEY SUGAR COMPANY OF CUBA	
For Cuban Sugar research	6,250.00
VISKING CORPORATION	
For fellowship in Chemistry	2,500.00
WILLIAM WALKER FUND	
Contributions for memorial room in Chemical Engineering	2,625.00
HENRY E. WARREN '94	
For Campbell special fund in Food Technology	2,000.00
WEIRTON STEEL COMPANY	
For research in Metallurgy	20,000.00
WESTINGHOUSE EDUCATIONAL FOUNDATION	
For Westinghouse Professorship in Mechanical Engineering	15,000.00
WESTINGHOUSE ELECTRIC CORPORATION	
For Cascade Research in Aeronautical Engineering	10,000.00
HOWARD D. WILLIAMS '11	
For Industrial Management	500.00
WORTHINGTON CORPORATION	
For research in Mechanical Engineering	5,000.00
	$1,601,890.23

OTHER GIFTS

The following gifts are added to Agency Funds held by the Institute for investment purposes.

CLASS OF 1903	
Contributions of class members	$ 8,194.44
CLASS OF 1905	
Contributions of class members	5,620.00
CLASS OF 1906	
Contributions of class members	6,477.13
CLASS OF 1910	
Contributions of class members	2,610.00
CLASS OF 1916	
Contributions of class members	2,042.50
CLASS OF 1917	
Contributions of class members	6,999.51
CLASS OF 1933	
Contributions of class members	483.12
CLASS OF 1937	
Contributions of class members	1,554.02
CLASS OF 1944	
Contributions of class members	576.58
CLASS OF 1949	
Contributions of class members	339.11
OTHER CLASSES	
Contributions of class members	412.45
SAILING PAVILION FUND	
Contribution for new equipment	3,416.34
M. I. T. WOMEN'S DORMITORY FUND	3.00
	$ 38,728.20

The following gifts are added to Annuity Funds:

ANONYMOUS E. M.	
For Anonymous E. M.	$ 10,000.00
ESTATE OF GERTRUDE NEWMAN	
For an annuity	10,000.00
GEORGE S. WITMER '09	
For Witmer Fund	4,500.00
	$ 24,500.00

Reports of Other Administrative Officers

Secretary of the Institute

THE INSTITUTE'S PROGRAM of external relations is designed to provide the best possible communications with those individuals and groups outside the M. I. T. family who are concerned, directly or indirectly, with our operations. Among the most important of these are the business and industrial community, secondary schools, and the general public. Special offices have been set up

to establish and maintain the proper communication system with each of these groups.

Our relations with industry are varied and complex. Through co-operative courses and placement services, companies have direct contact with the students themselves. Through contract research and grants-in-aid, industry may arrange with our faculty and staff for fundamental studies in fields of mutual interest. The many special programs offered during the summer provide still further opportunities for the interchange of ideas among faculty and industrial personnel. With the ever increasing need for direct financial support from industry, the Institute has established within the past few years two additional offices. The permanent Development Office, under Mr. Ralph T. Jope, has the responsibility for the planning and implementation of our general fund-raising program. The Industrial Liaison Office, headed by Mr. William R. Weems, keeps the sixty-eight companies who are contributing to our general support, in direct touch with the Institute's research efforts.

DEVELOPMENT OFFICE

Total gifts received by the Institute during the past fiscal year amounted to $5,961,897.45. Active solicitation efforts continue to be directed primarily towards industrial support. This may consist of grants-in-aid for basic research in specified fields, or of unrestricted gifts that may be used for current operations. This latter type of grant usually entitles the donor to the services of the Industrial Liaison Program. In the highly competitive undertaking of obtaining corporate support for higher education, this Program has proved to be a very important adjunct.

There has been a gratifying increase in undergraduate scholarship funds, both endowment and current grants. Industrial scholarships on the annual grant basis have become an important source of this type of support. Recent awards have included provisions for supplementary grants to the school to cover actual costs in excess of tuition. It is hoped that this pattern will be followed in future scholarship programs.

In addition to soliciting corporate support, the Development Office has been very active in a bequest program, with both alumni and non-alumni. In addition to over 23,000 letters to alumni, the following procedures have been taken to stimulate giving by will: (1) As alumni wills are probated, a story is submitted to class secretaries for inclusion in class notes in the *Technology Review;* and (2) Advertisements have been run from time to time in the *Technology Review* to remind alumni that M. I. T. is in need of bequests.

Since the completion of the letters to alumni on bequests, over 10,000 letters have been sent to non-alumni prospects whose names were obtained through the Development Program and elsewhere. The responses, like those of the alumni campaign, are difficult to assay, although one person advised that she was establishing a memorial fund of $50,000 in her will.

Smaller special projects have received the attention of the Development Office, along with its major solicitation efforts. Funds amounting to $43,709 have been raised for the purchase of a new dinghy fleet.

The primary concern of the Institute's continuing development program is capital funds, preferably those which are unrestricted in their use. Such funds would function as endowment, but could be made available for current expenditures by vote of the Executive Committee of the Corporation. Additions to endowment funds for designated purposes during the past year included receipts for the Webster Professorship in Electrical Engineering, the Gertrude Newman Fund, and the Grimmons Fund, the last two for scholarships. Efforts are under way to obtain endowment for additional professorships and other important uses.

Two major building requirements were left unfulfilled by the recent intensive Development Drive: a laboratory for the physical sciences to house the Institute's scattered activities in nuclear science and electronics, and a new gymnasium. These projects have had a high priority for some time and will form an important part of our fund-raising program.

INDUSTRIAL LIAISON OFFICE

The end of the fiscal year 1952–1953 marked the fifth anniversary of the Industrial Liaison Program. Since the normal term of the agreements with participating companies is five years, a considerable number of them were due for renewal. This situation should yield a realistic evaluation of the Program from the industrial viewpoint. During the year, the financial benefit of the Industrial Liaison Program to the Institute amounted to almost $1,100,000. Two companies found it necessary to withdraw, and a total of eight new ones joined, so that the number of participating companies increased to 68 at the end of the year. The average amount of activity per company through the Industrial Liaison Office has also continued to grow.

Over 80 per cent of the companies participated in a series of eight private symposia; the average attendance was slightly over thirty-eight visitors representing twenty-three companies.

The organized distribution of preprints, reports, and other documents continued to be an important and expanding feature of the Industrial Liaison Program. During the year the regular mailing operations distributed 313 different documents, with the average number distributed estimated at 150 copies. In addition, the office handled a greatly increased number of special requests for publications, primarily due to wider knowledge of the Industrial Liaison Program within participating companies, and due partly to the availability of the *Directory of Current Research*. This document, in its second annual volume this year, has proved invaluable as a "technological map" of M. I. T.; its wider use has caused the Office to establish systems for correlating entries therein with publications issuing from M. I. T. Publications generated within the Office itself included a new brochure designed for disseminating information on the Industrial Liaison Program within participating companies.

For the first time, the Industrial Liaison Office has this year maintained an informal record of individual visits by company personnel. Slightly over 85 per cent of the companies took advantage of the opportunity of arranging M. I. T. visits through the

Liaison Office, and the recorded total of such visitors is 361. The actual total is probably closer to 400.

Many of the most interesting and fruitful activities were, as in previous years, in the special or "unusual" category. For example, thirteen Liaison Program companies participated in a research project being conducted by M. I. T. staff members on certain factors of morale, communications, and attitudes that affect the performance of professional people engaged in research and development.

Within the Industrial Liaison Office, the year was characterized by adjustment to major changes in operating personnel. Early in the year, Mr. Robert V. Bartz, in charge of the Industrial Liaison Program since its inception, left to become Director of the Office for Industrial Associates at the California Institute of Technology. Shortly thereafter, Dr. Rowland S. Bevans left to join a prominent industrial research organization. The vacancies thus created were filled by Mr. Thomas Cantwell and Mr. Eugene B. Skolnikoff. The remainder of the regular staff consisted of Mr. Walter L. Allison and Mr. William R. Weems, the latter being appointed as Director. During the fall Professor Rogers B. Finch served as a part-time member of the Liaison staff, and at the end of the fiscal year arrangements were completed for Mr. Vincent Fulmer to be added to the staff.

THE EDUCATIONAL COUNCIL

The Educational Council was established two years ago to help attract the best possible students to the Institute, and thus maintain an adequate flow of qualified graduates into industry and the professions. The Council consists of selected alumni throughout the country who keep in direct personal contact with secondary schools and their students. The office of the Educational Council, under the supervision of its Executive Secretary, Mr. Arthur L. Bryant, furnishes the members with the latest information on the Institute's activities and policies.

The past twelve months have seen considerably more time

and effort devoted to field organization than was possible during the first year of the Educational Council program. This increase was due primarily to the fact that the necessary groundwork had been laid during the first year, including the establishment of general policies and procedures and the preparation of necessary literature.

In September, 1952, the staff was augmented by the addition of Mr. Walter L. Milne on a half-time basis. Mr. Milne has assumed primary responsibility for the publication of the monthly *Bulletin* and has taken an active part in the major activities of the Educational Council office.

Membership in the Council now totals 448 alumni throughout the nation, including 246 Honorary Secretaries and 202 Educational Counselors. In addition to these domestic representatives, 33 Honorary Secretaries are located in foreign countries. This brings the total number of Honorary Secretaries and Educational Counselors to 481.

Thirty-eight Council units are now fully active, and organization is under way in 36 additional areas. These 74 areas are located in 29 states plus the District of Columbia and Hawaii; all are outside of New England. Within the 38 active units, Council members are now working with 381 secondary schools. A year ago steps toward organization had been taken in only 18 areas.

Final statistics are not yet available concerning interviews with applicants for admission to the 1953 freshman class, but those for the previous year show that Council members reported on 1491 admissions applicants. Although this is only one of the many services that members are presently rendering to M. I. T., its significance and importance to the Institute's welfare make it worthy of particular mention.

In addition to normal visits made on their own initiative to schools with which they are in contact, Honorary Secretaries and Educational Counselors represented the Institute at 56 college conferences sponsored by secondary schools during the past academic year. This in itself is a very important service to the

Institute, since M. I. T. would not otherwise be represented at these local programs.

The *Educational Council Handbook* was published in the fall of 1952 and distributed to all members. In addition, eight issues of the *Educational Council Bulletin* were published during the school year. Copies of the *Bulletin* were sent to the presidents and secretaries of local M. I. T. Clubs as well as to the Honorary Secretaries and Educational Counselors.

The President's dinner for Educational Council members and officers of M. I. T. Clubs was held on Sunday, June 14. Ninety-three alumni attended this program, which was held for the second time in the new Faculty Club.

This report would not be complete without emphasizing again the magnificent support that the Educational Council has received from alumni. Their enthusiastic response in very large measure accounts for the rapid and substantial progress that has been possible to date, and it assures the ability of the Council to become an increasing source of strength to the Institute in the years ahead.

PUBLIC RELATIONS

The relations between M. I. T. and the general public cannot be defined as specifically as those with industry and schools, but they are equally important. As a national resource of trained manpower and fundamental research, the Institute has heavy obligations to the nation at large. In turn, it must call upon the public and its governing agencies for sympathetic support, both tangible and intangible. The best way to encourage such support is to keep the outside world informed as to our objectives, policies, and accomplishments. Two different offices, the News Service (John J. Rowlands, Director) and the Office of Publications (John I. Mattill, Director), share this responsibility.

News Service. The past year has brought to the News Service an increasing number of exploratory inquiries on science and

engineering as subjects for television and radio programs. These proposals are being made at a high intellectual level, and it is expected that the Institute will be able to co-operate in a number of such educational programs with mutual benefit to the public and to M. I. T. A constantly increasing number of nationally known writers are coming to the Institute for articles on various phases of science and engineering for magazines of wide circulation.

The many programs in this year's Summer Session were given exceptionally wide publicity through more than 1,300 journals in various fields in this country and abroad.

The Pathé documentary film, "Men of Science," is being shown in theatres throughout the country, and responses from the public, including our own alumni, indicate that it is making a very favorable impression.

Office of Publications. In fulfilling its responsibilities for the official announcements and documents of the Institute during 1952–1953, the Office of Publications has assisted in producing over 90 pieces of printed matter. These range from single-sheet leaflets to the 228-page General Catalogue, to which the Office of Publications' contribution ranges from the smallest degree of management to complete editorial, design and production supervision.

A primary purpose during the year has been to achieve a standard of contemporary graphic arts that will reflect credit on the Institute comparable with that achieved by its educational and technical activities. Competence in this field should help to demonstrate that M. I. T. is a center of interests far broader than the technology for which it is most famous.

WALTER H. GALE

Dean of Students

THE PAST YEAR has been devoted almost exclusively to building an organization and clarifying procedures in accordance with the philosophy described briefly in this report a year ago. Several developments deserve special mention.

The establishment of a Student Aid Center in separate offices under the Director of Student Aid is already doing much to unify and coordinate financial aid to students by scholarships, loans, and jobs.

The Freshman Advisory Council has been outstandingly successful in its first year and promises in the future to provide close faculty supervision of and participation in the work of the first year.

Although women students are a very small minority of the student body, the increasing demand by women for scientific and technical education and the outstanding accomplishments of many women in professional life indicate the growing importance of education for women at the Institute. The appointment of a woman as an Assistant to the Dean of Students with responsibility for women students is a significant step. Already the response from students and alumnae has been most gratifying.

This office is charged with coordinating counseling at M. I. T. and is, therefore, concerned not only with all student advisory programs but with the whole area of special services such as reading instruction, aptitude testing, and tutoring. The appointment this spring of a new Associate Dean of Students with special responsibility in this area should do much to increase the efficacy of present services and to develop more adequate and better-coordinated auxiliary services.

With the building of the new auditorium and a chapel, attention is focused on the Institute's concern for the spiritual welfare of students. At the same time, the General Secretary of the Technology Christian Association has retired, thus emphasizing the need to re-examine the future of that organization in relation to present-day needs and developments. A two-year period of study

and exploration, both in connection with the building of the chapel and auditorium and in T. C. A., has been set up: the new Associate Dean of Students mentioned above has been charged with a two-year assignment of stimulating and coordinating the thinking of the Institute family relative to spiritual needs at M. I. T.; and a new General Secretary has been appointed by T. C. A. for a two-year period to join in this study and to plan a future program for T. C. A. commensurate with new programs sponsored by the Institute. The significance of this two-year period of exploration and the importance of active participation in discussions by all groups at the Institute cannot be over-stressed. In an age of scientific miracles and untold tragedies in human relations, M. I. T.'s leadership in the field of moral, spiritual values as they apply to human relations can be of paramount importance.

Active faculty concern and responsibility in educational procedures outside the classroom is fundamental to the success of undergraduate education in modern times. This report would not be complete, therefore, if it did not express appreciation of the work done this year by the Faculty Committee on Student Environment in thinking through some of the underlying objectives of education in terms of the development of the whole man — physically, intellectually, emotionally, spiritually, socially, and civicly. Translation of these objectives into recommendations of policy by this Committee should be of vital importance in the years immediately ahead.

STUDENT AID

A total of approximately $675,000 in financial aid was made available to our student population during the academic year ending June, 1953: $190,000 earned in student employment, $265,990 in undergraduate scholarships, and $217,266 in loans.

Student Employment. The rapid growth of the student staff system of the past two years has now begun to stabilize, and it is anticipated that eleven student staffs will be fully manned in different units of the campus this fall. The rapid expansion of this system

has produced a number of problems and has pointed up the necessity to formulate broad general policies of operation and coordination. One of our objectives during the coming year is to develop cooperatively definitions of responsibilities in order to insure that this program will operate effectively in the different services of the Institute and be a valuable part of our student aid program.

This year's experience has shown that the desire and willingness to earn is prevalent with a large fraction of our student body; however, the dependency exemption of $600 under the current Federal Income Tax law has proved to be a deterrent and a handicap, as many parents were justifiably concerned lest their dependents earn in excess of the tax limit.

In addition to the student staffs, a number of our students have earned through their services to many departments and other divisions of the Institute.

During the spring of 1953 the Student Personnel Office assisted and counseled almost 500 undergraduate students concerning summer jobs; the tentative results of this activity show that this can be a very important factor in a student's financial plans. More than 200 students were placed in vacation jobs with estimated earnings of $95,000.

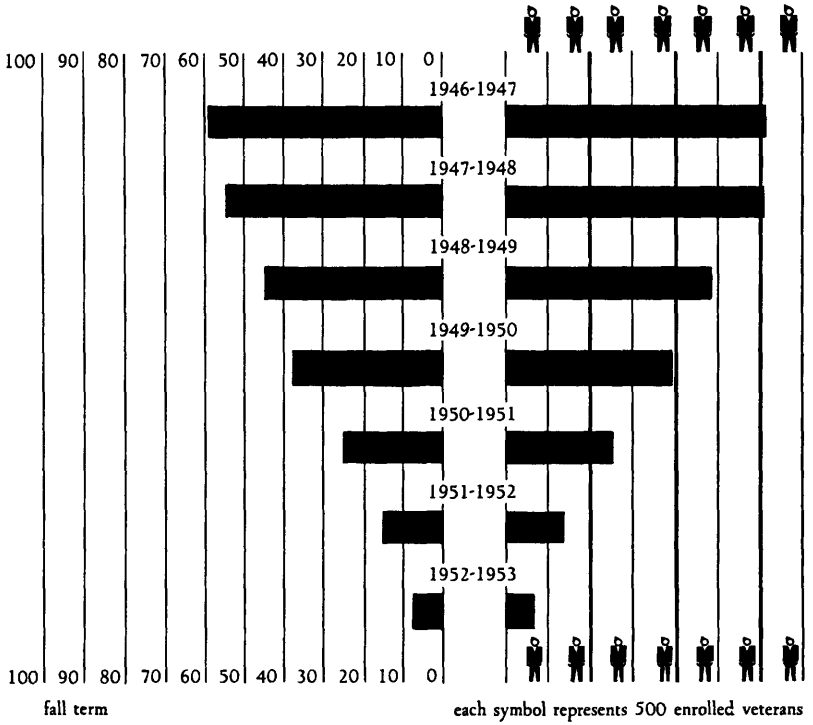
Scholarships and Loans. Although the announced increase in tuition does not go into effect until September, 1953, the scholarship awards for 1952–1953 increased in total dollars by better than forty per cent and in numbers of students assisted by some eighteen per cent. This increase has been made possible to a limited extent by a gain in annual gifts from several different sources but in large part by a decision to use the accumulated income of our scholarship funds at an accelerated rate.

Grants from the Technology Loan Fund showed a gain of ten per cent over the previous year with only a slight increase in numbers. It is expected that for 1953–1954 total loans granted will exceed any year since the establishment of the Fund twenty-three years ago.

In common with many colleges and universities, the number

of scholarship applications from prospective entering freshmen continues to show a sharp upward trend. For the class entering in the fall of 1953, more than 1,500 requests (a fifty per cent increase over the previous year) were processed and considered. This gain in number of requests was stimulated, in part, by the announcement of the Alfred P. Sloan National Scholarships in Science and Engineering, which surpass any freshman or undergraduate award that has previously been available. First selections of Sloan National Scholars, and also of recipients of four-year scholarships established by the Lockheed Educational Foundation and the Cincinnati Milling Machine Company, were made this Spring.

VETERANS ENROLLED UNDER P.L. 16 or 346
AND THEIR PERCENTAGE OF TOTAL REGISTRATION



Gifts amounting to almost $46,000 from seventeen private foundations, trusts, companies, and professional organizations as well as individuals, were used to assist 79 undergraduates.

SCHOLARSHIPS AND LOANS	*1952–1953*		*1951–1952*	
	Number	*Award*	*Number*	*Award*
From M. I. T. endowment funds:				
Freshman scholarships	283	$124,040	235	$ 71,725
Other undergraduate scholarships	274	96,155	256	81,424
From outside sources:				
Other undergraduate scholarships	79	45,795	62	35,162
Total Scholarships	636	$265,990	553	$188,311
Undergraduate loans	283	167,540.18	270	148,096
Total scholarships and loans	*819	$433,530.18	*753	$336,407

* Allowing for individuals receiving both scholarships and loans.

VETERANS UNDER PL 16 OR 347	*1952–1953*		*1951–1952*	
	No.	*Per cent of total registration*	*No.*	*Per cent of total registration*
Fall Term	340	7%	687	15%
Spring Term	257	5	502	11
Summer Term	57	4	137	8

ATHLETICS

Undergraduate and graduate student participation in organized athletics remained at the customary high level (approximately 60 per cent) over the past year. A slight increase was noted, however, in the use by students and staff members of such facilities as the sailing pavilion, swimming pool, tennis courts, squash

courts, and playing field areas. The Alumni Pool continues to be the most popular facility, attracting an average of 300 persons per day.

The outstanding improvement of facilities during the past year was the acquisition of a new fleet of 40 Fiberglas dinghies to replace the original Tech wood dinghy fleet. The Nautical Association members are enthusiastic over the performance of these boats; in addition there are also 10 dinghies of different designs, four 110's, and one Star Boat available to students interested in more advanced sailing activities.

The four clay courts adjacent to the Walker Memorial Building have been hard-surfaced, and the eight Briggs Field Courts have been reconditioned and repainted. A new Nissen trampoline has been installed in the Barbour field house for members of the ski and diving (swimming) teams, and for members of the gymnastic (physical education) classes.

The freshman cross-country team, under the expert guidance of veteran coach Oscar Hedlund, finished first among 18 freshman teams in the New England Colleges' Cross-Country Championships. The varsity team established its best record since 1946, finishing second in a field of 23 colleges in the championship meet.

The sailing team maintained its prestige by placing second behind Harvard in the National Collegiate Championships at Kings Point, New York. A team composed of M. I. T. and Harvard sailors successfully defended the Lipton Cup in a challenge from a West Coast collegiate team; this cup represents the International Collegiate Championship. By winning the 1953 McMillan Cup Regatta at Annapolis in early April the M. I. T. team added still further to its laurels.

The baseball team finished a surprisingly strong third among seven colleges in the Greater Boston Collegiate Baseball League, behind Boston College and Tufts College. This record is especially significant because baseball is a relatively new sport at M. I. T.; the first formal team was organized in the spring of 1949, and from a competitive standpoint the teams have compiled excellent records.

Charles Seymour, '53, varsity heavyweight wrestler, finished his collegiate career undefeated and winning the New England championship. In 36 collegiate matches, he won 33 by falls and 3 by decisions.

STUDENT HOUSING

The development of the dormitory system as an integral part of the educational program continues to be one of the most important, as well as one of the most difficult, phases of our work. Thanks to the untiring work of student government at all levels during this last year, much clarification of responsibility between faculty and student government has been accomplished, better means of communication instituted, and clarification of regulations established. It is vital that this work be continued this next year, that the Faculty Committee on Environment become actively engaged in dormitory problems, and that more faculty participation in the life of the dormitories be encouraged in every way possible. At the same time, a continuing study should be made of general administrative procedures in the dormitories leading to as much decentralization and as much local autonomy in each unit as possible. The continued growth of the Graduate School points up the urgency of making more adequate plans for graduate student housing; the over-all administrative procedures for the Westgate units should receive continuing study with the objective of making Westgate a more integral part of our student housing program.

STUDENT GOVERNMENT AND ACTIVITIES

A special word of praise should be said for the work done by student government during the last year. Long concerned that its structure was inadequate to handle modern conditions, student government has undertaken a continuing study of its organization and has made several changes: elections were moved forward this year so that new incumbents were in office long enough, with their predecessors available for advice, to become adequately organized before the beginning of a new school year; the Leadership Conference was moved from the fall to the spring so that it serves as an

adequate means of indoctrination and transition as well as a forum for discussing policies for the ensuing year; and effective cooperation with officials of the City of Cambridge was established by student government this spring.

Both student government and this office have been dissatisfied with our relationships with student activities. The new Activities Council, to be established through the recent re-organization of student government, should do much to solve this problem. Meanwhile, student government is studying, with the help of the Alumni Association and the Administration, ways of re-establishing and expanding the traditional role of alumni as advisers to student organizations.

WOMEN STUDENTS

This office has kept in close touch with the activities of the Women's Associations, both undergraduate and alumnae, and has tried to bring together the dormitory group and the girls unable to live in the dormitory. Because the dormitory is still not adequate for the number who apply, especially freshmen, we have taken steps so that we can recommend intelligently suitable alternatives for that kind of living unit.

Together with the Women's Alumnae Association, we have undertaken a questionnaire sent to all women graduates to aid in setting up a better program for future women students and to bring the alumnae roster up to date.

For the first time, a young woman basketball coach was brought in to teach some of the fine points of the game to the girls, and one or two games were played with an outside team.

All women's activities are now centered in one place, and we hope the women will feel that this office is a place where they may receive the same consideration and help which the men have always received.

CONCLUSION

Two men active in work with students for many years retired in June: Mr. Wallace M. Ross, for thirty-four years General Secre-

tary of T. C. A., and Mr. Joseph F. MacAllister of the Hobby Shop, with which he was connected for eight and a half years. Mr. Ross is continuing at the Institute half-time as Secretary to the Advisory Board of T. C. A. responsible for fund-raising. The importance of their contributions to M. I. T. has been eloquently testified to elsewhere.

When the position of Faculty Resident was established in the undergraduate dormitories in 1951, it was decided that incumbents should hold office for two years. Much appreciation is due to those who have just completed tours of duty as Faculty Residents: Professor John T. Rule, Burton House; Associate Dean Frederick G. Fassett, Jr., Baker House; Professor S. Curtis Powell, East Campus; and Professor William N. Locke, who served for one term in Baker House as a replacement for Dean Fassett.

It is with pleasure that we report the return to work on August 3rd of Dean Fassett, after a term's absence because of serious illness. Special gratitude is expressed to Mr. William Speer for the work he did as Assistant Dean during Mr. Fassett's absence. In conclusion, may I express, on behalf of Mrs. Bowditch and myself, our continued appreciation of the loyal support, cooperation, and untold help which we have been given on every hand by Faculty, staff, and students.

E. Francis Bowditch

Dean of the Graduate School

In over-all scope, Graduate School operations during this past year followed closely the post-war pattern. Enrollment continues in the 1,800 to 2,000 range. About one-third of this number

receive advanced degrees each year. Of these 650 to 700 degrees, about two-thirds, or 450 to 500, are Master's Degrees; one-quarter, or 160, are Doctorates; and the remainder are Engineer's Degrees. In general, this scale of activity is determined by the available staff, facilities, and space, rather than by the number of qualified applicants. It is very roughly double that of the decade ending early in the war, while total Institute enrollment has slightly less than doubled.

GRADUATE SCHOOL ENROLLMENT 1952–1953

School	*Summer 1952*	*Fall 1952*	*Spring 1953*
Engineering	620	1,165	1,134
Science	198	559	517
Architecture and City Planning	30	50	45
Humanities and Social Science	8	54	46
Industrial Management	21	51	54
Totals	878	1,879	1,796

ADVANCED DEGREES CONFERRED 1952–1953

	*S.M.**	*Engineer*	*Sc.D.*	*Ph.D.*	*Total*
September 1952	112	6	18	28	164
February 1953	66	2	21	22	111
June 1953	267	34	38	51	390
Totals	445	42	77	101	665

* Includes M.Arch. and M.City Planning.

The varied and cosmopolitan character of the graduate student body is indicated by the fact that it includes 174 foreign students, 115 of them new this year, representing 50 countries. There are also some 258 officers of the Armed Services, distributed approximately as follows: Air Force, 100; Army, 15; Navy, 140.

Thus far, call to military service through either the draft or reserve officer channels has interrupted the study of very few regular graduate students. This is largely a result of the very

effective work of Professor Ernest H. Huntress in presenting promptly and persuasively to the appropriate authorities the facts concerning each student's actual status and the nature of his work, and the consequent judicial actions of these authorities. With the apparently increasing trend toward what is, in effect, universal military service, the Graduate School enrollment may feel at least some temporary effects, though these are unpredictable.

Present industrial competition for the type of young men highly qualified for graduate work is strong. However, the financial aid available from industrial and other fellowships, scholarships, sponsored research, and assistantships cuts the over-all cost of graduate work, including lost income, to a level acceptable to many. The growing number of excellent industrial fellowships at the Institute offer able students important encouragement to undertake graduate work as does the fine fellowship program of the National Science Foundation for the country as a whole. Such subsidies are an essential part of Graduate School activities under today's conditions.

AWARDS OF FELLOWSHIPS AND SCHOLARSHIPS

Fellowships	$270,722
Scholarships	61,291
Staff Scholarships	113,543
Total	$445,556

A significant development of the year was the formation of the Graduate Student Organization. Earlier discussions were crystallized at a dinner meeting of some 50 graduate student and faculty representatives of the departments and graduate living groups, held at President Killian's home on January 13, 1953. A student planning committee was appointed and Mr. Austin Whillier elected as chairman. Subsequently a constitution was drafted and adopted establishing the Graduate Student Organization, which includes all M. I. T. graduate students. Its governing body is the Graduate Student Council, including representatives of departments and living groups. This in turn has its Executive Committee.

The objectives of the Graduate Student Organization are: to provide liaison between the Administration and the graduate student body; to advise and co-operate with the Administration on all matters pertaining to the general welfare of graduate students; to provide for the welcoming and counselling of incoming graduate students; to provide for and stimulate interest in cultural, civic, social and athletic activities within the graduate community; to co-ordinate the activities of the departmental clubs and the living groups; and to encourage participation of graduate students in alumni activities.

Several issues of the *Graduate Student Bulletin* have been published. Initial response to this activity indicates that it will fill a real and important need.

In January a *Graduate School Manual* was published to bring together all pertinent material concerning the organization, policies, and procedures of the Graduate School. This manual is proving a valuable aid to common understanding among graduate students and faculty of a somewhat complex operation. On July 17, 1953, the Executive Committee of the Corporation appointed Professor Ernest H. Huntress to the newly created position of Secretary of the Graduate School. Professor Huntress brings to this position invaluable experience in Graduate School operations.

Upon recommendation of the Committee on Graduate School Policy and the Faculty, the Corporation authorized during the year four new fields for the Master of Science degree. These are: Biochemical Engineering; Geophysics; Nuclear Engineering; and Naval Architecture and Marine Engineering (replacing the former fields of Naval Architecture, Marine Engineering, and Naval Construction and Engineering). These new authorizations recognize fields clearly co-ordinated with previously recognized fields pending further development of the as-yet-indecisive sentiment for a simplified Master's degree designation.

The Committee on Graduate School Policy continues to be effective as the primary policy body for the School. The Dean acknowledges with gratitude the contribution of each member and

the uniform quality of spirit that puts School ahead of Department, and educational ideals ahead of personal considerations.

During this year the following donors established new fellowships: American Chicle Company; Armour & Company (additional); General Communication Company (two fellowships); Gerber Products Company; Roche Anniversary Foundation; Union Carbide & Carbon Corporation (additional); Weirton Steel Company (additional); Armco Steel Corporation; Muchnic Foundation; and William Underwood Company.

HAROLD L. HAZEN

Director of the Summer Session

THE SUMMER SESSION of 1953 was the fifth since the reformulation of the Institute's objectives and opportunities regarding its summer activities and the consequent establishment in the spring of 1949 of the Office of the Summer Session as a distinct administrative entity. During this period, the relative emphasis on the various summer projects has substantially changed to increase the accent upon adult professional and technical education of personnel from industry, government and other educational and research institutions. The desirability and public recognition of this trend is attested by the phenomenal growth of the 1953 Summer Session, whose results indicate convincingly that the Institute can utilize its outstanding staff, special equipment and excellent general facilities in satisfying an urgent demand for adult professional education.

The 1953 Summer Session was marked by a phenomenal increase both in attendance at and gross receipts attributable to the group of Special Summer Programs. These are summarized and compared with last year as follows:

SPECIAL SUMMER PROGRAMS	*1952*	*1953*
Number of registrants	889	1,354
Receipts		
Tuition	$ 85,507	$197,372
Housing	21,238	40,334
Total *gross* income	$106,745	$237,706

The 1953 Summer Session comprised three distinct types of activities: (1) a series of 26 Special Summer Programs primarily directed toward professional adults not otherwise connected with the Institute; (2) a series of 5 Conference-Symposia Programs on specialized topics; and (3) a program of regular subjects for Institute graduate and undergraduate students desiring to maintain academic progress during the summer.

Corresponding to the relative emphasis indicated above, special mention should be made of the 26 Special Summer Programs. These were carried out in 10 different departments as follows: Mechanical Engineering 10, Metallurgy 1, Architecture and City Planning 1, Chemistry 4, Electrical Engineering 4, Physics 2, Industrial Management 1, Aeronautical Engineering 1, Food Technology 1, Mathematics 1. These Special Summer Programs varied in length from one to six weeks and attracted a total of approximately twelve times as many registrants as the first such series five years ago. In administering these registrations, quite apart from its dispatch of printed publicity, the Summer Session Office corresponded with substantially 3000 individuals.

The 1354 actual registrants comprised 1304 (96%) men and 50 (4%) women. They came not only from 45 out of the 49 recognized geographical units of the United States, but also included 83 representatives of other areas, viz. Canada 50, Puerto Rico 5, Canal Zone 1, Cuba 1, Honduras 1, Mexico 2, Venezuela 3, England 3, France 15, Sweden 1, and Pakistan 1. Of the 1271 from the continental United States, 272 (21.4%) came from New England, 826 (65.0%) others from east of the Mississippi River,

89 (7.0%) from the West Central and Mountain areas, and 84 (6.6%) from the Pacific Coast states. Of the total 1354 registrants, more than two-thirds (930 = 68.7%) were drawn from industrial companies, the remainder coming from government (267 = 19.7%) or from other research and educational institutions (157 = 11.6%).

While the professional experience of these 1354 registrants cannot readily be measured, the extent of their previous academic training is suggested by their degrees. Of the total group, 144 (10.6%) held no college degree although many had some college training; 748 (55.2%) held at least one bachelor's degree; 340 others (25.0%) *also* held master's degrees; while 122 additional cases (9.2%) held doctor's degrees.

The average age of the 1354 Special Summer Program registrants was 34.9 years. The oldest age average for any particular Program was 42.5 for the Westinghouse Science Teachers Program; the youngest was 31.5 for Technique of Infrared Spectroscopy. The oldest individual registrant was 71; the youngest 21 (five cases). Registrants 50 years old or above numbered 67; those below age 25 numbered 40.

Out of the 1354 registrants 1054 (77.9%) accepted M. I. T. dormitory housing, while the remaining 300 (22.1%) elected to reside elsewhere; 157 registrants (14.9% of the 1054 in M. I. T. dormitories) were accompanied by their wives.

Earlier experience had convincingly demonstrated the desirability of simplifying the admission and registration procedure for Special Summer Program applicants. Special attention to these aspects during 1953 resulted in very substantial improvements.

The Conference-Symposia Programs, the second type of activity of the 1953 Summer Session, included a three-day conference on Modern Highways, a one-day conference on Crystal Chemistry as Applied to Ceramics, the dedication of the new Dorrance Building with attendant symposia in the fields of biology and food technology, a special week-end Conference on Unionism and Collective Bargaining, and a three-day meeting of the Association for Computing Machinery.

Concurrent with the series of Special Summer Programs and Conference-Symposia, the program of regular Institute subjects described in the Summer Session Issue of the M. I. T. Catalogue was carried on as scheduled. Corresponding to the change of emphasis already indicated, however, the number of subjects offered was diminished from 233 (in each of the preceding three years) to 179.

In addition to the three types of enterprise already summarized, the M. I. T. summer activities also included the Foreign Student Summer Project sponsored and administered by an undergraduate student committee, the work of the M. I. T. Summer Surveying Camp at East Machias, Maine, and that of the Nova Scotia Center for Geological Sciences near Antigonish, Nova Scotia.

ERNEST H. HUNTRESS

Report of the Registrar

SINCE 1930, there has been a gradual but marked change in the geographical distribution of the freshman class as illustrated by comparing the percentage distributions for 1930 and 1952.

GEOGRAPHICAL DISTRIBUTION OF FRESHMEN

(See Table 6 for classification of states)

Geographical Area	1930 *Per Cent*	1952 *Per Cent*	*Change*
North Atlantic	82.0	68.6	−13.4
South Atlantic	4.2	6.4	+2.2
South Central	1.0	1.9	+0.9
North Central	7.1	11.7	+4.6
Western	1.5	4.5	+3.0
Territories	0.1	0.4	+0.3
Foreign	4.1	6.5	+2.4
	100.0	100.0	

The percentage from the North Atlantic States has decreased while the percentage from the remainder of the United States has nearly doubled.

A study of the North Atlantic group shows even more pronounced changes.

GEOGRAPHICAL DISTRIBUTION OF FRESHMEN FROM THE NORTH ATLANTIC AREA

Geographical Area	1930 *Per Cent*	1952 *Per Cent*	*Change*
Massachusetts	54.1	22.4	−31.7
Other New England States	7.8	8.2	+0.4
New Jersey	4.2	7.1	+2.9
New York	12.2	26.6	+14.4
Pennsylvania	3.7	4.3	+0.6
	82.0	68.6	−13.4

All other areas have shown an increase while the percentage from Massachusetts has dropped rather precipitously. The largest increase has been from New York State; last year, for the first time, there were more freshmen from New York than from Massachusetts. The preliminary figures for the class entering in 1953 indicate a continuing decline in Massachusetts, with only about 18 per cent, in contrast to New York, with 25 per cent.

The statistics for the year 1952–1953 and the summary statistics for the preceding years follow.[1]

[1]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	1895–96	1,187	1925–26	2,813
1866–67	137	1896–97	1,198	1926–27	2,671
1867–68	167	1897–98	1,198	1927–28	2,712
1868–69	172	1898–99	1,171	1928–29	2,868
1869–70	206	1899–00	1,178	1929–30	3,066
1870–71	224	1900–01	1,277	1930–31	3,209
1871–72	261	1901–02	1,415	1931–32	3,188
1872–73	348	1902–03	1,608	1932–33	2,831
1873–74	276	1903–04	1,528	1933–34	2,606
1874–75	248	1904–05	1,561	1934–35	2,507
1875–76	255	1905–06	1,466	1935–36	2,540
1876–77	215	1906–07	1,397	1936–37	2,793
1877–78	194	1907–08	1,415	1937–38	2,966
1878–79	188	1908–09	1,461	1938–39	3,093
1879–80	203	1909–10	1,479	1939–40	3,100
1880–81	253	1910–11	1,506	1940–41	3,138
1881–82	302	1911–12	1,559	1941–42	3,055
1882–83	368	1912–13	1,611	1942–43	3,048
1883–84	443	1913–14	1,685	1943–44	1,579
1884–85	579	1914–15	1,816	1944–45	1,198
1885–86	609	1915–16	1,900	1945–46	1,538
1886–87	637	1916–17	1,957	1946–47	5,172
1887–88	720	1917–18	1,698	1947–48	5,662
1888–89	827	1918–19	1,819	1948–49	5,433
1889–90	909	1919–20	3,078	1949–50	5,458
1890–91	937	1920–21	3,436	1950–51	5,171
1891–92	1,011	1921–22	3,505	1951–52	4,874
1892–93	1,060	1922–23	3,180	1952–53	5,074
1893–94	1,157	1923–24	2,949		
1894–95	1,183	1924–25	2,938		

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

TABLE 2. The Corps of Instructors

	'40	'41	'42	'43	'44	'45	46	'47	'48	'49	'50	'51	'52
Faculty Members of the Staff	285	292	313	319	317	330	379	398	413	435	436	457	480
Professors	99	95	97	97	107	113	110	118	124	131	132	136	144
Associate Professors	92	99	104	108	105	103	128	131	131	141	137	144	149
Assistant Professors	83	86	98	99	92	101	125	137	133	138	144	154	166
Ex-Officio	7	7	8	9	10	10	11	11	10	10	8	11	10
Professors Emeriti (Lecturers)	—	—	—	—	—	—	—	—	14	13	13	10	9
Instructors	3	2	3	3	—	—	—	—	—	—	—	—	—
Technical Instructors	—	1	1	1	1	1	1	—	—	—	—	—	—
Research Associates	1	2	2	2	2	2	2	—	—	2	2	2	2
Library Fellows	—	—	—	—	—	—	2	1	1	—	—	—	—
Other Members of the Staff	396	395	370	306	222	252	694	846	824	861	940	999	1051
Instructors	91	101	100	97	70	82	119	154	142	151	145	139	141
Technical Instructors	—	6	7	8	6	8	14	17	15	15	13	12	13
Administrative Assistants	—	—	—	—	—	—	1	—	—	—	2	2	2
Teaching Assistants	—	—	—	1	—	—	—	—	—	—	—	186	208
Teaching Fellows	55	52	60	52	8	18	74	77	72	91	98	—	—
Fellows in Applied Math.	—	—	—	—	—	—	4	3	—	—	—	—	—
Assistants	85	87	75	49	44	47	127	137	116	124	122	—	—
Consultant	—	—	—	—	—	—	—	—	—	1	—	—	—
Lecturers	31	17	18	16	7	7	11	10	13	11	22	32	25
Research Consultant	—	—	—	1	—	—	—	—	—	—	—	—	—
Research Associates	35	47	34	23	33	39	151	176	155	120	105	86	100
Research Assistants	91	84	64	59	54	51	193	272	311	348	433	474	517
Technical Assistants	—	—	—	—	—	—	—	—	—	—	—	46	45
Research Fellows	8	—	—	—	—	—	—	—	—	—	—	—	—
National Research Council Fellows	—	1	—	—	—	—	—	—	—	—	—	—	—
Carnegie Fellows	—	—	—	—	—	—	—	—	—	—	—	2	—
Fellows	—	—	—	—	—	—	—	—	—	—	—	20	—
Staff Members (D. I. C.)	—	—	12	—	—	—	—	—	—	—	—	—	—
Total	681	687	683	625	539	582	1073	1244	1237	1296	1376	1456	1531
Other Members of the Faculty	32	37	40	39	44	52	60	67	50	50	54	55	53
Faculty and Administrative Officers: Emeriti (not Lecturers)*	31	36	39	38	43	51	59	66	49	49	53	54	52
Non-Resident Professor	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	1950–51 YEAR						1951–52 YEAR						1952–53 YEAR					
	1	2	3	4	G	Total	1	2	3	4	G	Total	1	2	3	4	G	Total
Aeronautical Engineering XVI	45	40	22	33	97	237	37	31	17	19	105	209	59	31	21	19	135	265
Aeronautical Engineering(Cooperative) XVI-B	—	—	22	17	—	39	—	—	19	18	—	37	—	—	4	21	—	25
Architecture IV-A	40	37	30	34	21	162	18	37	34	29	24	142	43	19	42	29	28	161
Architecture (IV-A) Fifth Year	—	—	—	32	—	32	—	—	—	37	—	37	—	—	—	32	—	32
Biology																		
Quantitative VII	11	13	13	9	33	79	12	22	10	10	32	86	15	10	17	6	34	82
Physical VII-A	—	—	4	—	4	8	—	—	—	1	—	1	—	—	—	3	1	4
Chemical VII-B	—	—	—	2	—	2	—	—	—	2	3	5	—	—	—	1	2	3
Building Engineering and Construction XVII	14	21	30	38	13	116	10	12	23	31	18	94	8	10	16	19	23	76
Business and Engineering Administration XV	45	63	106	118	39	371	46	75	68	98	37	324	44	69	96	78	52	339
Chemical Engineering X	103	77	81	93	119	473	118	76	81	67	110	452	161	89	75	63	106	494
Chemical Engineering Practice X-A, X-B	—	—	—	27	41	68	—	—	—	11	19	30	—	—	—	10	18	28
Chemistry V	42	20	31	28	151	272	29	23	26	31	149	258	37	17	21	23	168	266
City Planning IV-B	1	1	1	3	24	30	—	1	1	2	22	26	—	—	1	1	24	26
Civil Engineering I	56	56	58	57	47	274	60	43	59	56	51	269	69	41	45	55	63	273
Army Engineer (in Civil Eng. Department)	—	—	—	—	3	3	—	—	—	—	4	4	—	—	—	—	6	6
Economics and Engineering XIV	2	7	20	27	57	113	1	6	10	25	50	92	2	8	9	10	54	83
Electrical Engineering VI	160	136	99	111	255	761	153	129	100	103	285	770	178	150	75	86	349	838
Electrical Engineering (Coöperative) VI-A	—	—	43	44	52	139	—	—	43	51	44	138	—	—	46	51	42	139
Food Technology																		
Food Technology XX, XX-A	5	8	7	9	20	49	2	9	8	7	16	42	5	4	4	4	26	43
Biochemical Engineering XX-B	—	—	—	—	—	—	—	—	—	1	—	1	—	—	2	1	—	3
General Engineering IX-B	—	—	11	33	—	44	7	6	12	15	—	40	5	6	16	22	—	49
General Science IX-A	—	—	8	7	—	15	7	—	5	8	—	20	4	3	4	10	—	21
‡Geology XII-A	5	17	22	19	36	99	5	10	18	18	31	82	2	9	8	7	} 35	82
Geophysics XII-B	—	—	—	—	—	—	—	—	—	—	—	—	1	7	3	10		
Marine Transportation XIII-C	1	4	10	5	—	20	2	1	3	8	—	14	—	—	—	2	—	2
*Marine Transportation (XIII-C) Fifth Year	—	—	—	8	—	8	—	—	—	4	—	4	—	—	—	—	—	—
Mathematics XVIII	11	17	29	15	68	140	12	13	17	26	79	147	23	13	9	18	85	148
Mechanical Engineering II	110	98	96	138	121	563	85	100	70	91	124	470	137	103	74	75	161	550
Mechanical Engineering (Cooperative) II-B	—	—	34	20	—	54	—	—	25	31	—	56	—	—	18	25	—	43
Metallurgy III	12	25	40	46	95	218	13	25	32	42	91	203	17	28	28	30	102	205
Ceramics (in Metallurgy Department)	—	—	—	—	13	13	—	—	—	—	15	15	—	—	—	—	15	15
Meteorology XIX	7	6	8	11	39	71	6	6	8	11	84	115	1	3	6	9	74	93
Naval Architecture and Marine Eng. XIII	17	14	12	19	11	73	18	14	12	16	7	67	19	18	15	9	7	68
Naval Construction and Engineering XIII-A	—	—	—	—	91	91	—	—	—	—	86	86	—	—	—	—	80	80
Physics VIII	97	79	72	61	203	512	95	72	62	72	213	514	105	69	60	60	211	505
Sanitary Engineering XI	—	—	—	—	22	22	—	—	—	—	21	21	—	—	—	—	20	20
Science Teaching IX-C	—	—	—	—	—	—	—	—	3	—	—	3	2	1	2	2	—	7
Total	784	739	909	1,064*	1,675	5,171	736	711	766	941*	1,720	4,874	937	708	717	791*	1,921	5,074

* These totals include fifth year in Architecture IV-A and Marine Transportation XIII-C (discontinued June 1952).
‡ Beginning 1952–53 Geology became Geology XII-A and Geophysics XII-B.

TABLE 4-A Classification of Students by Courses, Options and Years

COURSE No	Name	Option	Opt	YEAR 1 Opt.	1 Tot.	2 Opt.	2 Tot.	3 Opt.	3 Tot.	4 Opt.	4 Tot.	G Opt.	G Tot.	Total	Course Number
I	Civil Engineering	1. Theory and Design	1	—	69	—	41	20	45	25	55	63	69	279	I
		2. Planning and Administration	2	—		—		2		5					
		3. Construction and Management	3	—		—		23		25					
	Army Engineer			—		—		—		—		6			
II	Mechanical Engineering			—	137	—	103	—	74	—	75	149	161	550	II
	Textile Technology			—		—		—		—		12			
II-B	Mechanical Engineering (Cooperative)	a. At Plant		—	—	—	—	7	18	—	25	—	—	43	II-B
		b. At M. I. T.		—		—		11		—		—			
III	Metallurgy	1. Metallurgy	1	—	17	—	28	23	28	24	30	92	117	220	III
		2. Mineral Engineering	2	—		—		5		6		10			
	Ceramics			—		—		—		—		15			
IV-A	Architecture			—	43	—	19	—	42	29	61	—	28	193	IV-A
	Fifth Year			—		—		—		32		—			
IV-B	City Planning			—	—	—	—	—	1	—	1	—	24	26	IV-B
V	Chemistry			—	37	—	17	—	21	—	23	—	168	266	V
VI	Electrical Engineering	1. Electric Power	1	—	178	28	150	7	75	21	86	—	349	838	VI
		3. Electrical Communications	3	—		49		37		44		—			
		4. Electronic Applications	4	—		73		31		21		—			
VI-A	Electrical Engineering (Cooperative)	1. Electric Power	1	—	—	—	—	7	46	15	51	—	42	139	VI-A
		3. Electrical Communications	3	—		—		22		23		—			
		4. Electronic Applications	4	—		—		17		13		—			
VII	Quantitative Biology			—	15	—	10	—	17	—	6	—	34	82	VII
VII-A	Physical Biology			—	—	—	—	—	—	—	3	—	1	4	VII-A
VII-B	Chemical Biology			—	—	—	—	—	—	—	1	—	2	3	VII-B
VIII	Physics			—	105	—	69	—	60	—	60	—	211	505	VIII
IX-A	General Science			—	4	—	3	—	4	—	10	—	—	21	IX-A
IX-B	General Engineering			—	5	—	6	—	16	—	22	—	—	49	IX-B
IX-C	Science Teaching			—	2	—	1	—	2	—	2	—	—	7	IX-C
X	Chemical Engineering			—	161	—	89	—	75	—	63	—	106	494	X
X-A	Chemical Engineering Practice — Graduate			—	—	—	—	—	—	—	—	—	18	18	X-A
X-B	Chemical Engineering Practice — Undergraduate			—	—	—	—	—	—	—	10	—	—	10	X-B
XI	Sanitary Engineering			—	—	—	—	—	—	—	—	—	20	20	XI
XII-A	Geology		A	2	3	9	16	8	11	7	17	—	35	82	XII
XII-B	Geophysics		B	1		7		3		10		—			
XIII	Naval Architecture and Marine Engineering			—	19	—	18	—	15	—	9	—	7	68	XIII
*XIII-A	Naval Construction and Engineering			—	—	—	—	—	—	—	—	—	80	80	*XIII-A
XIII-C	Marine Transportation			—	—	—	—	—	—	—	2	—	—	2	XIII-C
XIV	Economics and Engineering	A. Mechanical Engineering	A	2	2	4	8	3	9	4	10	—	54	83	XIV
		B. Electrical Engineering	B	—		1		3		3		—			
		C. Chemical Engineering	C	—		3		3		3		—			
XV	Business and Engineering Administration	A. Physical Sciences	A	39	44	51	69	78	96	59	78	—	52	339	XV
		B. Chemical Sciences	B	5		18		18		19		—			
XVI	Aeronautical Engineering			—	59	—	31	—	21	—	19	—	135	265	XVI
XVI-B	Aeronautical Engineering (Cooperative)	a. At Plant		—	—	—	—	4	4	—	21	—	—	25	XVI-B
		b. At M. I. T.		—		—		—		—		—			
XVII	Building Engineering and Construction			—	8	—	10	—	16	—	19	—	23	76	XVII
XVIII	Mathematics			—	23	—	13	—	9	—	18	—	85	148	XVIII
XIX	Meteorology			—	1	—	3	—	6	—	9	—	74	93	XIX
XX	Food Technology			—	5	—	4	—	4	—	3	—	26	42	XX
XX-A	Food Technology			—	—	—	—	—	—	—	1	—	—	1	XX-A
XX-B	Biochemical Engineering			—	—	—	—	—	2	—	1	—	—	3	XX-B
	Total				937		708		717		**791	—	1921	5074	Total

* First Year, 32. Second Year, 29. Third Year, 19.

**This total includes fifth year in Architecture.

TABLE 4-B

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

COURSE	YEAR					TOTAL	COURSE
	1	2	3	4	G		
I Civil Engineering	—	—	—	1	4	5	I
II Mechanical Engineering	—	2	2	4	23	31	II
III Metallurgy	—	1	1	2	8	12	III
IV-A Architecture	—	—	3	1	2	6	IV-A
Fifth Year	—	—	—	1	—	1	(Fifth Year)
IV-B City Planning	—	—	—	—	1	1	IV-B
V Chemistry	1	—	—	—	4	5	V
VI Electrical Engineering	1	1	4	1	142	149	VI
VII Quantitative Biology	—	—	—	—	8	8	VII
VIII Physics	1	1	—	—	26	28	VIII
IX-A General Science	—	—	1	1	—	2	IX-A
X Chemical Engineering	—	—	—	—	8	8	X
XIII Naval Architecture and Marine Engineering	—	—	1	—	2	3	XIII
XIV Economics and Engineering	—	—	1	—	7	8	XIV
XV Business and Engineering Administration	—	—	—	1	6	7	XV
XVI Aeronautical Engineering	—	—	—	1	33	34	XVI
XVII Building Engineering and Construction	—	—	—	—	2	2	XVII
XVIII Mathematics	1	1	—	2	32	36	XVIII
XIX Meteorology	—	1	—	1	46	48	XIX
XX Food Technology	—	—	—	—	7	7	XX
Total	4	7	13	16	361	401	Total

TABLE 4-C

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

COURSE	YEAR					TOTAL	COURSE
	1	2	3	4	G		
I Civil Engineering	1	1	3	—	4	9	I
II Mechanical Engineering	—	4	6	7	9	26	II
III Metallurgy	—	4	2	1	5	12	III
IV-A Architecture	—	—	—	1	—	1	IV-A
IV-B City Planning	—	—	—	—	3	3	IV-B
V Chemistry	—	—	1	—	5	6	V
VI Electrical Engineering	—	9	3	6	9	27	VI
VII Quantitative Biology	—	2	1	—	1	4	VII
VII-A Physical Biology	—	—	—	1	—	1	VII-A
VIII Physics	1	1	—	4	6	12	VIII
IX-A General Science	—	1	—	—	—	1	IX-A
IX-B General Engineering	—	—	1	2	—	3	IX-B
X Chemical Engineering	1	—	2	1	7	11	X
XI Sanitary Engineering	—	—	—	—	1	1	XI
XII-A Geology	—	1	—	—	2	3	XII-A
XIII Naval Architecture and Marine Engineering	1	—	1	—	—	2	XIII
XIII-A Naval Construction and Engineering	—	—	—	—	1	1	XIII-A
XIV Economics and Engineering	—	2	1	—	3	6	XIV
XV Business and Engineering Administration	—	2	5	5	1	13	XV
XVI Aeronautical Engineering	—	—	—	3	5	8	XVI
XVII Building Engineering and Construction	—	1	2	1	—	4	XVII
XVIII Mathematics	—	1	—	—	3	4	XVIII
XIX Meteorology	—	—	—	1	3	4	XIX
XX Food Technology	—	—	—	—	2	2	XX
Total	4	29	28	33	70	164	Total

* Excludes 50 special students

TABLE 5. CLASSIFICATION OF STUDENTS BY COURSES SINCE 1945

	1945–46	1946–47	1947–48	1948–49	1949–50	1950–51	1951–52	1952–53
School of Engineering . . . . . *Total*	1,225	4,092	4,398	4,094	4,055	3,287	3,094	3,269
Aeronautical Engineering XVI, XVI-B	208	425	346	304	274	276	246	290
Building Engineering and Construction XVII . . .	15	70	98	111	124	116	94	76
¶Business and Engineering Administration XV . .	73	490	556	449	415	—	—	—
Chemical Engineering X, X-A, X-B	220	695	693	611	596	541	482	522
Civil Engineering I	63	209	220	258	277	277	273	279
¶‡Economics and Engineering XIV	—	4	69	87	81	—	—	—
Electrical Engineering VI, VI-A	303	1,091	1,215	1,051	996	900	908	977
General Engineering IX-B	12	32	51	57	62	44	40	49
Mechanical Engineering II, II-B	178	718	749	691	711	617	526	593
Metallurgy III	31	135	155	203	243	231	218	220
Meteorology XIX	12	46	46	66	65	71	115	93
‡Naval Architecture and Marine Eng. XIII, XIII-C	26	85	85	92	92	101	85	70
NavalConstruction and Engineering XIII-A . . .	81	78	101	98	98	91	86	80
Sanitary Engineering XI	3	14	14	16	21	22	21	20
School of Science . . . . . *Total*	269	895	1,037	1,090	1,151	1,176	1,159	1,164
Biology VII, VII-A, VII-B	21	66	85	77	85	89	92	89
Chemistry V	108	272	292	280	281	272	258	266
**Food Technology XX, XX-A, XX-B	4	29	41	59	46	49	43	46
General Science IX-A	3	3	6	7	10	15	20	21
***Geology and Geophysics XII-A, XII-B	4	27	38	61	86	99	82	82
Mathematics XVIII	36	105	116	137	165	140	147	148
Physics VIII	93	393	459	469	478	512	514	505
Science Teaching IX-C	—	—	—	—	—	—	3	7
School of Architecture and Planning . . . . . *Total*	40	156	179	204	202	224	205	219
Architecture IV-A	40	156	144	169	169	194	179	193
*City Planning IV-B	—	—	35	35	33	30	26	26
¶*School of Humanities and Social Studies* . . . *Total*	—	—	—	—	—	484	92	83
Business and Engineering Administration XV . . .	—	—	—	—	—	371	—	—
Economics and Engineering XIV	—	—	—	—	—	113	92	83
¶*School of Industrial Management* . . . . . *Total*	—	—	—	—	—	—	324	339
Business and Engineering Administration XV . . .	—	—	—	—	—	—	324	339
†Economics and Eng. or Natural Science, Industrial Economics, and Group Psychology . . *Total*	4	29	48	45	50	—	—	—
Grand Total	1,538	5,172	5,662	5,433	5,458	5,171	4,874	5,074

* Prior to February 1947 included in Architecture.
‡ September 1946, Meteorology changed from Course XIV to Course XIX; Economics and Engineering, Course XIV started.
** Prior to July 1945, included in Biology. From July 1945 to September 1946, Course VII-B, September 1946, changed to Course XX.
† After June 1950 included in Economics and Engineering XIV.
¶ June 1950, School of Humanities and Social Studies started. Business and Engineering Administration and Economics and Engineering changed from School of Engineering to New School. 1951–52 Business and Engineering Administration changed to School of Industrial Management.
*** June 1952, Geology changed to Geology Course XII-A and Geophysics Course XII-B.

TABLE 6

GEOGRAPHICAL CLASSIFICATION OF STUDENTS SINCE 1948

UNITED STATES	1948	1949	1950	1951	1952
North Atlantic . . . . . Total	3,633	3,590	3,297	3,139	3,276
Connecticut	199	199	174	151	150
Maine	43	52	41	40	44
Massachusetts	1,710	1,672	1,523	1,542	1,547
New Hampshire	51	47	45	47	42
New Jersey	311	307	286	270	282
New York	981	973	901	824	939
Pennsylvania	262	267	258	205	199
Rhode Island	53	51	49	38	49
Vermont	23	22	20	22	24
South Atlantic . . . . . Total	343	308	319	262	269
Delaware	14	8	13	11	12
District of Columbia	50	49	44	38	40
Florida	66	65	69	52	62
Georgia	15	10	12	17	17
Maryland	68	61	61	45	43
North Carolina	26	18	20	16	14
South Carolina	12	11	8	8	9
Virginia	63	65	67	55	56
West Virginia	29	21	25	20	16
South Central . . . . . Total	194	200	175	161	148
Alabama	15	25	20	23	15
Arkansas	15	14	11	10	8
Kentucky	25	28	25	23	24
Louisiana	29	20	18	16	14
Mississippi	10	9	12	12	11
Tennessee	36	33	25	25	17
Texas	64	71	64	52	59
North Central . . . . . Total	641	659	633	597	626
Illinois	175	174	151	139	169
Indiana	37	38	41	36	28
Iowa	20	22	11	14	15
Kansas	17	14	17	14	19
Michigan	88	97	94	96	92
Minnesota	31	35	38	35	38
Missouri	61	58	48	47	45
Nebraska	18	28	20	16	18
North Dakota	5	3	2	5	4
Ohio	136	140	158	145	148
South Dakota	2	3	4	5	3
Wisconsin	51	47	49	45	47
Western . . . . . Total	282	290	284	259	272
Arizona	6	7	11	12	14
California	97	99	102	96	109
Colorado	22	28	16	20	18
Idaho	7	8	8	7	6
Montana	10	8	7	9	10
Nevada	4	3	3	2	2
New Mexico	7	7	8	5	9
Oklahoma	39	33	32	28	20
Oregon	22	17	20	20	21
Utah	13	15	14	9	8
Washington	50	58	52	44	49
Wyoming	5	7	11	7	6
Territories and Dependencies . . . . Total	20	26	28	26	19
Alaska	2	4	5	6	2
Canal Zone	3	6	5	4	2
Hawaii	9	12	12	14	12
Puerto Rico	6	4	6	2	3
Total for United States	5,113	5,073	4,736	4,444	4,610

(*Continued on page 179*)

TABLE 6 — (*Continued*)

GEOGRAPHICAL CLASSIFICATION OF STUDENTS SINCE 1948

FOREIGN COUNTRIES	1948	1949	1950	1951	1952
Total	320	385	435	430	464
Afghanistan	—	1	—	—	—
Argentina	8	9	8	10	12
Australia	2	2	6	8	8
Austria	—	1	2	3	1
Azores	—	—	—	1	—
Bahamas	—	—	1	—	—
Belgium	1	4	5	1	4
Bolivia	1	2	2	2	1
Brazil	12	13	12	15	10
British West Indies	1	3	5	3	2
Burma	—	1	—	1	3
Canada	60	76	80	73	74
Canary Islands	—	—	1	—	—
Ceylon	—	1	—	—	—
Chile	1	1	—	1	2
China	22	21	18	17	16
Colombia	6	6	14	12	13
Costa Rica	—	—	—	1	1
Cuba	16	17	18	17	17
Cyprus	1	1	—	—	—
Czechoslovakia	2	1	1	—	—
Denmark	1	—	1	1	1
Dominican Republic	1	2	—	—	1
Ecuador	1	3	—	2	2
Egypt	6	6	4	5	5
England	13	12	9	14	16
Ethiopia	—	—	—	1	1
Finland	2	2	4	2	3
France	10	15	12	12	13
French West Indies	1	—	—	—	—
French Indochina	—	1	—	1	—
Germany	—	—	—	1	2
Gold Coast	—	1	—	—	—
Greece	6	6	12	12	17
Guatemala	4	3	4	4	2
Haiti	—	—	—	—	1
Honduras	2	—	—	—	—
Hong Kong	—	5	11	14	10
Hungary	—	—	1	—	—
Iceland	4	3	3	1	2
India	27	34	34	30	37
Iran	—	—	1	2	2
Iraq	3	5	6	4	2
Ireland	—	—	1	—	1
Israel	2	3	14	19	23
Italy	3	4	7	3	1
Jamaica	—	—	—	1	—
Japan	—	—	1	6	9
Kenya	—	—	1	1	1
Korea	1	1	2	1	—
Lebanon	—	2	1	1	3
Luxembourg	1	1	—	—	—
Malaya	1	2	2	1	1
Mauritius	—	—	—	—	1
Mexico	11	13	15	12	18
Morocco	—	1	—	1	—
Mozambique	—	1	2	1	1
Netherlands	2	1	3	3	2
Netherlands East Indies	3	2	—	—	—
Netherlands West Indies	1	2	2	2	3

(*Continued on page 180*)

TABLE 6 — (*Continued*)

GEOGRAPHICAL CLASSIFICATION OF STUDENTS SINCE 1948

FOREIGN COUNTRIES	1948	1949	1950	1951	1952
New Zealand	2	2	3	2	3
Nicaragua	1	2	3	2	3
Nigeria	—	—	1	1	1
Norway	33	31	25	22	13
Pakistan	—	1	3	2	4
Panama	2	—	—	1	2
Peru	5	3	5	7	8
Philippines	11	13	10	14	16
Poland	—	1	1	—	1
Portugal	2	5	4	3	2
Salvador	2	—	—	2	1
Scotland	—	2	3	4	5
Singapore	—	1	3	2	1
Spain	4	2	1	1	3
Sweden	3	3	6	10	9
Switzerland	2	3	2	3	1
Syria	—	—	—	1	2
Tanganyika	—	1	1	1	—
Thailand	—	3	4	3	5
Transjordan	—	—	—	—	1
Turkey	6	5	2	2	5
Union of South Africa	3	4	7	5	2
Uruguay	1	4	7	8	5
United States of Indonesia	—	—	3	—	—
Venezuela	3	7	15	11	25
Yugoslavia	1	1	—	—	1
Grand Total, United States and Foreign	5,433	5,458	5,171	4,874	5,074

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	14	3	—	3	20
Second Year	15	21	13	8	57
Third Year	—	18	34	30	82
Fourth Year	—	—	1	1	2
Graduate Year	—	—	42	428	470
Total	29	42	90	470	631

TABLE 8. Women Students Classified by Courses and Years

	Course	1	2	3	4	G	Total
I	Civil Engineering	2	—	—	—	—	2
III	Metallurgy	—	1	—	—	—	1
IV-A	Architecture	3	1	3	1	—	8
IV-B	City Planning	—	—	—	—	1	1
V	Chemistry	—	3	1	2	4	10
VI	Electrical Engineering	—	2	1	—	—	3
VII	Quantitative Biology	4	2	—	1	6	13
VIII	Physics	5	2	—	3	6	16
IX-A	General Science	—	1	—	—	—	1
IX-C	Science Teaching	1	—	1	—	—	2
X	Chemical Engineering	—	2	2	—	2	6
XII-A	Geology	—	—	—	1	1	2
XIV	Economics and Engineering	—	—	2	—	3	5
XV	Business and Engineering Administration	—	—	3	—	—	3
XVIII	Mathematics	3	—	—	3	9	15
XIX	Meteorology	—	—	1	—	2	3
XX	Food Technology	1	—	—	—	4	5
	Total	19	14	14	11	38	96

TABLE 9. Old and New Students

Year	1947–48	1948–49	1949–50	1950–51	1951–52	1952–53
Students registered at end of last academic year (including specials)	4,118	3,663	3,639	3,461	3,251	3,130
Students who have previously attended the Institute but were not registered at end of last academic year (including specials)	261	262	189	186	204	214
New students who entered by examination	530	501	433	510	443	605
New students who entered without examination	294	261	241	206	238	304
New students who entered from other colleges as candidates for degrees	396	645	877	732	575	631
New students (specials, not candidates for degrees)	63	101	79	76	163	190
Total	5,662	5,433	5,458	5,171	4,874	5,074

TABLE 10. List of American Colleges and Universities with Number of Graduates Attending the Institute

College		College		College	
Adelphi College	1	Dickinson College	1	Miami University (Ohio)	6
Akron University	1	Drexel Inst. of Technology	2	Miami, University of (Fla.)	1
Alabama Polytechnic Inst.	1	Duke University	2	Michigan College of Mining and Technology	5
Alabama, University of	2	Duquesne University	3	Michigan State College	8
Alfred University	4			Michigan, University of	32
American International College	2	Eastern Nazarene College	1	Michigan Western State Teachers College	1
Amherst College	17	Emmanuel College	3	Middlebury College	5
Antioch College	5	Erskine College	1	Milwaukee School of Engineering	1
Arizona, University of	1	Evansville College	1	Minnesota, University of	10
				Mississippi College	1
Babson Institute	1	Fisk University	2	Mississippi State College	2
Bard College	1	Florida, University of	2	Missouri, University of	3
Bates College	1	Fordham University	5	Montana School of Mines	1
Berea College	1	Franklin and Marshall Coll.	1	Montana State University	1
Bethany College	1			Mount Holyoke College	4
Blackburn University	1	Geneva College	1		
Boston College	17	George Washington Univ.	2	Nebraska, University of	4
Boston University	13	Georgia Inst. of Technology	10	Nevada, University of	1
Bowdoin College	7	Gettysburg College	3	Newark Coll. of Engineering	3
Bradley University	1	Grinnell College	1	New Hampshire, Univ. of	13
Brandeis University	1			New Jersey State Teachers College	1
Brigham Young University	1	Hamilton College	2	New Mexico College of Agric. and Mechanic Arts	1
Brooklyn College	10	Hampden-Sydney College	1	New Mexico, University of	1
Brown University	11	Harvard University	49	New York State College for Teachers	6
Bryn Mawr College	3	Haverford College	3	New York University	25
Bucknell University	1	Hobart College	1	Niagara University	2
Buffalo, University of	2	Holy Cross, College of the	3	North Carolina State College	2
		Hope College	1	North Carolina, University of	3
California Inst. of Tech.	19	Howard University	2	North Dakota Agric. College	1
California, University of at Berkeley	29	Hunter College	1	Northeastern University	39
California, University of at Los Angeles	12	Idaho, University of	2	Northwestern University	6
Carleton College	1	Illinois Inst. of Technology	10	Norwich University	2
Carnegie Inst. of Technology	6	Illinois, University of	24	Notre Dame, University of	2
Case Inst. of Technology	12	Indiana University	4		
Catholic University of America	5	Iowa State College	7	Oberlin College	5
Champlain College	1	Iowa, State University of	3	Occidental College	1
Chicago, University of	12			Ohio State University	9
Cincinnati, University of	9	Johns Hopkins University	8	Ohio Wesleyan University	5
Citadel, The	3	Juniata College	3	Oklahoma Agric. and Mech. College	10
City College, The (N. Y.)	9			Oklahoma, University of	2
Clark University	2	Kansas State College of Agric. and Applied Science	6	Oregon State College	2
Clemson College	2	Kansas, University of	3		
College of the City of New York	30	Kentucky, University of	5	Pacific Union College	2
College of New Rochelle	1	Kenyon College	1	Pennsylvania State College	12
College of the Pacific	1			Pennsylvania, University of	15
College of Wooster	4	Lafayette College	1	Philadelphia Textile Inst.	1
Colorado Agricultural and Mechanical College	2	Lawrence Inst. of Technology	1	Pittsburgh, University of	6
Colorado School of Mines	4	Lehigh University	5	Polytechnic Institute of Brooklyn	12
Colorado State College of Education	1	Loras College	1	Pomona College	2
Colorado, University of	3	Louisiana Polytechnic Inst.	1	Pratt Institute	3
Columbia College	2	Louisiana State University and Agric. and Mech. Coll.	10	Princeton University	16
Columbia University	15	Lowell Textile Institute	3	Principia College	2
Connecticut, University of	4	Loyola College (Md.)	1	Purdue University	27
Cooper Union, The	5				
Cornell University	14	Maine, University of	11	Queens College (N. Y.)	1
		Manhattan College	2		
Dartmouth College	6	Marietta College	1	Radcliffe College	4
Dayton, University of	3	Marquette University	2	Reed College	3
Delaware, University of	2	Maryland, University of	2	Rensselaer Polytechnic Inst.	33
Denison University	1	Maryville College	1		
Denver, University of	4	Massachusetts Inst. of Tech.	637		
DePauw University	1	Massachusetts School of Art	1		
		Massachusetts, University of	7		
		Merrimack College	1		

(*continued*)

TABLE 10. List of American Colleges and Universities with Number of Graduates Attending the Institute (*Continued*)

College		*College*		*College*	
Rhode Island School of Design	1	Temple University	3	Virginia Union University	1
Rhode Island, University of	2	Tennessee, University of	1	Virginia, University of	3
Rice Institute	4	Texas Agric. and Mech. Coll.	5		
Ripon College	6	Texas Christian University	1	Washington and Jefferson College	1
Rochester, University of	11	Texas Technological Coll.	4	Washington, State College of	6
Rose Polytechnic Institute	1	Texas, University of	4	Washington University	12
Rutgers University	8	Toledo, University of	4	Washington, University of	10
		Trinity College	3	Wayne University	1
St. Francis Coll. (Brooklyn)	1	Trinity University	1	Webb Inst. of Naval Arch.	1
St. John's University (Minn.)	2	Tri-State College	2	Wellesley College	6
St. Joseph's College	1	Tufts College	27	Wesleyan University	3
St. Lawrence University	2	Tulane University of Louisiana	2	Western Reserve University	1
St. Louis University	2			West Virginia, University of	5
San Diego State College	1	Union College (N. Y.)	11	Willamette University	1
Santa Clara, University of	1	U.S. Coast Guard Academy	26	William and Mary, College of	5
Seton Hall University	1	U.S. Merchant Marine Academy	5	Williams College	15
Simmons College	1	U.S. Military Academy	22	Wisconsin, University of	14
Smith College	1	U.S. Naval Academy	71	Worcester Polytechnic Inst.	7
South Carolina, University of	2	U.S. Naval Postgraduate School	28	Wyoming, University of	3
South Dakota School of Mines and Technology	1	Ursinus College	1		
South, University of the	1	Utah State Agricultural College	3	Yale University	21
Southeast Missouri State College	1	Utah, University of	8	Yeshiva College	4
Southern California, Univ. of	2			Youngstown College	1
Spring Hill College	1	Valparaiso University	1	Total	2,027
Stanford University	11	Vanderbilt University	1		
State Teachers College (Bridgewater)	2	Vassar College	1	Number of American Colleges Represented	245
Stevens Inst. of Technology	5	Vermont, University of	3	Number of Foreign Colleges Represented (not listed)	147
Swarthmore College	9	Virginia Military Institute	2	Total	392
Syracuse University	12	Virginia Polytechnic Inst.	7		

TABLE 11

Regular Students from Colleges Classified by Courses

COURSE	No Previous Degree			Graduates of Other Colleges					Graduates of M. I. T. Taking Graduate Work		
	Entered			Entered							
				Sept. 1952		Previous Years					
	Sept. 1952	Previous Years	Total	Undergrad.	Grad.	Undergrad	Grad.	Total	S.B. Degree 1952	Other Graduates	Total
Aeronautical Engineering XVI	7	15	22	1	53	1	26	81	13	10	23
Architecture IV-A	5	18	23	9	17	10	8	44	1	—	1
Biology VII, VII-A, VII-B	2	5	7	—	6	—	15	21	4	4	8
Building Engineering and Construction XVII	—	11	11	5	8	—	9	22	1	3	4
Business and Engineering Administration XV	16	24	40	7	40	5	3	55	2	1	3
Chemical Engineering X, X-A, X-B	10	25	35	3	29	5	49	86	21	17	38
Chemistry V	5	3	8	—	46	1	99	146	6	13	19
City Planning IV-B	—	—	—	—	6	—	13	19	1	3	4
Civil Engineering I	13	19	32	1	26	5	22	54	9	8	17
Economics and Engineering XIV	—	4	4	1	18	—	25	44	—	4	4
Electrical Engineering VI, VI-A	26	57	83	7	73	13	91	184	56	29	85
Food Technology XX, XX-A, XX-B	—	2	2	—	3	—	9	12	3	4	7
General Engineering IX-B	1	6	7	—	—	3	—	3	—	—	—
General Science IX-A	1	1	2	—	—	—	—	—	—	—	—
Geology XII-A	—	—	—	—	7	—	16	23	6	6	12
Geophysics XII-B	—	1	1	—	—	—	—	—	—	—	—
Mathematics XVIII	2	4	6	—	10	—	30	40	6	7	13
Mechanical Engineering II	15	37	52	4	42	5	40	91	34	22	56
Metallurgy III	5	12	17	—	18	2	49	69	12	30	42
Meteorology XIX	—	3	3	—	6	—	16	22	3	3	6
Naval Architecture and Marine Eng. XIII, XIII-C	4	6	10	—	3	2	—	5	2	—	2
Naval Construction and Engineering XIII-A	—	—	—	—	31	—	46	77	—	3	3
Physics VIII	10	14	24	1	21	2	102	126	18	44	62
Sanitary Engineering XI	—	—	—	—	7	—	13	20	—	—	—
Science Teaching IX-C	—	—	—	—	—	—	—	—	—	—	—
Total	122	267	389	39	470	54	681	1,244	198	211	409

TABLE 12. Number of Degrees Awarded in September 1952, February 1953, and June 1953

Name of Course	S.B.			B.Arch. and B.C.P.			S.M.			M.Arch. and M.C.P.			Adv. Eng.			Ph.D.			Sc.D.			Total		
	Sept.	Feb.	June	Sept.	Feb.	June	Sept.	Feb.	June	Sept.	Feb.	June	Sept.	Feb.	June	Sept.	Feb.	June	Sept.	Feb.	June	Sept.	Feb.	June
Aeronautical Engineering	3	1	33	—	—	—	1	3	30	—	—	—	1	—	2	—	—	—	2	—	3	7	4	68
Architecture	—	—	—	5	2	24	—	—	—	12	5	3	—	—	—	—	—	—	—	—	—	17	7	27
Biochemical Engineering	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Biology	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	2	—	—	—	—	—	2	—	1
Building Eng. and Constr.	2	1	17	—	—	—	—	3	4	—	—	—	—	—	—	—	—	—	—	—	—	2	4	21
Business and Eng. Admin.	3	3	69	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	3	69
Ceramics	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	1	—	2	1
Chemical Biology	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—
Chemical Engineering	4	3	52	—	—	—	9	8	14	—	—	—	—	—	—	—	—	—	2	5	6	15	16	72
Chemical Engineering Practice	—	—	12	—	—	—	4	2	10	—	—	—	—	—	—	—	—	—	—	—	—	4	2	22
Chemistry	1	—	19	—	—	—	—	4	2	—	—	—	—	—	—	13	12	10	—	—	—	14	16	31
City Planning	—	—	—	—	—	—	—	—	—	2	3	3	—	—	—	—	—	—	—	—	—	2	3	3
Civil Engineering	1	5	47	—	—	—	3	4	22	—	—	—	1	—	2	—	—	—	2	1	—	7	10	1
Economics and Engineering	1	3	7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	3	7
Electrical Engineering	23	21	87	—	—	—	28	12	62	—	—	—	1	—	4	1	—	—	6	3	5	59	36	158
Food Technology	1	—	3	—	—	—	1	1	—	—	—	—	—	—	—	1	3	—	—	—	1	3	4	4
General Engineering	3	2	16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	2	16
General Science	2	—	8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	8
Geology	—	—	7	—	—	—	—	1	1	—	—	—	—	—	—	—	1	5	—	—	—	—	2	13
Geophysics	—	—	9	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	9
Industrial Economics	—	—	—	—	—	—	—	—	26	—	—	—	—	—	—	1	—	9*	—	—	—	1	—	9
Industrial Management	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	26
Marine Engineering	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Marine Transportation	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
Mathematics	—	1	15	—	—	—	2	1	6	—	—	—	—	—	—	2	—	6	—	—	—	4	2	27
Mechanical Engineering	8	8	69	—	—	—	13	8	23	—	—	—	1	2	6	—	—	—	3	2	13	25	20	111
Metallurgy	—	1	26	—	—	—	8	4	5	—	—	—	1	—	1	—	—	—	3	5	7	12	10	39
Meteorology	—	—	5	—	—	—	12	1	11	—	—	—	—	—	—	—	—	—	—	2	1	12	3	17
Naval Architecture	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—
Naval Arch. and Marine Eng.	—	—	8	—	—	—	—	—	—	—	—	—	—	—	19	—	—	—	—	—	—	—	—	27
Physical Biology	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Physics	5	—	54	—	—	—	5	1	8	—	—	—	—	—	—	8	6	21	—	—	—	18	7	83
Quantitative Biology	3	—	8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	8
Sanitary Engineering	—	—	—	—	—	—	—	—	5	—	—	—	1	—	—	—	—	—	—	—	—	1	—	5
Textile Technology	—	—	—	—	—	—	—	—	6	—	—	—	—	—	—	—	—	—	—	1	1	—	1	7
Without Course Classification	—	—	—	—	—	—	6	5	25	—	—	—	—	—	—	—	—	—	—	—	—	6	5	25
Total	60	49	3	5	2	24	98	58	261	14	8	6	6	2	34	28	22	51	18	21	38	229	162	987

* Includes 1 in Group Psychology.

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. 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.	Physics	Sanitary Eng.	Total	Total by Decades
1868	—	—	—	—	—	—	—	—	—	6	—	—	—	—	—	1	—	—	1	—	—	—	6	—	—	—	14	
1869	—	—	—	—	—	—	—	—	1	2	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	5	
1870	—	—	—	—	—	—	—	—	1	4	—	—	—	—	—	1	—	—	2	—	—	—	2	—	—	—	10	29
1871	—	—	—	—	—	—	—	—	2	8	—	—	—	—	—	—	—	—	2	—	—	—	5	—	—	—	17	
1872	—	—	—	—	—	—	—	—	3	3	—	—	—	—	—	—	—	—	1	—	—	—	5	—	—	—	12	
1873	—	—	1	—	—	—	—	—	7	12	—	—	—	—	—	1	—	—	2	—	—	—	3	—	—	—	26	
1874	—	—	1	—	—	—	—	—	—	10	—	—	—	—	—	2	—	—	4	—	—	—	1	—	—	—	18	
1875	—	—	1	—	—	—	—	—	1	10	—	—	—	—	—	2	—	—	7	—	—	—	6	—	1	—	28	
1876	—	—	1	2	—	—	—	—	5	12	—	—	—	—	—	4	—	—	8	—	—	—	8	—	3	—	43	
1877	—	—	4	—	—	—	—	—	2	12	—	—	—	—	—	—	—	—	6	—	—	—	8	—	—	—	32	
1878	—	—	3	—	—	—	—	—	3	8	—	—	—	—	—	1	—	—	2	—	—	—	2	—	—	—	19	
1879	—	—	1	1	—	—	—	—	3	6	—	—	—	—	—	—	—	—	8	—	—	—	3	—	1	—	23	
1880	—	—	—	—	—	—	—	—	1	3	—	—	—	—	—	1	—	—	—	—	—	—	3	—	—	—	8	226
1881	—	—	3	1	—	—	—	—	8	3	—	—	—	—	—	2	—	—	5	—	—	—	6	—	—	—	28	
1882	—	—	3	1	—	—	—	—	6	2	—	—	—	—	—	1	—	—	5	—	—	—	5	—	1	—	24	
1883	—	—	1	—	—	—	—	—	3	3	—	—	—	—	—	—	—	—	7	—	—	—	5	—	—	—	19	
1884	—	—	—	—	—	—	—	—	12	5	—	—	—	—	—	—	—	—	6	—	—	—	13	—	—	—	36	
1885	—	—	2	—	—	—	—	—	4	4	—	2	—	—	—	1	—	—	7	—	—	—	8	—	—	—	28	
1886	—	—	1	1	—	—	—	—	7	9	—	10	—	—	—	1	—	—	23	—	—	—	7	—	—	—	59	
1887	—	—	1	1	—	—	—	—	9	10	—	8	—	—	—	3	—	—	17	—	—	—	8	—	1	—	58	
1888	—	—	5	3	—	—	—	—	10	11	—	17	—	—	—	1	—	—	25	—	—	—	4	—	1	—	77	
1889	—	—	3	1	—	—	—	—	8	14	—	17	—	—	—	2	—	—	24	—	—	—	5	—	1	—	75	
1890	—	—	5	3	—	—	—	—	13	25	—	18	—	—	—	6	—	—	28	—	—	—	3	—	2	—	103	507
1891	—	—	6	3	—	—	7	—	11	18	—	23	—	—	—	1	1	—	26	—	—	—	4	—	3	—	103	
1892	—	—	13	6	—	—	4	—	7	22	—	36	—	—	—	7	1	—	26	—	—	—	4	—	1	6	133	
1893	—	—	2	2	—	—	8	—	8	25	—	41	—	—	—	6	2	—	30	—	—	—	5	—	—	—	129	
1894	—	—	14	1	—	—	12	—	11	21	—	33	—	—	—	5	—	—	31	—	—	—	4	—	3	3	138	
1895	—	—	15	—	—	—	11	—	14	25	—	33	—	—	—	4	—	—	30	—	—	—	3	5	2	4	146	
1896	—	—	24	3	—	—	7	—	17	26	—	48	—	—	—	7	3	—	34	—	—	—	10	5	3	4	191	
1897	—	—	16	2	—	—	12	—	20	25	—	33	—	—	—	7	1	—	40	—	—	—	7	9	3	4	179	
1898	—	—	29	3	—	—	9	—	25	32	—	33	—	—	—	6	—	—	41	—	—	—	7	7	4	3	199	
1899	—	—	22	2	—	—	10	—	22	30	—	32	—	—	—	1	—	—	37	—	—	—	9	8	2	1	176	
1900	—	—	21	3	—	—	11	—	19	32	—	23	—	—	—	5	—	—	34	—	—	—	21	9	3	4	185	1,579

* 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.

(*Continued on page 187*)

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. Admin.	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
1901	—	—	21	1	—	—	14	—	17	37	—	25	—	—	—	6	1	—	39	—	—	—	18	16	1	4	200	
1902	—	—	18	5	—	—	9	—	14	24	—	35	—	—	—	3	—	—	46	—	—	—	14	14	3	7	192	
1903	—	—	15	1	—	—	10	—	13	26	—	39	1	—	—	1	1	—	37	—	—	—	27	12	3	4	190	
1904	—	—	24	3	—	—	7	—	15	34	—	34	8	—	—	5	1	—	45	—	—	—	32	17	5	2	232	
1905	—	—	12	3	—	—	13	—	23	46	—	31	3	—	—	3	1	—	54	—	—	—	26	24	—	5	244	
1906	—	—	22	2	—	—	10	—	21	47	—	37	3	—	—	—	—	—	69	—	—	—	38	19	4	6	278	
1907	—	—	21	—	—	—	14	—	10	37	—	32	5	—	—	—	2	—	52	—	—	—	22	10	—	3	208	
1908	—	—	19	4	—	—	15	—	16	48	—	38	2	—	—	—	—	—	62	—	—	—	19	5	—	2	230	
1909	—	—	18	5	—	—	13	—	12	51	—	42	3	—	—	—	—	—	41	—	—	—	30	5	3	9	232	
1910	—	—	18	3	—	—	18	—	10	57	—	36	3	—	—	2	—	—	57	—	—	—	24	11	—	12	251	2,257
1911	—	—	10	1	—	—	19	—	12	46	—	49	5	—	—	2	—	—	49	—	—	—	17	6	1	15	232	
1912	—	—	21	4	—	—	31	—	7	55	—	52	3	—	—	1	—	—	47	—	—	—	21	3	2	14	261	
1913	—	—	26	2	—	—	30	—	12	58	—	43	8	—	—	—	—	—	50	—	—	—	20	4	1	15	269	
1914	—	—	19	6	—	—	37	—	9	60	—	51	8	—	—	4	—	—	65	—	—	—	17	8	1	19	304	
1915	—	—	30	3	—	—	33	—	23	49	—	42	10	—	—	3	—	—	69	—	—	—	5	7	3	12	289	
1916	—	—	37	5	—	—	32	—	11	45	—	56	14	—	—	2	—	—	84	—	—	—	5	9†	3	18	321	
1917	—	—	27	10	—	37	43	—	13	49	—	45	10	—	—	5	2	—	63	—	—	—	14	9†	1	17	345	
1918	—	—	28	7	—	29	40	—	10	45	—	50	11	—	2	4	1	—	75	—	—	—	10	4	3	5	324	
1919	—	—	16	9	—	28	44	—	8	45	—	50	6	—	3	1	—	—	66	—	—	—	7	7	4	6	300	
1920	—	—	19	2	—	48	63	—	6	52	—	30	9	—	1	4	—	—	55	—	—	—	13	12	2	2	318	2,963
1921	—	—	11	3	—	70	92	—	9	98	—	75	15	—	15	—	3	—	128	—	—	—	24	18	1	3	565	
1922	—	—	32	8	—	126	98	15	11	65	—	109	25	—	25	1	8	—	56	—	—	—	27	16	8	7	637	
1923	—	13	18	6	—	115	73	19	16	64	—	78	16	—	23	2	8	3	106	—	—	—	23	13	9	3	608	
1924	—	6	15	6	—	82	57	8	13	69	—	125	17	—	36	4	2	1	82	—	—	—	19	11	3	1	557	
1925	—	6	18	2	—	94	53	8	18	57	—	110	9	—	37	2	3	2	98	—	—	—	23	10	5	—	555	
1926	—	9	24	5	—	95	45	13	19	76	—	108	14	—	33	2	4	1	76	—	—	—	20	14	1	2	561	
1927	2	15	19	6	—	89	39	6	13	73	—	121	8	—	22	2	3	3	72	—	—	1	9	4	4	3	514	
1928	8	19	16	5	—	73	38	7	13	59	—	114	11	—	12	2	1	3	67	—	—	—	12	3	3	5	471	
1929	29	25	26	7	9	69	37	11	18	46	—	84	10	—	14	1	2	5	64	—	—	—	11	5	4	6	483	
1930	29	15	44	9	23	59	39	12	11	46	—	76	8	—	9	1	2	1	48	—	—	—	6	6	11	4	459	5,410

* 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.

(*Continued on page 188*)

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. Admin.	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	68	32	10	12	49	—	83	6	—	22	5	3	4	70	—	—	—	12	13	7	2	496	
1932	27	16	5	15	18	70	45	7	15	38	—	74	4	—	29	3	2	3	68	—	—	4	21	16	21	4	505	
1933	27	9	—	13	9	56	38	3	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	2	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	—	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	—	1	12	2	1	4	93	7	24	—	—	29	12	—	479	
1947	84	—	—	4	9	154	114	—	23	45	—	189	—	6	28	3	—	7	170	20	12	—	—	30	35	—	933	
1948	64	—	—	13	29	225	163	—	35	31	10	262	—	3	37	8	1	12	186	16	6	—	—	12	60	—	1,173	
1949	51	—	—	3	23	157	72	12	28	49	16	176	—	12	33	7	3	5	114	17	5	—	—	16	40	—	839	
1950	51	—	—	16	29	121	92	33	37	55	35	180	—	13	39	6	11	21	185	36	9	—	—	17	61	—	1,047	6,626
1951	50	—	—	14	32	119	92	27	26	55	23	150	—	10	26	7	18	13	139	40	7	—	—	23	53	—	924	
1952	34	—	—	9	30	98	65	11	26	52	14	130	—	8	14	7	18	21	117	38	9	—	—	26	67	—	794	
§1953	34	—	—	8	18	72	55	12	19	52	10	108	—	3	18	8	16	16	77	27	5	—	—	10	54	—	622	
Total	999	172	865	406	325	2,853	2,543	334	1,135	2,717	108	4,549	301	56	742	295	159	189	4542	351	77	5	880	811	774	264	26,452	

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

TABLE 14

Degrees of Master of Science Awarded

Class (Calendar Year)	Aeronautical Engineering	Architecture	Biol. & P. H. (Inc. VII-A)	Bldg. & Eng. Constr. XVI	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	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
1900	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1901	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	4
1902	—	3	—	—	—	—	—	—	3	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	8
1903	—	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	7
1904	—	4	—	—	—	—	—	—	1	—	—	2	—	—	—	—	1	—	—	—	3	—	1	—	—	12
1905	—	9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	—	—	1	—	18
1906	—	3	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2	3	—	—	—	—	9
1907	—	6	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	8	—	—	—	—	15
1908	—	1	—	—	—	—	—	—	1	—	—	3	—	—	—	—	—	—	—	—	7	—	—	—	—	12
1909	—	6	—	—	—	—	1	—	1	2	—	1	—	1	—	—	1	—	—	—	3	—	1	—	—	17
1910	—	6	1	—	—	—	—	—	1	2	—	1	—	—	—	—	1	—	—	—	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	—	—	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	—	—	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	93
1922	5	—	—	—	—	—	6	32	4	5	—	37	—	2	—	2	4	—	—	—	10	—	1	—	18	126
1923	10	—	—	—	—	—	3	34	1	5	—	45	—	2	—	—	15	1	—	4	21	—	3	—	26	170
1924	4	—	—	—	—	—	6	41	1	5	—	34	—	1	—	—	8	1	—	—	12	—	5	—	28	146
1925	5	—	—	—	1	—	3	35	3	5	—	35	—	—	—	—	10	2	—	—	—	—	2	1	21	123
1926	6	—	—	—	—	—	5	20	2	2	—	60	—	3	—	—	6	1	—	—	12	—	—	—	25	142
1927	9	—	1	—	—	—	2	26	4	6	—	54	—	6	—	1	13	—	—	—	6	—	1	—	32	161
1928	9	—	—	—	—	—	5	14	2	8	—	63	—	—	—	2	13	—	—	—	9	—	1	—	43	169
1929	5	—	—	—	2	—	3	21	4	6	—	79	—	4	—	2	16	—	—	—	6	—	2	1	45	196
1930	3	—	—	—	1	—	7	22	5	9	—	51	—	1	—	2	5	3	—	1	5	—	1	1	53	170

(*Continued on page 190*)

TABLE 14 — *Continued*

Degrees of Master of Science Awarded

Class (Calendar Year)	Aeronautical Engineering	Architecture	Biol. & P. H. (Inc. VII-A,B)	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	4	—	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	40	—	4	3	25	1	56	30	8	20	2	106	1	5	5	14	53	20	8	3	—	—	12	10	18	444
1952	29	—	7	4	26	—	36	19	4	24	3	111	2	2	2	6	32	29	19	2	—	—	15	7	26	405
*1953	33	—	1	7	26	—	22	12	6	26	—	74	1	2	—	7	37	9	12	—	—	—	9	5	30	319
Total	561	84	69	35	263	7	633	831	189	528	33	1,823	16	68	39	108	817	194	173	61	478	5	149	98	773	8,035

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	8,161

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

TABLE 15

Degrees Awarded in Architecture and City Planning

Class (Calendar Year)	Bachelor in Architecture	†Bachelor in City Planning	Master in Architecture	Master in City Planning
1921	—	—	3	—
1922	—	—	2	—
1923	—	—	7	—
1924	—	—	8	—
1925	—	—	5	—
1926	—	—	9	—
1927	—	—	7	—
1928	—	—	6	—
1929	—	—	9	—
1930	—	—	7	—
1931	—	—	9	—
1932	11	—	5	—
1933	24	—	7	—
1934	27	—	—	—
1935	17	4	11	—
1936	14	4	4	2
1937	9	2	11	3
1938	19	1	3	3
1939	14	1	10	3
1940	11	2	21	7
1941	17	2	6	1
1942	15	1	4	4
1943	10	—	3	6
1944	8	—	2	3
1945	5	—	—	7
1946	7	—	2	8
1947	9	1	20	15
1948	11	3	14	13
1949	24	2	10	12
1950	20	4	17	13
1951	27	2	20	12
1952	33	1	15	10
*1953	26	—	8	6
Total	358	30	265	128

* Includes only February and June degrees.
†From 1935 to 1944 Bachelor of Architecture in City Planning.

TABLE 16

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

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

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

TABLE 17

Degrees of Advanced Engineering Awarded

Class (Calendar Year)	Aeronautical Engineer	Chemical Engineer	Civil Engineer	Electrical Engineer	Mechanical Engineer	Metallurgical Engineer	Meteorologist	Naval Architect	Naval Engineer	Sanitary Engineer	Total
1949	—	—	—	2	—	—	1	—	37	—	40
1950	2	—	—	10	8	2	—	—	27	—	49
1951	3	1	—	9	10	2	—	1	33	—	59
1952	2	—	1	6	13	1	1	—	38	3	65
*1953	2	—	2	4	8	1	—	—	19	—	36
Total . . .	9	1	3	31	39	6	2	1	154	3	249

* Includes only February and June degrees.

TABLE 18

Degrees of Doctor of Philosophy Awarded

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

(*Continued on page 195*)

TABLE 18 — (*Continued*)

Degrees of Doctor of Philosophy Awarded

Class (Calendar Year)	Biology	Chemistry	Electrical Engineering	Food Technology	Geology	Industrial Economics	Mathematics	Physics	Group Psychology	Total
1951	2	30	—	—	8	7	7	30	—	84
1952	4	30	1	1	9	7	7	27	—	86
*1953	—	22	—	3	6	8	6	27	1	73
Total	55	493	2	8	83	41	86	299	9	1,076

* Includes only February and June degrees.

TABLE 19. DEGREES OF DOCTOR OF SCIENCE AWARDED

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

(*Continued on page 197*)

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

Class (Calendar Year)	Aero. Eng.	Ceramics	Chem. Eng.	Chemistry	Civil Eng.	Elec. Eng.	Electrochem. Eng.	Food Technology	Geology	Mathematics	Mech. Eng.	Metallurgy	Meteorology	Min. Eng.	Naval Arch.	Petroleum Eng.	Physics	San. Eng.	Total
1944	2	—	4	—	—	1	—	—	2	—	1	4	—	—	—	—	1	—	15
1945	—	1	7	—	2	—	—	—	—	—	1	3	1	—	—	—	—	—	15
1946	1	—	11	—	3	1	—	—	1	—	2	1	2	—	—	—	1	—	23
1947	2	1	10	—	2	4	—	2	1	—	2	11	1	—	—	—	1	—	37
1948	3	1	10	—	3	3	—	—	1	—	4	9	9	—	—	—	3	—	46
1949	2	5	21	—	6	8	—	—	—	—	7	15	4	—	—	—	1	2	71
1950	6	3	12	1	5	13	—	1	—	—	14	11	4	—	—	—	—	—	70
1951	5	2	10	—	7	11	—	—	—	—	10	19	2	—	1	—	3	4	74
1952	3	2	13	1	5	16	—	2	—	—	9	14	3	—	—	—	1	3	72
*1953	3	3	11	—	1	8	—	1	—	—	16	12	3	—	—	—	—	1	59
Total	40	30	249	12	50	114	2	6	12	5	87	154	39	5	2	1	41	13	862

* 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 (1868–1952)

Bachelor of Science	26,452
Bachelor in Architecture	358
Bachelor in City Planning	30
Master of Science	8,161
Master in Architecture	265
Master in City Planning	128
Master in Public Health (Discontinued after 1944)	103
Advanced Engineering	249
Doctor of Philosophy	1,076
Doctor of Science	862
Doctor of Public Health (Discontinued after 1944)	9
Doctor of Engineering (Discontinued after 1918)	4
Grand Total	37,697

Joseph C. MacKinnon

Registry of Guests

THE OFFICE of the Registry of Guests officially opened its door on September 3, 1953, to assist the President and the Faculty in extending hospitality to our visitors.

The principal functions of this Office during its first ten months of operation appear to be divided into two general categories: reception of visitors to the Institute; and the tender in behalf of the Institute of appointment as Guest or Visiting Fellow to approved visitors of at least postbaccalaureate attainment who wish to reside at M. I. T. for more than a brief period.

Visitors to the Institute have ranged from ambassadors, who have been extended as complete hospitality as the Institute affords, to the casual visitor who drops in unannounced with a spare hour or so at his disposal, for whom a tour of the Institute is arranged.

Three standard tours are available: one of general interest, one dealing with engineering facilities, and one with emphasis on pure and applied natural science. For visitors in the fields of humanities, social sciences, or business administration, the generously-tendered co-operation of the appropriate departments has been of great assistance.

The Office of Student Personnel under Mr. William Carlisle has maintained close and effective liaison with the Registry of Guests in these guided tours and in furnishing competent guides for special cases.

Pre-scheduling of appointments for those guests whose objectives could be ascertained in advance has contributed to economical and more profitable expenditure of time for both the visitors and their faculty hosts. An appointment schedule executed in duplicate for each visitor and each host stating room location and duration of visit for each appointment has proved useful.

It has been found advantageous to grant a specific academic status under Corporation appointment as Guest or Visiting Fellow for stated duration of time, to those whose stay is more than transient. Thus:

A GUEST of the Institute is one of professorial rank or equivalent professional attainments; he may share the academic facilities available to a staff member, without remuneration and without fee, for a stated period of time.

A VISITING FELLOW is of less academic attainment than professor but qualified for advanced study or research. He may audit or otherwise seek information without academic credit without fee, he may enroll as a special graduate student for credit with the appropriate fee, or, if a non-citizen on an Exchange-Visitor 3/2 visa, he may be given staff employment coincident with this appointment.

The official M. I. T. Guest Book of handmade paper in full leather binding is not only a handsome example of the bookbinder's art but is becoming an increasingly valuable addition to the Institute records. The guest signatures are headed by that of Mr. Lewis O. Douglas, former Ambassador to the Court of St. James, the guest speaker at our June, 1953, Commencement.

In the office of the Registry of Guests there is maintained also a current list of Guests and Visiting Fellows of the Institute with permanent and temporary address, local and other sponsorship, field of activity, and similar data. For our more permanent visitors from abroad, it has been possible to render some assistance in respect to income taxes and their waiver or adjustment. With regard to visas and exit permits for foreign visitors, we benefit from the understanding and co-operation of the Boston Office of the Immigration and Naturalization Service of the U. S. Department of Justice. While the Registry of Guests cannot appropriately render legal opinions, it can and does suggest procedures in the interest of equitable settlement of foreign guests' problems in the above matters, in collaboration with the Adviser to Foreign Students.

In addition to these services, this Office arranges for official Institute representation by alumni at inaugurations of college presidents and other academic functions elsewhere.

The following summary represents the number of Guests, Visiting Fellows and visitors of whom this Office has had official cognizance during the period September 3, 1952, through June 30, 1953:

Guests	16
Visiting Fellows	21
Visitors	950 (approx.)

The many expressions of appreciation from our guests for their reception by this office are attributable in the highest degree to the efficiency of its Executive Secretary, Miss Carolyn Evans.

JOHN W. M. BUNKER

Director of Libraries

THE BEST POSSIBLE library to meet the educational and research needs of the Institute would result if the following five ingredients could be ideally realized and combined: buildings and equipment, book collections, personnel, organization, and service. In these the ideal thus far remains to be achieved, although progress on all fronts has been more rapid during the past year than even sanguine estimates might have predicted.

The M. I. T. book collections are often surprising. Usually the surprise is occasioned by the amazing richness and variety of materials represented, but sometimes it is the reverse. At this writing, the official count of volumes in the library has passed the half-million mark; the addition of 17,045 volumes during the year raised the official count on June 30 to 499,453. During the past year, while many of the books, periodicals, and other materials that comprise the Library were in process of reassignment and relocation, they were also being reappraised. As deficiencies are isolated they are being remedied; obsolete or surplus materials are being weeded; duplication is being kept at a minimum. As new interests come to the fore they receive a place in acquisition policy. Most of the books bear outward signs of regular use; many are worn, some are battered. These signs analogous to the calluses of honest

toil are a matter of pride, yet the Tubby Rogers Collection of fine books and good reading editions which is now housed on the mezzanine of the north wing Humanities Library forms an interesting contrast. The Report of the Executive Board of the Faculty Committee on the Library (Part II, 1953) clearly demonstrates that if the Institute is to continue to provide adequate research facilities, money for the acquisition of new material and for binding must be added to the library budget.

ADMINISTRATIVE STUDIES

Personnel classification and salaries were intensively studied by the Executive Board of the Faculty Committee on the Library in co-operation with the Personnel Office and the Administration. A report (Report on the Metcalf Survey, Part II, 1953) submitted in late spring formed the basis for action and initial readjustments which took effect with the beginning of the fiscal year 1953–1954. Standards of librarianship are high in terms of service in the M. I. T. libraries and the staff is keeping pace with developments. The retirement of two senior members, Miss Mirian S. Smith and Mrs. Ruth McG. Lane, after service of 41 and 22 years, respectively, must be reported. Both have accepted emeriti appointments which will secure their competence and years of experience to the Library.

Organizationally, great forward strides have been taken. The creation of faculty advisory committees for the Divisional Libraries of Engineering and Science, with Professors Warren M. Rohsenow and Philip M. Morse as Chairmen, marks a real advance in co-operation.

Service, that is to say effective use of the libraries, has increased notably during the year. Regardless of the yardstick employed, the statistics all point up net increases. With the establishment of the Science Library, it became possible for the first time to provide an optimum schedule of open hours. Except for five major holidays, the Science Library is open from 8 A.M. until 11 P.M., Monday through Saturday and from 1 to 9 P.M. on Sunday. Users of the library have demonstrated approval by their presence at all hours. The vast Records Changing Project which serves to shorten

the gap between book and reader is well under way. The perfection of the Union Catalogue of all books at the Institute; the divided catalogue in the Science Library and a similar facility in process for the Engineering Library; the restriction of outside circulation and interlibrary loan of periodicals with the substitution of micro copies or other facsimiles to insure availability of needed material for Institute readers — all are illustrative of kinds of activity. The use of the Library by outside firms and individuals is by no means diminishing. In fact, it has at times constituted an embarrassment. Means must be found to enable these needed services to be supplied to those outside the Institute. Miss Smith, as Reference Librarian Emeritus, is investigating ways whereby those who can benefit from the M. I. T. Library may have an opportunity to do so and to contribute to its support and development, possibly through an Industrial Reference Service.

DIVISIONAL LIBRARIES

The organization plan as reported last year was in part a reality and in part a blueprint.

In the Architecture Library collections, functions, and activities are well integrated in the program of the Department. The Engineering Library is emerging as an important center for engineering activities. By uniting like interests and bringing together formerly dispersed materials, the Engineering Library as a whole is beginning to appear greater than the sum of its parts.

A Divisional Library for Humanities and Social Studies at M. I. T. would seem to require something more than a working collection for undergraduates with additional bibliographic and related material for the instructing staff. It would be unrealistic to visualize another great humanities research library in Cambridge; it is completely practical to forecast the development of an individual and highly distinctive library with proportionate emphasis on music and fine arts and with research materials in particular fields to complement and support a humanities program that has already achieved a position of pioneering leadership in the country. A Humanities Librarian, Mr. Burton Robie, was appointed in

January. It will be his responsibility to cope with the serious and involved problems of building a new kind of humanities library and integrating it physically and intellectually into the program.

The Divisional Library of Industrial Management is practically all open-shelf material; heavy use met and even exceeded anticipations. As the program of the fifth school unfolds, the role of this library is clearer. Close co-operation in the instructional program will go hand in hand with research. It is apparent that primary research materials in some quantity will be needed and will be acquired.

A science library has as many prickles for the unwary hand as a porcupine. Science at M. I. T. is a driving, demanding, expanding force, and it must have up-to-date material rapidly and conveniently at hand. In addition, the contrasting needs of the scientist who does probing research into a special field and those of the scientist who wishes to work in fringe areas between two or more established disciplines or across a wide range of scientific fields create a challenge for those who must meet the divergent demands. A good beginning has been made and heavy use has resulted.

The future may call for the segregation and recombination of library interests and the perfection of ways and means to meet special and individual demands. These, with the help and co-operation of the Faculty and through the Advisory Committee on the Science Library, will be achieved. Any solution will require patience, tolerance within and among fields, and co-operation in the true sense — that is, a measure of give-and-take without die-hard insistence on personal prerogatives.

LIBRARY OPERATIONS

To report the regular operations of a major research library in sufficient detail to present a fair and complete picture would require a great deal of space. Only brief mention is therefore possible. Totals for acquisitions appear elsewhere in this report and it is only necessary to add that we have received many gifts ranging from single items to large collections from individuals, firms, and organizations. The activities of the Friends of the Library were reflected

directly and indirectly in many of these valuable additions. Despite the requirements imposed by the Records Changing Project, the Catalogue Department again increased its production. It is becoming difficult to procure Library of Congress catalogue cards for new materials, and at least 50 per cent of our acquisitions seem to fall in fields not covered by the Library of Congress. Consequently it has been necessary to prepare cards in increasing numbers and to duplicate them on Multilith equipment. In the library generally, whole collections, large segments, and even single titles have been moved, relocated, and rearranged. At the same time, the records needed for access have been maintained up to date.

Statistically, circulation presents a somewhat confused picture brought about by changes from closed to open shelves, longer library hours, better library accommodations, and substitution of room use for withdrawal. It is apparent that the Library has been more generally and intensively used in the past year than ever before. Restrictions on interlibrary loan for periodicals caused this activity to diminish by about 40 per cent, although 3,123 items were loaned; similarly, borrowing for M. I. T. users decreased, but only by about 12 per cent. The ratio, which is the important factor, shows that the Library still loans four times as much as it borrows. Coincidentally the demand for facsimile reproductions has increased by a factor of about five. These are healthy and encouraging signs.

SPECIAL ACTIVITIES

Among the special facilities maintained by the Library are included the Exhibition Gallery, the Boston Stein Club Map Room, the Projection Room, and the Library Lounge. A series of exceedingly well planned and presented exhibits held in the Gallery under the direction of the Exhibitions Committee attracted numerous visitors not only from the M. I. T. community but from the Boston area generally. Other exhibits supplementing the humanities program were held in the Gallery and adjoining corridor areas.

The Library Lounge continues to receive heavy bookings for a great variety of Institute sponsored activities, while the Projection

Room, equipped this year with a new screen, is in constant demand. The Boston Stein Club Map Room is admirably meeting the needs that brought about its creation. With well-arranged collections, augmented this year by a large gift of topographic maps received from the Appalachian Mountain Club, it furnished the materials for an interesting summer exhibit of contemporary maps in the Gallery.

The Music Library, apart from its educational role, is one of the most attractive and popular areas in the Library if not in the entire Institute. Extensive record collections, excellent phonographs, books about music, and scores are made available for recreational use on the most liberal scale possible. Well-arranged record concerts in the library itself are broadcast from 9 A.M. until 5 P.M. over WMIT, which has now combined with the Radcliffe network to become WTRS. Several concerts of live music were presented to capacity audiences. A commentary on the use made of the facilities is the fact that the equipment, the best of its type obtainable, is wearing out with great rapidity and requires constant replacement. Musical assignments are now being recorded on tape which helps to check the wear on records, some of which were virtually worn out by constant use. The Boston Symphony concerts over WGBH-FM are received in the Music Library, and a full audience has enjoyed the concert series almost every Friday afternoon during the winter months.

On May 22 the Executive Board of the Faculty Committee on the Library presented Part II of its report derived from continued studies of the issues raised in the Metcalf Survey. This document, the second in a series of fundamental policy determinations, resulted from the distinguished leadership of the Chairman of the Committee,[1] Professor Samuel H. Caldwell, and the equally effective participation by each member through a long series of meetings. The first effects of the report have already been registered. The ultimate results will appear in succeeding years.

VERNON D. TATE

[1] Professor Samuel H. Caldwell (Chairman), Associate Professor Michael B. Bever, Professor Jacob P. Den Hartog, Professor Philip Franklin, Professor Philip M. Morse, Associate Professor Irwin W. Sizer (the Director of Libraries, and the Associate Librarian, Mr. Robert E. Booth, ex officio members).

Medical Director

THE MAIN EMPHASIS of the work of the Medical Department during the year 1952–1953 was on developing ways and means of making those medical principles useful in building and maintaining health available to as many members of the M. I. T. community as possible. This has been done through a continuation of the Faculty Health Survey, extension of the work in group psychodynamics as a means of furthering maturity, participation in the student counseling program, and pre-employment medical evaluations by the Occupational Medical Service, as well as through the basic medical and surgical care for those who suffer illness or injury.

The general health of the Institute personnel continued at its usual high level. The clinical work of the department has been very similar in volume to the experience of the last five years. Visits to the various services were distributed as follows:

Surgery	9,404
Medicine	8,525
Psychiatry and Neurology	3,049
Otolaryngology	1,683
Ophthalmology	1,182
Dermatology	1,203
Dental	5,116
Emergency Clinic	2,436
Physical Examinations	3,941
Occupational Medicine	1,002
Radiology	8,556
	46,097

In addition, the new Division of Defense Laboratories has two separate first-aid facilities, which are located at some distance from the Homberg Infirmary. The experience with these two stations has been less than one year, but in one of them the number of calls is more than 200 per month and increasing rapidly.

Of the total clinic visits, about 57 per cent were made by students, the remainder by staff members and employees. In the

Infirmary, there were 756 admissions, of which 77 per cent were students. The total number of patient days was 2,786, of which 71 per cent were students, 29 per cent staff members and employees. There were 15 cases of communicable diseases diagnosed during the year, mostly German measles and chicken pox. Two new cases of active pulmonary tuberculosis were discovered, neither of them in students. The clinical pathology service performed 13,583 laboratory procedures, an increase of more than 1,500 over the preceding year. The extent of use of the Medical Department as a whole can be visualized in another sense by the fact that approximately 200 persons visit it each day that the clinic is open.

The Faculty Health Survey has now been in existence two full years. During the first year, sufficiently full results to permit statistical treatment were obtained with 267 persons. From an analysis of those examinations, it was found that the general level of health of the staff was somewhat better than had been anticipated at the beginning of the survey. In four faculty members, serious disorders were found that were previously unsuspected and which were susceptible of successful treatment. In each instance a delayed diagnosis might have caused very serious results. A full account of the findings of the survey together with general suggestions regarding building and maintaining health was sent to all participants. New members have been added to the group so that the total number is now somewhat over 300. A valuable body of material has been built up that will be potentially of great aid to the individual in his future medical care and supervision, as well as in studying the prevalence of certain types of conditions. As a specific example, many of this group have volunteered for blood serum lipoprotein determinations, and those that have values which vary from the average will be followed over a period of several years to see whether or not this is of any significance in the development of atherosclerosis. Sources of psychological stress and strain in the group continue to be studied.

During the past year, two fellows in psychiatry, supported by grants from the United States Public Health Service through the National Institutes of Health, have been furnished a one-year

training period in college psychiatry. They have both contributed importantly to the work of the Department and will now be available for consultation in college health departments. The psychiatric clinic was used by 422 persons during the year, 330 of them students. Of the latter, 55 per cent were self-referred, the remainder coming largely because of suggestions of faculty members, the Dean's Office, and other physicians in the Department.

The clinic in disorders of the ear, nose, and throat has been making excellent progress under the guidance of Dr. Lyman G. Richards. Its use this year increased by 45 per cent over the preceding year and will now probably become stabilized at or near this level. Most of the other special clinics have become stabilized in such a manner that expected usage from year to year can be predicted reasonably accurately.

During the year a survey of "Health in Colleges" was published in the "Medical Progress" series of the *New England Journal of Medicine*. In it, the objectives of a college health service were ideally set forth as follows:

> To promote individual and general health in the college community by means of a program of comprehensive medical care.
>
> To prevent illness or injury when possible, in terms not only of sanitation and living conditions but also of factors promoting social and emotional maturity.
>
> To serve as an educational center for the collection and dissemination of information that affects the health of the community; this includes the maintenance of a referral or consultation service to enable college personnel to make effective use of the medical resources of the community.
>
> To aid in freeing the student or staff member from physical or emotional handicaps that prevent him from utilizing to the fullest extent the academic, extracurricular or environmental resources of the college.
>
> To care for sick students or staff members.

The excellent support and understanding of the Medical Department by the Administration has enabled the Department to realize many of these ideals and thus has served to encourage other colleges who are endeavoring to raise the standards of their own health service.

DANA L. FARNSWORTH

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, 1953, which date marks the natural termination of the Admissions Office year.

The following table compares, for this year and last, applications for admission to the freshman year, and those for transfer from other colleges at the undergraduate level:

FIRST YEAR CLASS*	*September 1952*	*September 1953*
Total applications	3,031	3,954
Admissions granted	1,425	1,565
Actual registration	943	843
Registration as per cent of admissions	66.2%	53.9%
Number of secondary schools represented	611	646

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

COLLEGE TRANSFERS	*September 1952*	*September 1953*
Total applications	668	644
Preliminary applications not followed up	300	270
Admissions granted	210	248
Actual registration	174	185
Combined Plan of Study	34	33
Registration as per cent of admissions	82.8%	74.7%

A marked increase in applications for admission to the first year proved later to be offset by a large increase in the proportion of accepted candidates who decided not to enter. This tendency, which we have experienced in common with many institutions, reflects the growing practice among students of submitting multiple applications and later making a choice among colleges based in part on relative offers of financial aid. We were able to counteract the heavy cancellations to some extent by drawing on the list of

qualified alternates set up in May when most of our notices of admission were sent out.

SCHOOL VISITING PROGRAM

During the past year, our program of visits to secondary schools has been greatly broadened by the participation of a faculty group. In addition to the four members of the Admissions Office staff, the following members of the Faculty and Instructing Staff took part in this program: Professors Martin A. Abkowitz, Richard B. Adler, Harl P. Aldrich, Holt Ashley, Walter A. Backofen, Elery F. Buckley, William V. A. Clark, John R. Coleman, Norman C. Dahl, Leslie H. Fishel, Jr., E. Lee Gamble, Robert G. James, James G. Kelso, Thomas F. Malone, S. Curtis Powell, Warren M. Rohsenow, John T. Rule, Francis W. Sears, Maurice E. Shank, J. Lowen Shearer, Howard Simpson, Albert B. Van Rennes, and Kenneth R. Wadleigh; also Messrs. Bruce Mazlish and Fred E. Werner, Jr.; and from the Administration, Messrs. Charles O. Jackson, Malcolm G. Kispert, and Philip A. Stoddard.

Most of these contributed one week, and a few two weeks, to school visits. An aggregate of 587 schools were thus visited by 32 members of the Institute staff. They talked with a total of 6,723 students, either individually or in small groups averaging about 12, the students being selected out of the entire student bodies of the respective schools because of their ability and potential interest in the fields with which M. I. T. is concerned.

In addition, alumni members of the Educational Council attended "college conferences" at 54 high schools, at which they saw a total of 691 students. Some 46 additional conferences were not covered because alumni were not available. In all, therefore, 7,414 secondary school students, selected on the basis of interest and ability, had an opportunity to talk directly with M. I. T. representatives who visited their schools and subsequently to examine M. I. T. literature. These contacts contribute much to the broad objective of furnishing competent guidance to young people at the stage when career choices are beginning to crystallize. Our representatives almost invariably are cordially

received, because they perform a legitimate function of educational guidance that far transcends any purely institutional recruiting purpose. The school visit program rests on a broad basis of public good will and contributes to the esteem in which M. I. T. is held in the educational world. It is conceived in these terms rather than as a plan for signing up freshmen for the ensuing September.

THE ADMISSIONS OFFICE AND THE PUBLIC

The school visiting program forms one aspect of the essential function of contact with the public, with schools, with prospective students, and with parents, friends, alumni, and others who are interested in their behalf. To the extent that this operation is broadly based, it follows that the major part of the time of the Admissions Staff tends to be occupied by people who do not actually enter. For example, some 4,200 inquiries about freshman admission were received, in addition to the 7,400 students seen in schools. Thus we had at least some contact, either in person or by mail, with 11,600 potential freshmen and in many cases with their teachers or parents as well; out of these was finally winnowed a class of 800 to 900 freshmen through selective processes partly under our control but largely under the control of the applicants themselves. In other words, most of those who went elsewhere did so voluntarily and not as a result of refusal here, since only about 700 were actually refused admission.

The same principle holds with reference to students interviewed in person. In the past year, individual conferences were held with 3,242 students and a memorandum was made of each conference. Almost exactly half of this number were seen in the Admissions Office and half by the Educational Counselors here and abroad; many of these were seen more than once. Less than one-third of this total actually entered either as freshmen or college transfers. While, therefore, the work of the Office includes screening and selection, it is in larger measure concerned with contact and relations with a widespread segment of the public.

CRITERIA FOR ADMISSION

Even though there are severe limitations on the amount of selection that we can exercise among applicants for admission, it is important that our screening be based as far as possible on rational criteria and sound judgment. This year, for the first time, all our applicants have taken the one-day test program of the College Entrance Examination Board. These scores, together with other evidence assembled for each candidate, make possible a reasonably accurate prediction of academic performance in the first year, a result made possible by the extended statistical studies of Professor George P. Wadsworth and Dr. Joseph G. Bryan.

The damage done to students' morale and the waste of educational resources involved in academic failures is so serious that one of our major continuing objectives is to confine the privilege of admission as far as possible to those who show a reasonable probability of being able to cope with the Institute program. In this selection, the appraisal of qualities of character and personality always occupies an important place, even though such elements are less susceptible of statistical measurement. In particular, motivation, emotional balance, and the ability to work harmoniously with others must be regarded as of central importance.

THE ADMISSIONS OUTLOOK

The last two or three years have witnessed in the United States a marked increase in interest in the broad problem of the transition from secondary school to college. This is one aspect of the more general problem of articulation between the segments of the educational system, which has always been difficult in this country because of the diversity that characterizes our system and the contrasting origins of its various parts.

A determined campaign is now in progress to improve the transition from school to college for the able student. For example, M. I. T. is one of twelve colleges participating in the Committee on Admissions with Advanced Standing, one of several projects having this objective. A rapidly growing number of secondary schools are starting advanced programs for exceptional

students under the auspices of this committee and it is expected that by September, 1954, we shall be accepting selected students who can be put ahead a year — or perhaps in a few cases more — in a number of subjects. The details of this proposal will be submitted to the Faculty during the coming year.

Professor Thresher is chairman of the Committee on the Colloquium for Admissions Officers which the College Entrance Examination Board is holding October 26 to 30, 1953, at which 96 colleges are to be represented. This project represents a considered effort to study the broad social and educational aspects of admissions problems, particularly in view of the very great increase in college enrollments which the next few years are expected to bring, and to aid in professionalizing an occupation usually entered with little preparation by persons of very diverse experience.

B. ALDEN THRESHER

Adviser to Foreign Students

IN THE ACADEMIC YEAR 1952–1953, 555 foreign students were enrolled at the Institute; of these, 281 were undergraduate and 274 were graduate students. They were citizens of 70 different countries. They comprised about 10 per cent of the Institute's total student body. This percentage of foreign to total students has been fairly constant in the post-war years, and it gives the Institute the most cosmopolitan student body of the major American universities.

The countries sending the largest delegations were as follows (figures in parentheses are for 1951–1952): Canada 90 (89), China 47 (43), India 36 (29), Great Britain 30 (24), Israel 25 (20), Venezuela 25 (9), France 20 (17), Greece 20 (13), Colom-

bia 17 (14), Mexico 16 (10), Cuba 15 (14), Norway 12 (25), Philippines 12 (8), and Australia 10 (10).

One of the interesting pairs of figures is that for Venezuela. Two factors have contributed to the sudden increase in numbers. The university in Caracas has been closed for some time because of a student strike, and many of that school's better students have tried to transfer to North American universities to complete their studies. A number of the major American oil companies have started scholarship programs for Venezuelan undergraduate students in several fields of engineering. The objective is to build up an engineering personnel largely Venezuelan. Two of the companies most active in this field are the Creole Petroleum Corporation, an affiliate of Standard Oil Company (New Jersey), and the Shell Caribbean Petroleum Company.

The other interesting figures are those for Norway. It was noted in the report for last year that after each of the World Wars a large group of undergraduate students came to M. I. T. from Norway. Those who entered in 1947 and 1948 have been graduated and Norway has apparently returned to "normalcy."

This year, again, has shown a sharp increase in the number of initial inquiries concerning admission to the Institute which come in from all over the world at the rate of about 40 a week. These are labelled "informal applications" in the accompanying table, since most students when they first write consider that they are making application. This is a measure both of an increasing desire abroad for an American education and of the increasing prestige of M. I. T. in other lands. One-third of those who hoped to come complete the formalities of an application, and one-third of that number join the Institute's classes in September.

FOREIGN STUDENT APPLICATIONS	*For September, 1952*	*For September, 1953*
Informal applications	1,541	1,935
Completed applications	599	643
Admitted and registered	218	193
Refused admission	278	267
Cancelled and "no show"	103	183

The Foreign Student Summer Project has completed another successful summer program. Seventy-seven young men and women from 32 countries attended classes, worked in laboratories, visited industries, and were introduced in many ways to the Greater Boston community and the American way of life. Co-chairmen were Rainer K. Sachs and Sanford E. Wolf. As in past years, F.S.S.P. was generously supported by the Alfred P. Sloan Foundation.

For the year 1953–1954, 20 students from M. I. T. have been granted 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, Fulbright Adviser and Assistant Director of Admissions.

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

The Placement Bureau was busier than ever during the period from October 14, 1952, to April 23, 1953. We had over 100 more companies this year than last, with a tremendous increase of company representatives on the campus. Many industrial concerns brought technical men with the regular recruiters, taxing our space facilities to the utmost. On occasion, personnel of the Bureau were obliged to give up their own offices in order to accommodate the influx of company representatives.

The Schedules Office was extremely helpful in making avail-

able three classrooms daily during the recruiting period from February 11 to April 23, 1953. As usual, this period was the heaviest, with the Placement Bureau averaging over nine companies, about 17 personnel representatives, per day. Our busiest day found us entertaining 27 recruiters from 11 companies.

Between October 14, 1952, and January 21, 1953, we were also correspondingly busier than last year. Indications are that the accepted interviewing procedure at M. I. T. is to visit twice, once in the fall to talk to those interested students in the small February class and to any June men who may be looking around early, and once in the spring (February or March) to reinterview those of the June men seen in the fall and any more who care to sign up.

The Placement Bureau received many more notices this year than last of technical summer employment available to interested juniors and some sophomores. Companies seem to be using this type of short duration job to accomplish needed work and to acquaint men with the company and the possibility of permanent employment in the future.

Current starting salaries are up about $15.00 per month, with Bachelors averaging about $350 per month, Masters about $395 per month, and Doctors from $500 up. The number of appointments already made for companies to visit M. I. T. during the coming fall and spring is well ahead of last year at this time. Dates already made and inquiries coming in daily point to another very busy year for the Student Placement Bureau and a wide choice of jobs for our graduates.

TABLE OF COMPANIES	*October 14, 1952, to January 21, 1953*	*February 11 to April 23, 1953*
Total number of companies	209	332
Different companies	160	256
Companies staying multiple days	49	76
Company representatives conducting interviews	247	376
Students interviewed by the above companies	2,150	3,782

TABLE OF STUDENTS BY GRADUATION DATES
REPORTING PLACEMENT AS OF JULY, 1953

September, 1952		*February, 1953*		*June, 1953*	
S.B.	72%	S.B.	80%	S.B.	87%
S.M.	63	S.M.	94	S.M.	92
Prof. Degree	100	Prof. Degree	100	Prof. Degree	97
Doctorate	78	Doctorate	91	Doctorate	91
Total	69.4	Total	89	Total	89

ALUMNI PLACEMENT

Although actual placement fell off appreciably this year percentage-wise it is less than 1 per cent under last year in relation to the number of men who registered. As has been true for so long now, the demand for men remains strong. During the first half of the year, we had an unusual number of requests for men in various phases of production management. During the last six months of the year, the majority of our calls have been for men with from three to five years of experience. Although the demand in other fields remained steady, the call for mechanical engineers and electrical engineers has been consistently high, with the greatest shortage showing up in the field of mechanical engineering.

This year, for the first time in several years, companies have been taking on a substantial number of sales trainees and sales engineers.

As was true in 1951–1952, hardly more than a dozen of the men who registered during the year were unemployed.

The average registrant was a graduate of the Class of 1939 or 1940, which is considerably older than our average has been for a number of years. This "average" man would have been even older except that, since February, 1953, a good many graduates of the last four classes have registered as they approached the date of their release from military service. Many of these younger men will not be available to accept positions until the latter half of 1953, which means that a considerable amount of the work we have done with them will carry into the next fiscal year.

Since February 1953, we have kept an up-to-date list of

these servicemen who knew when they would be released. With the full knowledge of the men concerned, this list has been sent out to over 100 companies. The firms have seemed to be most grateful for the service, but, from the point of view of this office, it has been a most disappointing experience. A relatively small number of men (45 to 50) have received literature and application forms from between 25 and 100 companies; only four men are known to have accepted positions in any of the companies that have approached them by this method.

PLACEMENT BUREAU FIGURES	*July, 1952 to June, 1953*	*July, 1951 to June, 1952*
Number of Jobs	2,934	3,115
Men Who Went on Available List	731	805
Men Who Came off Available List	424	432
Placements	150	170

In March, 1953, in order to find out what percentage of our recent graduates are in military service, we sent a questionnaire to all members of the Classes of 1949, 1950, and 1951. Better than 46 per cent of the men circularized have replied. On the basis of our present count, it appears that fewer than 10 per cent of the graduates of those classes are presently in service, and fewer than 1 per cent of the men in civilian life are eligible to be drafted. In the same mailing, we asked the civilians replying to the questionnaire to tell us how much they are earning. The response was most satisfactory, and the findings will be published in the November issue of the *Technology Review*.

NATHANIEL MCL. SAGE

Executive Vice President of the Alumni Association

DESPITE THE FACT that during 1952–1953 nearly 2,300 alumni were still paying final installments on Development Fund pledges, and hence could not appropriately be solicited by the Alumni Fund, the amount contributed to the 1953 Alumni Fund totalled $213,100 from 9,164 contributors. Thus the previous high mark of $206,600 attained in 1947–1948 was exceeded by 3 per cent, although the number of alumni contributing was 624, or 6.5 per cent, less than in 1947–1948.

The first two Alumni Regional Conferences held in January of 1951 and 1952 under the respective auspices of the M. I. T. Clubs at Chicago and Los Angeles, were followed by a third conference held last March in the Museum of Natural History under the auspices of the M. I. T. Club of New York. Nearly two hundred alumni were addressed by four members of the Institute Faculty during an afternoon session that preceded the conference dinner. Comment in the aftermath of this New York Conference has been as enthusiastic as it was after those held at Chicago and Los Angeles. Thus, it is to be hoped that the expressed desire of the Detroit M. I. T. Association to have a fourth regional conference in that city during 1953–1954 may be fulfilled.

With the recent establishment of the M. I. T. Clubs of Guatemala and New Mexico, the roster of these geographical alumni groups now totals 90. Sixty-nine M. I. T. Clubs are located within the continental United States, eleven are elsewhere in the Americas, and ten are overseas in the other hemisphere.

The preponderant majority of these clubs are, in fact, active groups of interested alumni, though it cannot be said that their programs of activity follow a common pattern. In larger centers it is customary for a club to meet on an average of four times per year; in cities less populous alumni-wise, not so frequently. Few clubs meet as often as once a month, and still fewer now schedule

weekly luncheons as many did in an elder day when urban traffic conditions were less complicated.

The trend of thinking by the officers of most M. I. T. Clubs during the past few years is to endeavor to make each foregathering an *occasion* that those attending will later recall with pleasure and satisfaction, instead of one of a series of scheduled dates arranged for faithful alumni attending from a sense of duty. Local tastes vary naturally and so do local conditions, and local opportunities, but there seems to be one common denominator applicable to any M. I. T. Club whether it be in Seattle or Miami, Los Angeles or Montreal, London or Honolulu — the cordiality of welcome extended when someone from Cambridge comes to report on recent progress at the Institute.

To the end that this desire be met in so far as possible, 71 members of the Institute staff went forth in the twelve months ended last April as emissaries of the Alumni Association to attend 126 meetings of 67 different M. I. T. Clubs.

This record of "visitation" is better than that of 1951–1952 when 57 individuals participated, and it represents a marked change compared with the corresponding activity five years ago, during 1947–1948, when only 32 visitors travelled to alumni clubs. The number of club meetings attended this year, 126, is slightly under last year's total of 135 but nearly half again as large as the 86 total of five years ago. Moreover, in each of the past two years over 65 M. I. T. Clubs have been visited in contrast to the 1947–1948 total of 49.

HAROLD E. LOBDELL

The Division of Industrial Cooperation

THERE HAS BEEN during the past year a healthy increase in non-government support of research activities, occasioned in part

by increases in industrial sponsorship and in part by foundation sponsorship. Reports on research in the Division will, as usual, be made by the departments conducting the research programs. We are including for the first time in this report a tabulation indicating the distribution by departments and interdepartmental laboratories of the research projects.

RESEARCH PROJECTS AS OF JUNE 30, 1953	*Government*	*Industrial and Foundations*	*Total*
Aeronautical Engineering	38	2	40
Biology	8	2	10
Building Engineering and Construction	2	0	2
Chemical Engineering	9	5	14
Chemistry	12	3	15
Civil and Sanitary Engineering	27	0	27
Electrical Engineering	14	0	14
Food Technology	8	1	9
Geology	5	0	5
Mathematics	6	1	7
Mechanical Engineering	32	8	40
Metallurgy	34	7	41
Meteorology	8	0	8
Physics	13	2	15
Acoustics Laboratory	10	1	11
Research Laboratory of Electronics	8	1	9
Laboratory for Nuclear Science	14	1	15
Center for International Studies	1	4	5
Dynamic Analysis and Control Laboratory	9	1	10
Servomechanisms Laboratory	8	5	13
Miscellaneous	6	2	8
Total	272	46	318

Below are the fiscal reports covering the operations of the Division for the year ending June 30, 1953, and tables indicating the personnel employed on research projects and the status of projects during the fiscal year ending June 30, 1953.

The Lincoln Laboratory has been excluded from these figures and is covered in a separate report of the Division of Defense Laboratories.

FISCAL REPORT FOR THE YEAR ENDED JUNE 30, 1953

Dollar Volume:	*Fiscal Years*	
	1952–1953	*1951–1952*
General Government	$16,906,800	$23,919,800
Industrial and Foundations	922,750	360,100
Total	$17,829,550	$24,279,900

PERSONNEL EMPLOYED ON D.I.C. PROJECTS

	As of June 30, 1953	*As of June 30, 1952*	*As of June 30, 1951*
D.I.C. Staff	770	1,161	788
D.I.C. Non-staff	1,199	1,799	1,170
M. I. T. Staff	680	644	550
Total	2,649	3,604	2,508

STATUS OF PROJECTS AS OF JUNE 30, 1953

	Number of Projects at June 30, 1953	*New*	*Terminated*	*Number of Projects at June 30, 1952*
General Government	272	83	58	247
Industrial and Foundations	46	16	52	82
Total	318	99*	110	329

* Does not include projects extended by contract amendment. These total 157, of which 135 are general government, and 22 are industrial and foundations.

NATHANIEL MCL. SAGE

Director of the Division of Defense Laboratories

THE DIVISION OF DEFENSE LABORATORIES was officially established as a separate Division as of January 1, 1953. To date, the only contracts assigned to it are the contracts under which the Lincoln Laboratory is operating.

Because it was not deemed feasible to segregate the operations of the Division of Defense Laboratories from those of the Division of Industrial Cooperation prior to January, 1953, the fiscal report of the Division of Industrial Cooperation includes the entire fiscal year's operations.

FISCAL REPORT FOR THE YEAR ENDED JUNE 30, 1953

Dollar Volume in Fiscal Year 1952–1953: $16,199,600

PERSONNEL AS OF JUNE 30, 1953

Division of Defense Laboratories Staff	500
Division of Defense Laboratories Non-staff	970
M. I. T. Staff	55
	1,525

HORACE S. FORD

Director of the Division of Business Administration

CONSTRUCTION OF the new auditorium started May 4, 1953, with an estimated completion date of July, 1954. The contract was awarded to the George A. Fuller Company. With the many detailed problems of the auditorium solved, the Building Committee gave concentrated attention to the plans for the chapel. Following

discussions in the Executive Committee of the Corporation and the full Corporation in June, the Saarinen proposal for a cylindrical form was approved and the detailed plans are now being formulated with the assistance of Dean Bowditch and a group of clergy of the several faiths which represent the major groups among the student body at the Institute.

The planning of the auditorium and chapel has brought into focus the need for renewed consideration of the long-term development of the West Campus. For example, provision is being made in the air conditioning unit of the auditorium for sufficient refrigeration to take care of a skating rink. A group of alumni have shown enthusiastic interest in seeking funds for a rink, a much needed facility. At the invitation of the City of Cambridge, the Institute's administration has joined with city authorities in presenting to the state a proposal for an underpass on Massachusetts Avenue. The construction of the proposed underpass would serve to tie together the East and West Campuses and greatly to alleviate a serious safety situation, since almost 1700 students who now live on West Campus must cross Massachusetts Avenue daily.

The Faculty Club completed its first year of operation very successfully from the standpoint of faculty participation. Financially the operation approached the break-even point, a surprising fact in view of the many unforeseen and extraordinary expenses involved in the first year. Members of the Faculty serving on the Executive Committee, under the presidency of Professor Charles Kindleberger, spent a great deal of time working on the problems of the Club. Much of the success of the operation, both social and financial, is due to the skillful and imaginative planning of the Club's manager, Mr. William Morrison. Through the continuing generosity of Redfield Proctor, the Club's physical facilities and decor have been greatly improved during the year.

The William Walker Lounge, for students of chemical engineering, was completed during the year. This was planned and largely carried through by students. Stephen Kliment was the architect; Edward Leonard played a major part in soliciting funds, working with Mr. Bradley Dewey of the Corporation. Professor

E. R. Gilliland, Acting Head of the Chemical Engineering Department, coordinated the student activities in carrying through the project.

The Charles M. Spofford Room, to be devoted to the social use of the staff of the engineering departments, is under construction and will be completed before the fall term starts. We were fortunate in having as architect Enrico Peressutti, Visiting Professor of Architecture. Funds for the Spofford Room were given anonymously by a distinguished alumnus of the Institute.

Other changes in physical plant included the completion and dedication of the John Thompson Dorrance Building; a major relighting and painting program in the Combined Engineering Library on the fifth floor of Building 10, which has done much to make that facility more attractive and useful; and minor space changes to permit justifiable expansion of growing departments, especially in Building 24 for the Department of Geology and Geophysics.

Among the unsolved space problems is that of parking; by the application of somewhat stringent regulations, the commuting personnel are adequately cared for, but there remains a sizeable number who cannot be accommodated with the present available area. The parking problem continues to merit frequent attention by the administration.

A great deal of credit for the successful execution of the building program and for carrying out the rehabilitation of existing buildings should be given to Mr. Carl Peterson, Superintendent of Buildings and Power, for his engineering and management skills in serving as principal liaison among the Institute's professional staff, the architects and the contractors. These projects, as well as the whole operation of the major services, are greatly benefited by the care and diligence of Mr. Philip A. Stoddard.

Personnel Office. The Personnel Office has continued under high pressure through the further development of the Lincoln Laboratory and the servicing of academic, administrative and contract research activities under highly competitive conditions.

The operations of the Lincoln personnel office have been successfully melded with the rest of the Institute's personnel procedures to a large extent through the efforts of Mr. R. Colin Maclaurin.

Housing and Dining Service. The housing and dining operations have had a successful year. Some changes in procedure, such as minimizing room changes in the dormitories, should result in better operation in 1953–1954. In cooperation with the fraternities, limited withdrawals from the dormitories will be permitted at the beginning of the second term to fill vacancies caused by attrition at the end of the first term. The continuing increases in the costs of operation of both housing and dining make it clear that some further efforts will have to be made to cut expenses or to increase revenue in order to maintain a break-even operation. The Campus Room of the Graduate House continues to serve as an attractive place for commons meals for the students of Burton House. The Snack Bar at Burton, in operation for the past year, has proved to be a popular place for residents of Burton and Baker.

A new lounge has been completed in Burton House during the year. The furnishings in the lower floor lounge in Baker have been supplemented and a music room has been provided. While these have been costly, the results in terms of the improvement in student campus living more than justify the expense. Like other capital changes, the costs are borne by special appropriation and are not charged against dormitory operations.

ROBERT M. KIMBALL

Principal Honors and Awards to the Staff

ADMINISTRATION

PIETRO BELLUSCHI

Associate, National Academy of Design.

JOHN ELY BURCHARD

Honorary degree of Doctor of Humane Letters, Union College.

Vice-President, American Academy of Arts and Sciences.

Member of the Advisory Board, United States Merchant Marine Academy.

BEVERLY DUDLEY

Chairman of the Boston Section, Institute of Radio Engineers.

HORACE SAYFORD FORD

Honorary degree of Doctor of Laws, Middlebury College.

GEORGE RUSSELL HARRISON

Chairman of the Rumford Committee, American Academy of Arts and Sciences.

Chairman of the *ad hoc* Committee on Policies and Procedures, American Academy of Arts and Sciences.
Chairman of Section B (Physics), American Association for the Advancement of Science.
Vice-President, American Association for the Advancement of Science.
Chairman, American Institute of Physics.
Director, Corning Museum of Glass.
Member, Science Manpower Commission.
Member, Joint Commission on Spectroscopy.
Project Reviewer, National Science Foundation.

JAMES RHYNE KILLIAN
Honorary degree of Doctor of Science, University of Havana, Cuba.

WALLACE MASON ROSS
Honorary Member, M. I. T. Alumni Association.

VERNON DALE TATE
Member of the Advisory Committee, Association of Research Libraries.
Fellow, American Academy of Arts and Sciences.

JAMES LIBBY TRYON
President, Medford Historical Society.

FACULTY AND STAFF

Department of Aeronautical Engineering

RAYMOND LEWIS BISPLINGHOFF
Chairman of the Boston Chapter, Institute of Aeronautical Sciences.

Department of Architecture

LAWRENCE BERNHART ANDERSON
President, Association of Collegiate Schools of Architecture.

HERBERT LYNES BECKWITH
Secretary, National Architectural Accrediting Board.

Department of Biology

JOHN HENRY DONALD BRYAN
Member, Genetics Society of America.

CECIL EDWIN HALL
President, Electron Microscope Society of America.
Special Lecturer, University of Brazil.
Special Lecturer, National Polytechnic Institute, Brazil.

KURT SIEGFRIED LION
Director, Academy of Physical Medicine.

SAMUEL CATE PRESCOTT
Special citation by the Institute of Food Technologists as a pioneer in the field of food technology.
Presentation of a gold key to the Samuel Cate Prescott Laboratory of Food Technology at the dedication ceremonies of the new Laboratory.

FRANCIS OTTO SCHMITT
Member, American Philosophical Society.

CLAIR ELSMERE TURNER
Honorary Medal of the City of Paris, France.
President, International Union for Health Education of the Public.

Department of Building Engineering and Construction

WERNER HERBERT GUMPERTZ
Chairman of the Program Committee for the Northwest Section, American Society of Civil Engineers.

HOWARD SIMPSON
Chairman of the Prestressed Concrete Subcommittee, Building Code Committee, American Concrete Institute.
Chairman of the Task Subcommittee on Materials, Joint Committee, American Concrete Institute–American Society of Civil Engineers.

Department of Chemical Engineering

THOMAS KILGORE SHERWOOD
Chairman of the Publications Committee, American Institute of Chemical Engineers.

JOHNSON EDWARD VIVIAN
Chairman of the Boston Section, American Institute of Chemical Engineers.

Department of Chemistry

CHARLES DUBOIS CORYELL
Louis Lipsky Fellowship for the Weizmann Institute of Science, Israel.
Chairman of the Gordon Conference on Nuclear Chemistry, American Association for the Advancement of Science.
Secretary–Treasurer, Federation of American Scientists.

LAWRENCE JOSEPH HEIDT
Fellow, American Academy of Arts and Sciences.
Member of the Conference on Solar Energy Conversion, National Science Foundation.

JOHN WITHERS IRVINE, JR.

Member, American Academy of Arts and Sciences.

Honorary degree of Doctor of Science, Missouri Valley College.

NICHOLAS ATHANASIUS MILAS

Invited Lecturer at Luton, England; Paris, France; Basel, Switzerland; and Zagreb, Yugoslavia.

JØRGEN RATHLEV

Gold Medal of the University of Copenhagen, Denmark, for philosophical treatise entitled "The Principle of Causality and Quantum Mechanics."

JOHN DOMBROWSKI ROBERTS

Fellowship, John Simon Guggenheim Memorial Foundation.

LOCKHART BURGESS ROGERS

National Councilor for the Northeastern Section, American Chemical Society.

JOHN CLARK SHEEHAN

Fellowship, John Simon Guggenheim Memorial Foundation.

JACINTO STEINHARDT

Vice-President, Operations Research Society of America.

WALTER HUGO STOCKMAYER

Fellow, American Physical Society.

Department of City and Regional Planning

JOHN TASKER HOWARD

Vice-President, American Institute of Planners.

BURNHAM KELLY

Member of the Special Committee on Social Responsibilities of the Planning Profession, American Institute of Planners.

Member of the Board of Directors of the Massachusetts State Association, American Institute of Architects.

LOUIS BEMIS WETMORE

Vice-President of the New England Chapter, American Institute of Planners.

Department of Civil and Sanitary Engineering

JOHN HENRY AUSTIN

Fulbright Award to the Delft Technical College, the Netherlands.

JAMES WALLACE DAILY

Chairman of the Advisory Committee on Basic Research in Underwater Ballistics, Office of Naval Research.

THOMAS WILLIAM LAMBE

Collingwood Prize of the American Society of Civil Engineers, for paper entitled "Capillary Phenomena in Cohesionless Soils."

CHARLES HEAD NORRIS
Chairman of the Structural Section, Boston Society of Civil Engineers.

HENRY MARTYN PAYNTER
Clemens Herschel Prize of the Boston Society of Civil Engineers, for paper entitled "Methods and Results of M. I. T. Studies in Unsteady Flow."

JOHN BENSON WILBUR
Vice-President of the Northeastern Section, American Society of Civil Engineers.

Department of Economics and Social Science

JOSEPH CARL ROBNETT LICKLIDER
Fellow, American Academy of Arts and Sciences.
Member of the Executive Council, Acoustical Society of America.
Chairman of the Committee on Speech Communication, Acoustical Society of America.

CHARLES ANDREW MYERS
Member of the Executive Board, Industrial Relations Research Association.

NORMAN JUDSON PADELFORD
Member of the Executive Council, American Society of International Law.
Honorary Chairman, United Council on World Affairs, Boston.

HERBERT ALLEN SHEPARD
Faculty Research Fellowship, Social Science Research Council.

ROBERT MERTON SOLOW
David A. Wells Prize of Harvard University, for a doctoral dissertation in the Harvard Economics Department entitled "On the Dynamics of the Income Distribution."

Department of Electrical Engineering

JORDAN JAY BARUCH
Chairman of the Professional Group on Audio, Institute of Radio Engineers.

LEO LEROY BERANEK
Fellow, American Academy of Arts and Sciences.
Fellow, Institute of Radio Engineers.
President, Acoustical Society of America.
Chairman of the Panel on Acoustics, Research and Development Board.
Chairman of the Committee on Acoustical Measurements and Terminology, American Standards Association.

EUGENE WHEELOCK BOEHNE

Chairman of the Boston Section, American Institute of Electrical Engineers.
Director, Massachusetts Society of Professional Engineers.
Member of the Science and Arts Committee, Franklin Institute.

HAROLD EUGENE EDGERTON

Franklin L. Burr Award of the National Geographic Society, "in recognition of outstanding achievements in the field of science."

RICHARD DUDLEY FAY

Vice-President, Acoustical Society of America.

WILLIAM MONROE PEASE

Chairman of the Technical Committee on Feedback Control Systems, Institute of Radio Engineers.

WILLIAM HENRY RADFORD

Member of the Special Commission on Educational Television, Commonwealth of Massachusetts.

WALTER ALTER ROSENBLITH

Chairman of the Subcommittee on Bio- and Psycho-acoustic Criteria for Noise Control, American Standards Association.

ARTHUR ROBERT VON HIPPEL

Chairman of the Conference on Electrical Insulation, National Research Council.

Department of Food Technology

SAMUEL A. GOLDBLITH

Among Ten Outstanding Young Men of 1952, Boston Junior Chamber of Commerce.

ROBERT SAMUEL HARRIS

Professor Honoris Causa, Faculty of Sciences, University of Havana, Cuba.

ERNEST EARL LOCKHART

Treasurer of the Northeast Section, Institute of Food Technologists.
Treasurer of the National Convention, Institute of Food Technologists.

BERNARD EMERSON PROCTOR

President, Institute of Food Technologists.
Chairman, Herman Frasch Foundation Awards Committee.

Department of Geology and Geophysics

MARTIN JULIAN BUERGER

Member, National Academy of Sciences.

ROLAND DANE PARKS
Chairman of the Boston Section, American Institute of Mining and Metallurgical Engineers.

Section of Graphics

RICHARD CORNELIUS DONKERVOET
Fulbright Fellowship for study in Holland.

Department of Humanities

ALDRED DUPONT CHANDLER, JR.
Research Fellowship in Entrepreneurial History, Harvard University.

CARVEL COLLINS
Secretary of the Conference on Literature and Psychology, Modern Language Association.

RICHARD MENDELL MARKUS
Editor, *Harvard Law Review*.

RALPH CLINTON PATRICK, JR.
Wenner–Gren Fellowship, to study culture change among Havasupai Indians of Arizona.

HOWARD JOHN THOMPSON
President, New England Forensic Association.

School of Industrial Management

WILLIAM VAN ALAN CLARK, JR.
Vice-Chairman, College–Industry Committee on Material Handling Education.

ERWIN HASKELL SCHELL
Wallace Clark International Award of the National Management Council for "distinguished contribution to scientific management in the international field."

ELI SHAPIRO
Fellowship to the Institute of Mathematics in the Social Sciences, Social Science Research Council.

Department of Mathematics

PHILIP FRANKLIN
Member of the Council, American Academy of Arts and Sciences.

WILLIAM TED MARTIN
Member of the Board of Trustees, American Mathematical Society.

ERIC REISSNER

Member of the Committee on Elasticity, American Society of Civil Engineers.

GEORGE PROCTOR WADSWORTH

Fellow, Operations Research Society of America.

Department of Mechanical Engineering

JOHN ALDEN CLARK

Honorary Member, Pi Tau Sigma.

JACOB PIETER DEN HARTOG

Member, National Academy of Sciences.

JOSEPH HENRY KEENAN

Honorary Member, American Association of Physics Teachers.

Chairman of the Rumford Committee, American Academy of Arts and Sciences.

FRANK AMBROSE MCCLINTOCK

Associate Member of the Engineering Panel, Committee on Statistics in the Physical Sciences, American Statistical Association.

LEONARD MAUNDER

Prize of the Institution of Mechanical Engineers for paper published in *Proceedings*.

WILLIAM MACGREGOR MURRAY

First William M. Murray Lecturer, Society for Experimental Stress Analysis.

BRANDON GARNER RIGHTMIRE

Vice-Chairman of the Boston Section, American Society of Lubrication Engineers.

WARREN MAX ROHSENOW

Junior Award of the Heat Transfer Division, American Society of Mechanical Engineers, for the outstanding paper presented, entitled "A Method for Correlating Boiling Heat Transfer Data."

Gold Medal Award of the American Society of Mechanical Engineers, to the engineering graduate who was most outstanding among members of his class in the first ten years following his graduation.

Award of the Yale Engineering Association, "for advancement of basic and applied science."

Member of the Executive Committee of the Boston Section, American Society of Mechanical Engineers.

EDWARD ROBINSON SCHWARZ

Honorary Member, Textile Society of Canada.

MILTON CLAYTON SHAW

Lectureship in Europe, European Engineering Societies.

Fellow, American Academy of Arts and Sciences.

PETER KOLOMAN STEIN

Chairman of the Junior Activities Committee for the Boston Section, American Society of Mechanical Engineers.

CHARLES FAYETTE TAYLOR

Certificate of Honor from the American Society of Mechanical Engineers, for paper entitled "Heat Transmission in Internal Combustion Engines."

Medical Department

DANA LYDA FARNSWORTH

President, American College Health Association.

Chairman, Fourth National Conference on Health in Colleges.

Member of the Executive Committee, Group for the Advancement of Psychiatry.

IVAN DERAY FRANTZ, JR.

Member, American Society of Biological Chemists.

Member, American Society for Clinical Investigation.

GRANT V. RODKEY

Fellow, American College of Surgeons.

GEORGE WHITE

Treasurer, Daland Society.

Department of Metallurgy

JOHN CHIPMAN

Losana Golden Medal of the Italian Metallurgical Association, in recognition of "pioneering metallurgical achievements."

Albert Sauveur Achievement Award of the American Society for Metals, for "substantial contributions to the knowledge of metals."

Charles M. Schwab Memorial Lecturer, American Iron and Steel Institute.

President of the Foundation for Education and Research, American Society for Metals.

Trustee, American Society for Metals.

MORRIS COHEN

Chairman of the Institute of Metals Division, American Institute of Mining and Metallurgical Engineers.

Kamani Medal of the Indian Institute of Metals, for the best paper published in the *Transactions* of the Indian Institute of Metals, Volume V.

Annual Mechanical Engineering Lecturer, University of Connecticut.

ANTOINE MARC GAUDIN

Third Sir Julius Wernher Memorial Lecturer, Institution of Mining and Metallurgy.

GORDON DOUGLAS GEMMELL

First Prize in the National Essay Competition, Electrochemical Society.

WILLIAM DAVID KINGERY

Secretary of the New England Section, American Ceramic Society.

FREDERICK HARWOOD NORTON

Trustee, American Ceramic Society.

Trinks Award of the Industrial Furnace Manufacturers' Association.

MARIA TELKES

Award of the Society of Women Engineers, "in recognition of meritorious contribution to engineering in the utilization of solar energy."

HARRY UDIN

Member of the Educational Committee, American Welding Society.

Chairman of the Program Committee for the Boston Chapter, American Welding Society.

Department of Modern Languages

WILLIAM NASH LOCKE

President, Alliance Française de Boston.

Department of Naval Architecture and Marine Engineering

MARTIN AARON ABKOWITZ

Member of the Analytical Wave Resistance Panel, Society of Naval Architects and Marine Engineers.

JOHN HARVEY EVANS

Vice-Chairman of the New England Section, Society of Naval Architects and Marine Engineers.

Member of the Hull Structure Committee, Society of Naval Architects and Marine Engineers.

Chairman of the Buckling Strength Panel, Society of Naval Architects and Marine Engineers.

SHANNON CURTIS POWELL

Member of the Executive Committee, Society of Naval Architects and Marine Engineers.

Chairman of the Sections Committee, Society of Naval Architects and Marine Engineers.

LAURENS TROOST

Corresponding Member for U. S. A., Association Technique Maritime et Aéronautique, Paris, France.

President's Award of the Society of Naval Architects and Marine Engineers, for the best paper presented before a local section.

Department of Physics

BORIS WILLIAM BATTERMAN

Fulbright Award for study in Germany.

RICHARD HENRY BOLT

Chairman of the Committee on Hearing and Bio-Acoustics, U. S. Armed Forces–National Research Council.

Member of the Special Subcommittee on Aircraft Noise, National Advisory Committee for Aeronautics.

Fellow of the Physical Society, London, England.

SANBORN CONNER BROWN

Fellow, American Academy of Arts and Sciences.

WILLIAM WEBER BUECHNER

Member of the Board of Editors, *Physics Today*.

Extraordinary Professor, University of Mexico.

Honorary degree of Doctor of Science, University of Mexico.

MARTIN DEUTSCH

Fellow, American Academy of Arts and Sciences.

Fellowship, John Simon Guggenheim Memorial Foundation.

LAWRENCE GOULD

Fulbright Award for study in France.

THEODOR FRIEDRICH HUETER

Member of the Committee on Ultrasonics, Acoustical Society of America.

Chairman of the Committee on Ultrasonic Diathermy, American Standards Association.

PHILIP MCCORD MORSE

President, Operations Research Society of America.

Member of the Board of Trustees, American Institute of Physics.

ROBERT WALTER WILLIAMS

Fellow, American Physical Society.

DIVISION OF INDUSTRIAL COOPERATION

DAVID RANDOLPH BROWN

Vice-Chairman of the Electronic Computers Committee, Institute of Radio Engineers.

DAVID L. FALKOFF

Associate Editor, *American Journal of Physics.*

INEZ BELLAMY HAZEL

Treasurer, Society of Women Engineers.

JOHN ALEXANDER KESSLER

Senior Member, Institute of Radio Engineers.

Member of the Administration Committee for the Professional Group on Audio, Institute of Radio Engineers.

Secretary of the Boston Chapter of the Professional Group on Audio, Institute of Radio Engineers.

Member of the Music Committee, Acoustical Society of America.

JOHN ERWIN WARD

Secretary of the Committee on Feedback Control Systems, Institute of Radio Engineers.

WILLIAM WEAVER WARD

First Prize in the Annual Essay Contest for Young Engineers, Engineering Societies of New England.

Periodical Publications, Books, and Reviews by the Staff

DEPARTMENT OF AERONAUTICAL ENGINEERING

ASHLEY, HOLT, J. DUGUNDJI and D. O. NEILSON. Two Methods for Predicting Air Loads on a Wing in Accelerated Motion. *J. Aero. Sci.* 19, pp. 543–552, August, 1952.

ASHLEY, HOLT and R. L. HALFMAN. Aeroelastic Properties of Slender Wings. (In *Proceedings* of the First U. S. National Congress of Applied Mechanics, Chicago, Illinois, June, 1951, pp. 907–916. New York: Am. Soc. Mech. Engrs., 1952.)

BARON, JUDSON R. On the Use of the Neutral Point as a Stability Parameter. *J. Aero. Sci.* 20, pp. 145–146, February, 1953.

HUNSAKER, JEROME C. *Aeronautics at the Mid-Century.* New Haven: Yale Univ. Press, 1952.

HUNSAKER, JEROME C. U. S. National Advisory Committee for Aeronautics. *Annual Report* 38, 1952. Washington, D. C.: Govt. Print. Office, 1952.

HUNSAKER, JEROME C. Aeronautics: Some Social Aspects. *Aero. Eng. Rev.* 11, no. 12, pp. 20–31, December, 1952.

HUNSAKER, JEROME C. Social Aspects of Aeronautics. *The Technology Review* 55, pp. 309–342, April, 1953.

LAPP, PHILIP A. and Y. T. LI. A Flowmeter for Measuring True-Mass-Rate with Fast Response. National Conference on Industrial Hydraulics, 9th, 1953. *Proceedings* v. 7, 1953.

MUELLER, ROBERT K. *Microsyn Electromagnetic Components.* Cambridge, Mass., M. I. T. Instrumentation Lab., 1952.

PIAN, THEODORE H. H. and HALLOWELL, F. C. Structural Damping in a Simple Built-up Beam. (In *Proceedings* of the First U. S. National Congress of Applied Mechanics, Chicago, Illinois, June, 1951, pp. 97-102. New York: Am. Soc. Mech. Engrs., 1952.)

PIAN, THEODORE H. H. and SIDDALL, J. N. Prediction of Stresses in a Structure under an Arbitrary Dynamic Loading. *Soc. Exper. Stress Analysis Proc.* 9, no. 2, pp. 1–12, 1952.

PIAN, THEODORE H. H. Effect of Structural Flexibility on Aircraft Loading. V. Rapid Estimation of Some Effects of Aeroelasticity on Airload Distribution at an Abrupt Aileron Deflection, by T. H. H. Pian and H. Lin. *AF Tech. Rept.* No. 6358, April, 1952. VI. An Approximate Method for Determing Spanwise Airload Distribution over an Elastic Wing in Subsonic Flow, by T. H. H. Pian and H. Lin. *AF Tech. Rept.* No. 6358, September, 1952. (U.S.A.F. Wright Air Development Center.)

TRILLING, LEON and K. WALKER, JR. On the Transonic Flow Past a Finite Wedge. J. *Math. Phys.* 32, pp. 72–80, April, 1953.

VOSS, HERBERT M., G. ZARTARIAN and P. T. HSU. Theoretical and Experimental Investigation of the Aeroelastic Behavior of Low-Aspect-Ratio Wings. M. I. T. Aero. Eng. Dept. Aeroelastic and Structures Research Lab. Report for the U. S. Navy, Bureau of Aeronautics, June 1, 1953.

DEPARTMENT OF ARCHITECTURE

BELLUSCHI, PIETRO *and Others.* Mid-City Shopping Center (Baltimore). *Arch. Forum* 98, no. 3, pp. 134–139, March, 1953.

NEWMAN, ROBERT B. Acoustics in the Synagogue. (Chapter in *An American Synagogue for Today and Tomorrow.* New York: Union of American Hebrew Congregations, 1953.)

NEWMAN, ROBERT B. Sound Control for Rooms Lighted by Luminous Ceilings. *Arch. Record* 112, pp. 187–189, August, 1952.

NEWMAN, ROBERT B. Acoustics Considerations: Junior High School, Attleboro, Massachusetts. *Progressive Arch.* 33, no. 12, p. 77, December, 1952.

WHIFFEN, MARCUS. The Travellers' Club: Its Building History and the Evolution of Its Design. *Royal Inst. British Architects J.* 59, pp. 417–419, September, 1952.

WHIFFEN, MARCUS. New Light on Chiswick. *Arch. Rev.* 113, pp. 269–270, April, 1953.

DEPARTMENT OF BIOLOGY

BEAR, RICHARD S. The Structure of Collagen Fibrils. *Advances in Protein Chem.* 7, pp. 69–160, 1952.

BEERS, ROLAND F., JR. and I. W. SIZER. Kinetics and Thermodynamics of the Steady State System of Catalase with Hydrogen Peroxide. *J. Phys. Chem.* 57, pp. 290–293, March, 1953.

BEERS, ROLAND F., JR. and I. W. SIZER. Catalase Assay with Special Reference to Manometric Methods. *Science* 117, pp. 710–712, June 26, 1953.

BIGELOW, ROBERT P. Review of *Doctors Differ*, by Harley Williams. Springfield, Ill.: Charles C. Thomas, 1952. *Biol. Abstracts* 26, November, 1952.

BLAKE, CHARLES H. James Lee Peters. *Bird-Banding* 23, p. 136, July, 1952.

BLAKE, CHARLES H. A Population Balance for the Black-capped Chickadee. *Bird-Banding* 23, pp. 165–168, October, 1952.

BLAKE, CHARLES H. Turnover Ratios. *Bird-Banding* 24, pp. 7–10, January, 1953.

BLAKE, CHARLES H. Wood Duck Data Needed. *Mass. Audubon Soc. Bull.* 37, pp. 199–200, May, 1953.

BLAKE, CHARLES H. Review of *Parental Care and Its Evolution in Birds*, by S. Charles Kendeigh. Urbana, Ill.: Univ. of Illinois, 1952. *Bird-Banding* 24, pp. 86–87, May, 1953.

BLAKE, CHARLES H. Proposal of a Nomenclatorial Statute of Limitation. *Bull. Zool. Nomenclature* 8, pp. 56–57, June 25, 1953.

COHEN, CAROLYN and R. S. BEAR. Helical Polypeptide Chain Configuration in Collagen. *Am. Chem. Soc. J.* 75, pp. 2783–2784, June 5, 1953.

GALLOP, PAUL M. and I. W. SIZER. A Quartz Crystal with Tyndall Effect as a Secondary Light Scattering Standard. *Rev. Sci. Instr.* 24, p. 399, May, 1953.

GOULD, BERNARD S., M. A. BOSNIAK, S. NEIDLEMAN and S. GATT. Effect of Hexachlorophene and Related Bisphenolic Compounds on the Dehydrogenases and Cytochrome Systems of *Bacillus Subtilis* and *Escherichia Coli*. *Arch. Biochem. Biophys.* 44, p. 284, June, 1953.

GOULD, BERNARD S. and G. T. JOHNSON. Pigment Production in Certain of the Aspergillus Group. *Mycologia* 45, pp. 172–193, April, 1953.

HALL, CECIL E. *Introduction to Electron Microscopy*. New York: McGraw-Hill, 1953.

KOLTUN, WALTER L. and D. F. WAUGH. An X-Ray Diffraction Study of Selected Types of Insulin Fibrils. *Federation Proc.* 12, p. 79, March, 1953.

KRUGELIS, EDITH J. and I. W. SIZER. The Effects of Tyrosinase Activity on the Components of the Blood Clotting System. *Anatom. Record* 113, p. 4, August, 1952.

LION, KURT S. Displacement Transducer Using Glow-Discharge Tube. N.B.S. Report, 5th Conference on Basic Instrumentation, 1952.

LION, KURT S. Oculomotric Muscle Forces and Fatigue. *Illuminating Eng.* 47, pp. 388–390, July, 1952.

LION, KURT S. and D. F. WINTER. A Method for the Discrimination between Signal and Random Noise of Electrobiological Potentials. *Electroencephalography and Clinical Neurophysiology* 5, pp. 109–111, February, 1953.

LION, KURT S. A Method of Increasing Photographic Sensitivity by Electrical Discharges. *J. Appl. Phys.* 24, pp. 367–368, March, 1953.

LION, KURT S. Research Methodology. *Arch. Phys. Medicine* 34, pp. 217–224, April, 1953.

SCHMITT, FRANCIS O., J. GROSS and J. H. HIGHBERGER. Some Factors Involved in the Fibrogenesis of Collagen *in vitro*. *Soc. Exper. Biol. and Med. Proc.* 80, pp. 462–465, July, 1952.

SCHMITT, FRANCIS O., J. GROSS and J. H. HIGHBERGER. A New Particle Type in Certain Connective Tissue Extracts. *Nat. Acad. Sci. Proc.* 39, pp. 459–470, June, 1953.

SCOTT, JESSE F., W. R. SLAUNWHITE, L. ENGEL and C. HAM. Fluorescence and Absorption Spectra of Some Estrogens Heated in Sulfuric Acid. *J. Biol. Chem.* 201, pp. 615–618, April, 1953.

SIZER, IRWIN W. The Oxidation of Proteins by Tyrosinase and Peroxidase. *Advances in Enzymology* 14, pp. 129–161, 1953.

SIZER, IRWIN W. The Inhibition of Blood Clotting *in vitro* and *in vivo* by Tyrosinase. *Science* 116, pp. 275–276, September 12, 1952.

SIZER, IRWIN W. Collagen Purity as Measured by Ultraviolet Spectrophotometry. *Am. Leather Chem. Assoc.* J. 57, pp. 634–642, October, 1952.

SIZER, IRWIN W., S. J. ADELSTEIN, F. B. HERSHEY and J. R. LOOFBOUROW. The Stimulation of Yeast Growth and Respiration by Compounds Produced by Yeast Cells Irradiated with Ultraviolet Light. J. *Cellular and Comparative Physiol.* 40, pp. 269–278, October, 1952.

SIZER, IRWIN W. A New Line for Surgery. *The Technology Review* 55, pp. 255–258, March, 1953.

SPIEGLER, KURT S., W. JUDA and M. CARRON. Counterflow Regeneration of Cation Exchangers in the Partial Demineralization of Brackish Waters. *Am. Water Works Assoc.* J. 44, pp. 80–88, January, 1952.

SPIEGLER, KURT S. Ion-Exchange. *Sci. News* 26, pp. 78–97, November, 1952.

VALLEE, BERT L. Trace Metals (Chapter in *Clinical Problems in Cancer Research;* Sloan-Kettering Institute Seminar, 1948–1949; edited by David Karnofsky. New York: Sloan-Kettering Institute, 1952.)

VALLEE, BERT L. The Time Course of Serum Copper Concentrations of Patients with Myocardial Infractions. I. *Metabolism* 1, pp. 420–434, September, 1952.

VALLEE, BERT L. and F. L. Hoch. Gravimetric Estimation of Proteins Precipitated by Trichloroacetic Acid. *Anal. Chem.* 25, pp. 317–320, February, 1953.

DEPARTMENT OF BUILDING ENGINEERING AND CONSTRUCTION

GUMPERTZ, WERNER H. Reviews of Foreign Language Publications. *Am. Concrete Inst.* J. 24, June, 1953.

MURRAY, JAMES A. Apparatus for Producing High Humidity. *A.S.T.M. Bull.* No. 186, pp 47–48, December, 1952

DEPARTMENT OF CHEMICAL ENGINEERING

BENEDICT, MANSON. Rectification of Gaseous Mixtures. U. S. *Patent* 2,627,731, February 10, 1953

BENEDICT, MANSON. What is Delaying Industrial Nuclear Power? *Chem. Eng. News* 31, pp. 986–990, March 9, 1953.

BYRNE, JOSEPH and H. P. MEISSNER. Bonding of Thin Films. *J. Appl. Phys.* 23, pp. 1170–1173, October, 1952.

GILLILAND, EDWIN R. The Mechanics of Drops. *Chem. Eng. Progress* 48, pp. 497–504, October, 1952.

GILLILAND, EDWIN R. and R. F. BADDOUR. The Rate of Ion Exchange. *Ind. Eng. Chem.* 45, pp. 330–337, February, 1953.

GILLILAND, EDWIN R., E. A. MASON and R. C. OLIVER. Gas-Flow Patterns in Beds of Fluidized Solids. *Ind. Eng. Chem.* 45, pp. 1177–1185, June, 1953.

HOTTEL, HOYT C., G. C. WILLIAMS and R. S. LEVINE. The Influence of Isotropic Turbulence on Flame Propagation. (In *Abstracts of Papers.* Fourth Symposium [International] on Combustion, September, 1952. p. 112. Cambridge, Mass.: M. I. T., 1952.)

HOTTEL, HOYT C. Burning in Laminar and Turbulent Fuel Jets. (In *Abstracts of Papers.* Fourth Symposium [International] on Combustion, September, 1952. p. 121. Cambridge, Mass.: M. I. T., 1952.)

HOTTEL, HOYT C. and R. A. PERSON. Heterogeneous Combustion of Gases in a Vortex System. (In *Abstracts of Papers.* Fourth Symposium [International] on Combustion, September, 1952. p. 132. Cambridge, Mass.: M. I. T., 1952.)

HOTTEL, HOYT C. and W. G. MAY. Flame Stabilization in Air-Fuel Spray Mixtures, Part I. Characteristics of a Tranverse Rod Stabilizer, by H. C. Hottel and W. G. May. Part II. The Effect of Stabilizer Dimensions, by Glenn C. Williams and F. E. Maddocks, Jr. (In *Abstracts of Papers.* Fourth Symposium [International] on Combustion, September, 1952. pp. 156–157, Cambridge, Mass.: M. I. T., 1952.)

LEWIS, WARREN K. Reminiscences of William H. Walker, Father of Chemical Engineering. *Chem. Eng.* 59, pp. 158–159, July, 1952.

LEWIS, WARREN K. The Place of Chemistry in the Liberal Arts Curriculum. Bowdoin College. Report to the Alumni. *Bowdoin College, 1802–1952.* p. 45, September, 1952.

LEWIS, WARREN K. Chemical Engineering: A New Science. *Chem. Eng. Progress* 49, pp. 23–25, January, 1953.

MASON, EDWARD A., W. C. BAVER and R. R. QUINCY. Explosions in Chlorine Absorption Systems. *Tappi* 36, pp. 274–278, June, 1953.

MERRILL, EDWARD W. Method of Making Storage Battery Separators. U. S. *Patent* 2,626,429, January 27, 1953.

MICHAELS, ALAN S. Altering Soil-Water Relationships by Chemical Means. (In *Proceedings* Conference on Soil Stabilization, Cambridge, Mass., June, 1952, pp. 59–67. Cambridge, Mass.: M. I. T., 1952.)

MICHAELS, ALAN S. Simplified Method of Interpreting Kinetic Data in Fixed-Bed Ion Exchange. *Ind. Eng. Chem.* 44, pp. 1922–1930, August, 1952.

MICHAELS, ALAN S. The Undergraduate Thesis in Chemical Engineering at M. I. T. *J. Eng. Ed.* 43, pp. 90–94, October, 1952.

MICHAELS, ALAN S. Some Colloidal and Physico-chemical Aspects of Soil-chemical Interactions. *The Nucleus* 30, pp. 152–157 March, 1953.

SHERWOOD, THOMAS K. The Need for Basic Research in Hydraulics. *Nat. Conference on Industrial Hydraulics Proc.* 8, Chicago: Technical Center, 1952.

SHERWOOD, THOMAS K. Whither Chemical Engineering Science? *Chem. Eng. Progress* 48, p. 323, July, 1952.

SHERWOOD, THOMAS K. Should Engineering Schools Teach Engineering? *J. Eng. Educ.* 43, p. 383, March, 1953.

VIVIAN, J. E. and R. D. BEATTIE. When Making Cost Estimates, Watch Your Language. *Chem. Eng.* 60, pp. 172–175, January, 1953.

WILLIAMS, GLENN C. and C. W. SHIPMAN. Some Properties of Rod-Stabilized Flames of Homogeneous Gas Mixtures. (In *Abstracts of Papers.* Fourth Symposium [International] on Combustion, September, 1952. p. 158. Cambridge, Mass.: M. I. T., 1952.)

DEPARTMENT OF CHEMISTRY

ASHDOWN, AVERY A. John Xan. *The Nucleus* 30, p. 203, May, 1953.

BEATTIE, JAMES A., D. R. DOUSLIN and S. W. LEVINE. The Compressibility of and an Equation of State for Gaseous Neopentane. *J. Chem. Phys.* 20, p. 1619, October, 1952.

BEATTIE, JAMES A., J. S. BRIERLEY and R. J. BARRIAULT. The Compressibility of Krypton. I. An Equation of State for Krypton and the Weight of a Liter of Krypton. *J. Chem. Phys.* 20, p. 1613, October, 1952.

BEATTIE, JAMES A., J. S. BRIERLEY and R. J. BARRIAULT. The Compressibility of Gaseous Krypton. II. The Virial Coefficients and Potential Parameters of Krypton. *J. Chem. Phys.* 20, p. 1615, October, 1952.

BEATTIE, JAMES A., S. W. LEVINE and D. R. DOUSLIN. The Compressibility of an Equation of State for Gaseous Normal Pentane. *Am. Chem. Soc. J.* 74, p. 4778, October 5, 1952.

COPE, ARTHUR C. Cyclic Polyolefins. XXIII. Valence Tautomerism of 1,3,5-Cycloöctatriene and Bicyclo [4.2.0] octa-2,4-diene, by A. C. Cope, A. C. Haven, Jr., F. L. Ramp and E. R. Trumbull. *Am. Chem. Soc. J.* 74,

pp. 4867–4871, October 5, 1952; XXIV. 1,2-Diphenylcycloöctatetraene, by A. C. Cope and D. S. Smith. *Am. Chem. Soc. J.* 74, pp. 5136–5139, October 20, 1952; XXV. Cycloöctanediols. Molecular Rearrangement of Cycloöctene Oxide on Solvolysis, by A. C. Cope, S. W. Fenton and C. F. Spencer. *Am. Chem. Soc. J.* 74, pp. 5884–5888, December 5, 1952.

CORYELL, CHARLES D. Beta-Decay Energetics. *Annual Reviews of Nuclear Science* 2, pp. 305–334, 1953.

CORYELL, CHARLES D. Beta Decay Energetics and Nuclear Shell Structure. *N. Y. Acad. Sci. Trans.* 15, pp. 178–183, April, 1953.

GRUNWALD, FREDERICK A. and L. FIELD. Symmetrical 1,3-Bis-(alkane — and arylsulfonyl)-ureas. *Am. Chem. Soc. J.* 75, pp. 934–937, February 20, 1953.

GUILDNER, LESLIE A., J. B. THOMPSON and E. R. WASHBURN. Adsorption of Carbon Dioxide by Glass. *J. Phys. Chem.* 56, pp. 979–981, October, 1952.

HARRIS, LOUIS and J. K. BEASLEY. Reflectance of Thin Cellulose Nitrate Films. *Optical Soc. Am. J.* 42, pp. 634–636, September, 1952.

HEIDT, LAWRENCE J. and C. M. COLMAN. Degradation of D-Glucose, D-Fructose and Invert Sugar in Carbonate Buffered Water Solution. *Am. Chem. Soc. J.* 74, p. 4711, September 20, 1952.

HEIDT, LAWRENCE J. and A. F. McMILLAN. Conversion of Sunlight into Chemical Energy Available in Storage Form for Man's Use. *Science* 117, pp. 75–76, January 23, 1953.

HUME, DAVID N., A. A. H. LAUW-ZECHA and S. S. LORD. Colorimetric Determination of Niobium Using Thiocyanate. *Anal. Chem.* 24, pp. 1169–1173, July, 1952.

HUME, DAVID N. and G. C. B. CAVE. Colorimetric Determination of Silver with *p*-Dimethylaminobenzalrhodanine. *Anal. Chem.* 24, pp. 1503–1505, September, 1952.

HUME, DAVID N., H. M. HERSHENSON and M. E. SMITH. A Polarographic, Potentiometric and Spectrophotometric Study of Lead Nitrate Complexes. *Am. Chem. Soc. J.* 75, pp. 507–511, February 5, 1953.

HUME, DAVID N. and R. E. FRANK. A Polarographic Study of the Zinc Thiocyanate Complexes. *Am. Chem. Soc. J.* 75, pp. 1736–1737, April 5, 1953.

HUME, DAVID N., M. A. DESESA, D. O. DEFORD and A. C. GLAMM. Polarographic Characteristics of Metallic Cations in Acetate Media. *Anal. Chem.* 25, p. 983, June, 1953.

HUNTRESS, ERNEST H., E. R. ATKINSON, E. A. HAM and M. S. TIBBETS. 1-Nitrofluorenone. *Am. Chem. Soc. J.* 75, p. 743, February 5, 1953.

KEYES, FREDERICK G. Additional Measurements of Heat Conductivity of Nitrogen, Carbon Dioxide, and Mixtures. *Am. Soc. Mech. Engrs. Trans.* 74, pp. 1303–1306, November, 1952.

LINDE, HARRY W., L. B. ROGERS and D. N. HUME. Automatic Thermometric Titrations. *Anal. Chem.* 25, pp. 404–407, March, 1953.

LORD, RICHARD C. and R. S. McDONALD. A Vacuum-Tight Seal Between LiF and Silver. *Rev. Sci. Instr.* 23, p. 442, August, 1952.

LORD, RICHARD C. and PUTCHA VENKATESWARLU. Rotation-Vibration Spectra of Allene and Allene-d_4. *J. Chem. Phys.* 20, pp. 1237–1247, August, 1952.

LORD, RICHARD C. and R. E. MERRIFIELD. Evaluation of Zeta Sums for Rotation-Vibration Interaction in Axially Symmetrical Molecules. *J. Chem. Phys.* 20, pp. 1348–1350, September, 1952.

LORD, RICHARD C. Recent Developments in Infrared Spectroscopy. *Optical Soc. Am. J.* (Abstract) 42, p. 874, November, 1952.

LORD, RICHARD C. and R. E. MERRIFIELD. Strong Hydrogen Bonds in Crystals. *J. Chem. Phys.* 21, pp. 166–167, January, 1953.

LORD, RICHARD C. Synthesis of Cyclobutene-d_6 and Cyclobutane-d_8. *J. Chem. Phys.* 21, p. 378, February, 1953.

MILAS, NICHOLAS A. Organic Peroxides and Peroxy Compounds. (In *Encyclopedia of Chemical Technology*; edited by R. E. Kirk and D. F. Scott. Vol. 10, pp. 58–88. New York: Interscience Encyclopedia, Inc., 1953.)

MILLARD, EARL B. *Physical Chemistry for Colleges*, Seventh Ed. New York: McGraw-Hill, 1953.

MORTON, AVERY A. Condensations by Sodium, XXXII. Dissociation and the Cation Influence in Amylsodium and Similar Organosodium Reagents, by A. A. Morton and E. F. Cluff. *Am. Chem. Soc. J.* 74, pp. 4056–4059, August 20, 1952; XXXIII. The Effect of Alkali Metal Halides upon Amylsodium, by A. A. Morton and E. F. Cluff. *Am. Chem. Soc. J.* 75, pp. 134–136, January 5, 1953; XXXIV. The Effect of Sodium Reagents on Indicators, by A. A. Morton and F. H. Bolton. *Am. Chem. Soc. J.* 75, pp. 1146–1148, March 5, 1953.

MORTON, AVERY A. Polymerization, XIII. A Comparison of the Action of Organosodium Reagents and of the Alfin Catalyst on Styrene, by A. A. Morton and E. Grovenstein, Jr. *Am. Chem. Soc. J.* 74, pp. 5434–5436, November 5, 1952; XIV. The Reactions of Amylsodium with α- and β-Methylstyrenes, by A. A. Morton and E. Grovenstein, Jr. *Am. Chem. Soc. J.* 74, pp. 5437–5440, November 5, 1952.

MORTON, AVERY A., F. H. BOLTON, F. W. COLLINS and E. F. CLUFF. Effect of Associated Salts on the Polymerization of Butadiene by Organosodium Reagents. *Ind. Eng. Chem.* 44, pp. 2876–2882, December, 1952.

MORTON, AVERY A. Alfin Rubbers: A New Type of Polymer. *Rubber Age* 72, pp. 473–476, January, 1953.

NEWMAN, LEONARD, C. F. HISKEY and R. H. ATKINSON. Analytical Chemistry of Niobium and Tantalum. *Anal. Chem.* 24, pp. 1988–1991, December, 1952.

ROBERTS, JOHN D. and R. E. MCMAHON. Ethyl Orthocarbonate. (In *Organic Syntheses*, vol. 32, pp. 68–69. New York: Wiley, 1952.)

ROBERTS, JOHN D. and G. R. CORAOR. Rearrangement of 2-Methylbutane-1-C^{14} over Aluminum Bromide. *Am. Chem. Soc. J.* 74, pp. 3586–3588, July 20, 1952.

ROBERTS, JOHN D., C. M. REGAN and I. ALLEN. Mechanisms of Acid Catalysis. The Kinetics and Mechanisms of the Acid Catalyzed Reactions of Ethyl Diazoacetate with Ethanol and Acetic Acid. *Am. Chem. Soc. J.* 74, pp. 3679–3683, July 20, 1952.

ROBERTS, JOHN D. and C. M. REGAN. Kinetics and Some Hydrogen Isotope Effects of the Reaction of Diphenyldiazomethane with Acetic Acid in Ethanol. *Am. Chem. Soc. J.* 74, pp. 3695–3696, July 20, 1952.

ROBERTS, JOHN D., W. BENNETT, R. E. MCMAHON and E. W. HOLROYD, JR. Rearrangements in the Solvolysis of 2-Butyl-1-C^{14} *p*-Toluenesulfonate. *Am. Chem. Soc. J.* 74, pp. 4283–4286, September 5, 1952.

ROBERTS, JOHN D., A. STREITWIESER, JR. and C. M. REGAN. Small-Ring Compounds. X. Molecular Orbital Calculations of Properties of Some Small-Ring Hydrocarbons and Free Radicals. *Am. Chem. Soc. J.* 74, pp. 4579–4582, September 20, 1952.

ROBERTS, JOHN D. and A. STREITWIESER, JR. Quantum Mechanical Calculations of Orientation in Aromatic Substitution. *Am. Chem. Soc. J.* 74, pp. 4723–4725, September 20, 1952.

ROBERTS, JOHN D. and J. A. YANCEY. The Reaction of Ethylamine-1-C^{14} with Nitrous Acid. *Am. Chem. Soc. J.* 74, pp. 5943–5945, December 5, 1952.

ROBERTS, JOHN D., W. T. MORELAND, JR. and W. FRAZER. Synthesis of Some 4-Substituted Bicyclo [2.2.2] octane-1-carboxylic Acids. *Am. Chem. Soc. J.* 75, pp. 637–640, February 5, 1953.

ROBERTS, JOHN D. and C. M. REGAN. Rearrangements in the Reactions of 2-(4-Substituted)-phenylethylamines-1-C^{14} with Nitrous Acid. *Am. Chem. Soc. J.* 75, pp. 2069–2072, May 5, 1953.

ROBERTS, JOHN D. and W. T. MORELAND, JR. Electrical Effects of Substituent Groups in Saturated Systems. Reactivities of 4-Substituted Bicyclo [2.2.2]octane-1-carboxylic Acids. *Am. Chem. Soc. J.* 75, pp. 2167–2173, May 5, 1953.

ROBERTS, JOHN D. and W. T. MORELAND, JR. σ-Constants of the Carbethoxyl and Hydroxyl Groups. *Am. Chem. Soc. J.* 75, pp. 2267–2268, May 5, 1953.

ROGERS, LOCKHART B. Deposition of Trace Elements. (Letter to the Editor.) *Electrochem. Soc. J.* 99, p. 287, October, 1952.

ROGERS, LOCKHART B., A. L. UNDERWOOD and A. M. BURRILL. Catalytic Determination of Submicrogram Quantities of Silver. *Anal. Chem.* 24, pp. 1597–1601, October, 1952.

ROGERS, LOCKHART B. Chemical Analyses in the Submicromolar Region. *J. Chem. Ed.* 29, pp. 612–615, December, 1952.

ROGERS, LOCKHART B. and G. P. HAIGHT, JR. Alcohol Content of Several Triple Acetate Salts of Sodium. *Analytica Chimica Acta* 7, pp. 501–506, December, 1952.

ROGERS, LOCKHART B. and C. MERRITT, JR. Electrodeposition Behavior of Cadmium and of Thallium at Mercury Cathodes. *Electrochem. Soc. J.* 100, pp. 131–135, March, 1953.

ROGERS, LOCKHART B., C. MERRITT, JR. and H. M. HERSHENSON. Spectrophotometric Determination of Bismuth, Lead and Thallium with Hydrochloric Acid. *Anal. Chem.* 25, pp. 572–577, April, 1953.

SCATCHARD, GEORGE. Solutions of Nonelectrolytes. *Annual Rev. Phys. Chem.* 3, p. 259, 1952.

SCATCHARD, GEORGE. Vapor-Liquid Equilibrium. VIII. Hydrogen Peroxide Water Mixtures, by George Scatchard, G. M. Kavanagh and L. B. Ticknor. *Am. Chem. Soc. J.* 74, p. 3715, August 5, 1952; IX. The Methanol-Carbon Tetrachloride-Benzene System, by George Scatchard and L. B. Ticknor. *Am. Chem. Soc. J.* 74, p. 3724, August 5, 1952.

SCATCHARD, GEORGE, L. B. TICKNOR, J. R. GOATES and E. R. MCCARTNEY. Heats of Mixing in Some Nonelectrolyte Solutions. *Am. Chem. Soc. J.* 74, p. 3721, August 5, 1952.

SCATCHARD, GEORGE. Some Physical Chemical Aspects of "Plasma Extenders." *N. Y. Acad. Sci. Annals* 55, p. 455, September, 1952.

SCATCHARD, GEORGE. Ion Exchanger Electrodes. *Am. Chem. Soc. J.* 75, p. 2883, June 20, 1953.

SCHUMB, WALTER C., S. F. RADTKE and M. B. BEVER. Discussion of a Paper: The Alloys of Molybdenum and Tantalum, by G. A. Geach and D. Summers-Smith. *Inst. Metals J.* 1, p. 143, May, 1952.

SCHUMB, WALTER C. and R. A. LEFEVER. Partial Hydrolysis of Hexachlorodisilane. *Am. Chem. Soc. J.* 75, p. 1513, March, 1953.

SCHUMB, WALTER C. Review of Gmelin: *Handbuch der Anorganischen Chemie.* System 17: *Arsenik.* Eighth edition. Verlag Chemie, GMBH, Weinheim, Germany, 1952. *J. Chem. Educ.* 30, p. 160, March, 1953.

SCHUMB, WALTER C. Review of *Inorganic Chemistry, An Advanced Textbook*, by Therald Moeller. New York: Wiley, 1952. *J. Chem. Educ.* 30, p. 157, March, 1953.

SHEEHAN, JOHN C. and B. M. BLOOM. The Synthesis of Teloidinone and 6-Hydroxytropinone. *Am. Chem. Soc. J.* 74, pp. 3825–3828, August 5, 1952.

SHEEHAN, JOHN C., D. W. CHAPMAN and R. W. ROTH. The Synthesis of Stereochemically Pure Peptide Derivatives by the Phthaloyl Method. *Am. Chem. Soc. J.* 74, pp. 3822–3825, August 5, 1952.

SHEEHAN, JOHN C. and E. J. COREY. Synthesis and Reactions of Acyclic N,N-diacylglycines. *Am. Chem. Soc. J.* 74, pp. 4555–4559, September 20, 1952.

SHEEHAN, JOHN C. and D. A. JOHNSON. The Synthesis and Reactions of N-acyl Thiol Amino Acids. *Am. Chem. Soc. J.* 74, pp. 4726–4727, September 20, 1952.

SHEEHAN, JOHN C. and A. K. BOSE. Attempted Cyclization of N-Chloroacetylthiazolidines. *Am. Chem. Soc. J.* 74, pp. 4957–4958, October 5, 1952.

SHEEHAN, JOHN C., R. A. CODERRE, L. A. COHEN and R. C. O'NEILL. Steroid Ring Closures Using the Acyloin Condensation. *Am. Chem. Soc. J.* 74, pp. 6155–6156, December 5, 1952.

STEINHARDT, JACINTO and E. M. ZAISER. Kinetic Study of the Reversible Acid Denaturation of Ferrohemoglobin. *Am. Chem. Soc. J.* 75, pp. 1599–1605, April, 1953.

STEPHENSON, CLARK C., J. M. CORBELLA and L. A. RUSSELL. Transition Temperatures in Some Dihydrogen and Dideutero Phosphates and Arsenates and their Solid Solutions. *J. Chem. Phys.* 21, p. 1110, June, 1953.

STOCKMAYER, WALTER H. Molecular Distribution in Condensation Polymers. *J. Polymer Sci.* 9, p. 69, July, 1952.

STOCKMAYER, WALTER H. Review of *Polymerisations-Kinetik*, by L. Küchler, Göttingen. Berlin: Springer-Verlag, 1951. *Am. Chem. Soc. J.* 74, p. 4984, October 5, 1952.

STOCKMAYER, WALTER H. and E. F. CASASSA. The Third Virial Coefficient in Polymer Solutions. *J. Chem. Phys.* 20, p. 1560, October, 1952.

STOCKMAYER, WALTER H., R. O. HOWARD and J. T. CLARKE. Co-polymerization of Vinyl Acetate with a Cyclic Disulfide. (Letter to the Editor.) *Am. Chem. Soc. J.* 75, p. 1756, April 5, 1953.

STOCKMAYER, WALTER H. and L. H. PEEBLES, JR. Copolymerization of Benzene with Vinyl Acetate. (Letter to the Editor.) *Am. Chem. Soc. J.* 75, p. 2278, May 5, 1953.

SUGIHARA, THOMAS T. and W. F. LIBBY. Negative Pion Activation of Bromine. *Phys. Rev.* 88, pp. 587–588, November 1, 1952.

SUGIHARA, THOMAS T. and J. R. ARNOLD. Decay Scheme of Natural Lutetium 176. *Phys. Rev.* 90, p. 322, April 15, 1953.

SWAIN, C. GARDNER. A Transition from Specific Oxonium-Ion Catalysis to General Acid Catalysis. *Am. Chem. Soc. J.* 74, pp. 4108–4110, August 20, 1952.

SWAIN, C. GARDNER, C. B. SCOTT and K. H. LOHMANN. Kinetic Evidence for the Triphenyl Carbonium Ion as a Reaction Intermediate and Measurement of its Relative Reactivity with Seven Nucleophilic Reagents. *Am. Chem. Soc. J.* 75, pp. 136–140, January 5, 1953.

SWAIN, C. GARDNER and C. B. SCOTT. Quantitative Correlation of Relative Rates. Comparison of Hydroxide Ion with Other Nucleophilic Reagents Toward Alkyl Halides, Esters, Epoxides and Acyl Halides. *Am. Chem. Soc. J.* 75, pp. 141–147, January 5, 1953.

SWAIN, C. GARDNER and C. B. SCOTT. Rates of Solvolysis of Some Alkyl Fluorides and Chlorides. *Am. Chem. Soc. J.* 75, pp. 246–248, January 5, 1953.

WILES, DONALD R., B. W. SMITH, R. HORSLEY and H. G. THODE. Fission Yields of the Stable and Long-lived Isotopes of Cesium, Rubidium, and Strontium and Nuclear Shell Structure. *Canadian J. Physics* 31, pp. 419–431, March, 1953.

YOUNG, RALPH C. and C. H. BRUBAKER, JR. The Reaction between Niobium Pentachloride and Niobium Metal. *Am. Chem. Soc. J.* 74, p. 3690, July 20, 1952.

YOUNG, RALPH C. and C. H. BRUBAKER, JR. Reaction of Tantalum with Hydrogen Chloride, Hydrogen Bromide, and Tantalum Pentachloride; Action of Hydrogen on Tantalum Pentachloride. *Am. Chem. Soc. J.* 74, p. 4967, October 5, 1952.

ZAISER, ETHEL M. and J. STEINHARDT. Specific Effect of Formate Ion on the Reversible Acid Denaturation of Ferrihemoglobin. *Federation Proc.* 12, p. 295, March, 1953.

DEPARTMENT OF CITY AND REGIONAL PLANNING

ISARD, WALTER. Some Remarks on the Marginal Rate of Substitution between Distance Inputs and Location Theory. *Metroeconomica* 5, Fasc. 1, pp. 11–21, April, 1953.

ISARD, WALTER. Some Emerging Concepts and Techniques for Regional Analysis. *Zeitschrift für die Gesamte Staatswissenschaft* 109, pp. 240–250, 1953.

ISARD, WALTER. Regional Commodity Balances and Interregional Commodity Flows. *Am. Econ. Rev.* 43, pp. 167–180, May, 1953.

ISARD, WALTER, R. A. KAVESH and R. E. KUENNE. The Economic Base and Structure of the Urban-Metropolitan Region. *Am. Soc. Rev.* 18, pp. 317–321, June, 1953.

ISARD, WALTER. Some Empirical Results and Problems of Regional Input-Output Analysis. (Chapter in *Studies in the Structure of the American Economy*, by W. W. Leontief and [others]. pp. 116–181, New York: Oxford Univ. Press. 1953.)

KELLY, BURNHAM. The Necessity for Dispersal. *Am. Inst. Planners J.* 19, pp. 20–25, Winter, 1953.

RODWIN, LLOYD. Studies in Middle Income Housing. *Social Forces* 30, no. 3, pp. 292–299, August, 1952.

RODWIN, LLOYD. The Achilles Heel of British Town Planning. *Town Planning Rev.* 24, no. 1, pp. 22–34, April, 1953.

RODWIN, LLOYD. Housing in 1952. *Collier's Yearbook* Spring, 1953.

RODWIN, LLOYD. Review of *Utopia, Ltd.*, by Harold Orlans. New Haven: Yale Univ. Press, 1953. *Am. Inst. Planners J.* 20, no. 2, Spring, 1953.

RODWIN, LLOYD. England's Town Development Act: Background of the Act. *Am. Inst. Planners J.* 18, no. 4, pp. 175–180, Fall, 1952.

RODWIN, LLOYD. England's Town Development Act: Problems and Implications. *Am. Inst. Planners J.* 19, no. 1, pp. 26–33, Winter, 1953.

DEPARTMENT OF CIVIL AND SANITARY ENGINEERING

BIGGS, JOHN M. Wind Loads on Truss Bridges. *Am. Soc. Civil Eng. Proc.* 79, no. 201, June, 1953.

BONE, ALEXANDER J. Travel Time and Gasoline Consumption Studies in Boston. *Highway Research Board Proc.* 31, pp. 440–456, 1952.

DAILY, JAMES W. and K. C. DEEMER. Measurements of Fluid Friction with Steady and Unsteady Motion. M. I. T. Hydrodynamics Lab. *Tech. Rept.* no. 9, July, 1952.

DAILY, JAMES W. and S. C. STEPHAN, JR. The Solitary Wave—Its Celerity, Profile, Internal Velocities and Amplitude Attenuation in a Horizontal Smooth Channel. *Proceedings* of Third Conference on Coastal Engineering. October, 1952.

HANSEN, ROBERT J. Introduction: Purpose of and Need for Symposium. *Proceedings* of the Conference on Building in the Atomic Age. Cambridge, Mass.: M. I. T., 1953.

HARLEMAN, DONALD R. F. and H. E. CROSSLEY, JR. Studies on the Validity of the Hydraulic Analogy to Supersonic Flow. Part V: Towed Model Investigation of Transonic Flow. M. I. T. Hydrodynamics Lab. *Tech. Rept.* No. 11. December, 1952.

IPPEN, ARTHUR T. and D. R. F. HARLEMAN. Certain Quantitative Results of the Hydraulic Analogy to Supersonic Flow. *Proceedings* of Second Midwestern Conference on Fluid Mechanics, Ohio State University. pp. 219–230, 1952.

IPPEN, ARTHUR T. and D. R. F. HARLEMAN. Steady-State Characteristics of Subsurface Flow. In *Proceedings* of the NBS Semicentennial Symposium on Gravity Waves: June 18–20, 1951. pp. 79–93, U. S. Nat. Bur. Standards Circular 521, 1952.

LAMBE, T. W. The Alteration of Soil Behavior by Trace Chemicals. Magazine of the Institute of Engineers, Architects, and Surveyors in Puerto Rico. April, 1953.

LAMBE, T. W. The Alteration of Soil Properties with Chemicals. *The Nucleus* 30, pp. 181–189, April, 1953; pp. 207–216, May, 1953.

PAYNTER, HENRY M. and NEIL MACDONALD. Water and Computers. *Computers and Automation* 2, pp. 9–11, March, 1953.

SAWYER, CLAIR N. and M. T. GARRETT. Kinetics of Removal of Soluble B.O.D. by Activated Sludge. *Proceedings* of Seventh Industrial Waste Conference Purdue University, 1952.

SAWYER, CLAIR N. and A. W. BUSCH. Determination of the B.O.D. of Sewage and Industrial Wastes with the Polarograph. *Anal. Chem.* 24, pp. 1887–1891, December, 1952.

SAWYER, CLAIR N. and H. D. KILGORE, JR. Nutritional Requirements in the Biological Stabilization of Industrial Wastes. IV. Treatment on High-Rate Filters. *Sewage and Industrial Wastes* 25, pp. 596-604, May, 1953.

WHITMAN, ROBERT V. Discussion of Paper: Deflections in Gridworks and Slabs. *Am. Soc. Civil Eng. Trans.* 117, pp. 905–909, 1952.

WILBUR, JOHN B. Civil Engineering Looks to the Future. *Civil Eng.* 22, no. 9, pp. 78–81, September, 1952.

DEPARTMENT OF ECONOMICS AND SOCIAL SCIENCE

BALDERSTON, FREDERICK E. *Scale, Vertical Integration and Costs in Residential Construction Firms.* (Unpublished Ph.D. Thesis, Princeton University, May, 1953.) 678pp.

BALDWIN, GEORGE B. The Effect of Nationalization on Britain's National Union of Mine Workers. *Industrial Relations Research Association Proc.* pp. 170–182, December, 1952.

BISHOP, ROBERT L. Elasticities, Cross-Elasticities, and Market Relationships. *Am. Econ. Rev.* 42, pp. 779–803, December, 1952.

BURTON, NANCY G. and K. M. DALLENBACH. The Measurement of the Duration of the After-Sensation of Warmth Aroused by Punctiform Stimulation. *Am. J. Psych.* 66, pp. 386–396, July, 1953.

COLEMAN, JOHN R. Trends in Labor-Management Relations. (In McGill University, Industrial Relations Centre, *Proceedings of Fourth Annual Conference.* pp. 41–64, April, 1952.)

KINDLEBERGER, CHARLES P. *International Economics.* Chicago: Richard D. Irwin, Inc., 1953.

LICKLIDER, JOSEPH C. R. Hearing. *In Annual Review of Psychology.* Stanford, California: Annual Review, Inc., 1953.

LICKLIDER, JOSEPH C. R. On the Process of Speech Perception. *Acoustical Soc. Am. J.* 24, pp. 590–594, November, 1952.

MILLER, GEORGE A. and W. J. MCGILL. A Statistcal Description of Verbal Learning. *Psychometrika* 17, pp. 369–396, December, 1952.

MILLER, GEORGE A. What is Information Measurement? *Am. Psychologist* 8, pp. 3–11, January, 1953.

MYERS, CHARLES A. *Comment* on Papers on Long-Run Effects of Full Employment on the Labor Market. *Papers* and *Proceedings* of the Sixty-Fifth Annual Meeting of the American Economic Association. Chicago: December 27–29, 1952.

PADELFORD, NORMAN J. and G. A. LINCOLN. Selected Chapters in *International Relations: Policies for National Security.* West Point: U. S. Military Academy, 1953.

ROBINSON, ROMNEY. A Graphical Analysis of the Foreign Trade Multiplier. *Econ.* J. 62, pp. 546–564, September, 1952.

SAMUELSON, PAUL A. Full Employment Versus Progress and Other Economic Goals. (Chaper 12 in *Income Stabilization* for a Developing Democracy; edited by Max F. Millikan. New Haven: Yale Univ. Press, 1953.)

SAMUELSON, PAUL A. Probability, Utility, and the Independence Axiom. *Econometrica* 20, pp. 670–678, October, 1952.

SAMUELSON, PAUL A. Rapidly Converging Solutions to Integral Equations. *J. Math. and Phys.* 31, pp. 276–286, January, 1953.

SAMUELSON, PAUL A. Consumption Theorems in Terms of Overcompensation Rather Than Indifference Comparisons. *Economica* 20, no. 77, pp. 1–9, February, 1953.

SCHULTZ, GEORGE P. and R. P. CRISARA. NPA Case Study No. 10 on *Causes of Industrial Peace Under Collective Bargaining*: Lapointe Machine Tool Co. and United Steelworkers of America (C.I.O.) Washington, D. C.: Nat'l. Planning Ass'n., 1952.

DEPARTMENT OF ELECTRICAL ENGINEERING

ANGELO, ERNEST J. An Electron-Beam Tube for Analog Multiplication. *M. I. T. Res. Lab. Electronics Tech. Rept.* 249, p. 43, October 27, 1952.

BARUCH, JORDAN J. and H. C. LANG. An Analogue for Use in Loudspeaker Design. *National Electronic Conference Proc.* 8, p. 89, January, 1953.

BERANEK, LEO L. and A. P. G. PETERSON. *Apparatus for Noise Measurement.* Cambridge, Mass.: Gen. Radio Co., 1952.

BERANEK, LEO L. Unsolved Military Noise Problems. *Acoustical Soc. Am. J.* 24, pp. 769–772, November, 1952.

BERANEK, LEO L., J. L. REYNOLDS and K. E. WILSON. Apparatus and Procedures for Predicting Ventilation System Noise. *Acoustical Soc. Am. J.* 25, pp. 313–321, March, 1953.

BROWN, GORDON S. Feedback System Engineering: An Expanding Professional Field. *Elec. Eng.* 71, pp. 1067–1071, December, 1952.

BROWN, GORDON S. The Modern Engineer Should be Educated as a Scientist, II. In College. *J. Eng. Educ.* 43, pp. 274–281, December, 1952.

BROWN, GORDON S. and D. P. CAMPBELL. Control Systems. *Sci. American* 187, pp. 55–64, September, 1952.

CAMPBELL, DONALD P. Dynamic Behavior of Linear Production Systems. *Mech. Eng.* 75, pp. 279–283, April, 1953.

DAVENPORT, WILBUR B., JR. An Experimental Study of Speech-Wave Probability Distributions. *Acoustical Soc. Am. J.* 24, pp. 390–399, July, 1952.

EDGERTON, HAROLD E. and C. H. WINNING. Explosive Argon Flashlamp. *Soc. Motion Picture Television Engrs. J.* 59, pp. 178–183, September, 1952.

EDGERTON, HAROLD E. Double-Flash Microsecond Silhouette Photography. *Rev. Sci. Instr.* 23, 532–533, October, 1952.

FAY, RICHARD D. Waves in Liquid Filled Cylinders. *Acoustical Soc. Am. J.* 24, pp. 459–462, September, 1952.

FAY, RICHARD D. Notes on the Transmission of Sound Through Plates. *Acoustical Soc. Am. J.* 25, pp. 220–223, March, 1953.

GOULD, LEONARD A. and P. E. SMITH, JR. Dynamic Behavior of Pneumatic Devices. (Presented at the Seventh Nat. Conf. of the Instrument Soc. Am. Cleveland: p. 13, September 8–12, 1952.)

HUGGINS, WILLIAM H. A Phase Principle for Complex-Frequency Analysis and Its Implications in Auditory Theory. *Acoustical Soc. Am. J.* 24, pp. 582–589, November, 1952.

LAWRENCE, RALPH R. and H. E. RICHARDS. *Principles of Alternating Current Machinery*, 4th Ed. Cambridge, Mass.: McGraw-Hill Book Co., Inc., 1953.

MASON, SAMUEL J. Feedback Theory. 1. Some Properties of Signal Graphs. *M. I. T. Research Lab. Electronics. Tech. Rept.* no. 153. February, 1953.

MATHEWS, MAX V. Progress on a Basic Analysis of the Errors in Analogue Computers. *M. I. T. Dynamic Analysis and Control Lab. Research Memo.* RM 7023-1, May 18, 1953.

MAWARDI, OSMAN K. Noise Characteristics from Axial Flow Compressors. (Abstract) *Acoustical Soc. Am. J.* 24, p. 446, July, 1952.

MAWARDI, OSMAN K. and C. HEMOND. Propagation of Sound in Water Spray Mufflers. (Abstract) *Acoustical Soc. Am. J.* 24, pp. 446–447, July, 1952.

MAWARDI, OSMAN K. and IRA DYER. On Noise of Aerodynamic Origin. *Acoustical Soc. Am. J.* 25, pp. 389–395, May, 1953.

MAWARDI, OSMAN K. On a Variational Principle in Acoustics. (Paper Delivered at the Eighth International Congress of Appl. Mech., Istanbul, Turkey.) *Acustica*, 3, pp. 189–191, 1953.

MOON, PARRY and D. E. SPENCER. Separability Conditions for the Laplace and Heomholtz Equations. *Franklin Inst. J.* 253, pp. 585–600, June, 1952.

MOON, PARRY. Review of *Principles of Lighting*, by W. R. Stevens. *Optical Soc. Am. J.* 42, p. 502, July, 1952.

MOON, PARRY and D. E. SPENCER. Theorems on Separability in Riemannian n-Space. *Am. Math. Soc. Proc.* 3, pp. 635–642, August, 1952.

Moon, Parry and D. E. Spencer. Separability in a Class of Coordinate Systems. *Franklin Inst. J.* 254, pp. 227–242, September, 1952.

Moon, Parry. Review of *Color in Business, Science, and Industry*, by D. B. Judd. New York: Wiley, 1952. *Rev. Sci. Instr.* 24, pp. 56–57, January, 1953.

Moon, Parry and D. E. Spencer. Theory of the Photic Field. *Franklin Inst. J.* 255, pp. 33–50, January, 1953.

Moon, Parry and D. E. Spencer. Some Applications of Photic-Field Theory. *Franklin Inst. J.* 255, pp. 113–126, February, 1953.

Moon, Parry. Recent Investigations of the Separation of Laplace's Equation. *Am. Math. Soc. Proc.* 4, pp. 302–307, April, 1953.

Moon, Parry. A Scale for Specifying Frequency Levels in Octaves and Semitones. *Acoustical Soc. Am. J.* 25, pp. 506–515, May, 1953.

Newton, George C., Jr. Compensation of Feedback-Control Systems Subject to Saturation, Parts I and II. *Franklin Inst. J.* 254, pp. 281–296, October, 1952, pp. 391–413, November, 1952.

Pease, William M. An Automatic Machine Tool. *Sci. American* 187, pp. 101–116, September, 1952.

Reintjes, J. F. and M. J. Levin. A Five-Channel Electronic Correlator. *NEC Proceedings* 8, pp. 647–656, January, 1953.

Reintjes, J. F. and G. T. Coate. *Principles of Radar*. New York: McGraw-Hill Book Co., 1952.

Riaz, Mahmoud. Transient Analysis of the Metadyne Generator. *Elec. Eng.* 72, p. 541, June, 1953.

Rosenblith, Walter A. The Peripheral Origin of Activity with Reference to the Ear. (Discussion of Paper by H. Davis, I. Tasaki, and R. Goldstein.) *Cold Spring Harbor Symposia on Quantitative Biology* 17, pp. 153–154, 1952.

Rosenblith, Walter A., L. L. Beranek, R. H. Bolt, R. B. Newman, J. J. Baruch and J. J. Labate. Tentative Criteria for Noise Control Design. (Abstract) *Acoustical Soc. Am. J.* 24, p. 446, July, 1952.

Rosenblith, Walter A. and K. N. Stevens. Pitch Discrimination Data from Two Psychophysical Methods. *Acoustical Soc. Am. J.* 24, pp. 449–450, August, 1952.

Rosenblith, Walter A. and G. A. Heise. Electrical Responses to Acoustic Stimuli Recorded at the Round Window of the Pigeon. *J. Comparative and Physiol. Psychology* 45, pp. 401–412, October, 1952.

Rosenblith, Walter A. The Effects of Noise Upon the Behavior of People. (In Proceedings of the 3rd Nat. Noise Abatement Symposium, Armour Research Foundation, Ill. Inst. Tech., Tech. Center, Chicago. pp. 40–48, October 10, 1952.

ROSENBLITH, WALTER A. and W. J. McGILL. Neural Responses to Pairs of Acoustic Clicks. (Abstract) *Am. J. Physiol.* 171, pp. 746–747, December, 1952.

ROSENBLITH, WALTER A., D. E. WHEELER and H. SMEDAL. *Problems of High-Intensity Noise! A Survey and Recommendations.* Cambridge, Mass.: Psycho-Acoustic Laboratory, Harvard University, February 28, 1953.

ROSENBLITH, WALTER A. Electrical Responses to Clicks Recorded from Eighth-Nerve Locations in Monkey. *Federation Proc.* 12, p. 119, March, 1953.

SCOTT, RONALD E. Network Synthesis by the Use of Potential Analogs. I.R.E. *Proc.* 40, pp. 970–973, August, 1952.

STUMPERS, FRANS L. H. M. *A Bibliography of Information Theory, Communication Theory,* Cybernetics. Cambridge, Mass.: M. I. T. Research Lab. Electronics, February, 1953.

THOMAS, J. E., W. L. KRAUSHAAR and I. HALPERN. Synchrotrons. *Annual Rev. Nuclear Sci.* 1, pp. 175–198, 1952.

TIMBIE, WILLIAM H. and A. KUSKO. Elements of Electricity Fourth Edition. New York: John Wiley, May, 1952.

TRUMP, JOHN G., H. F. HARE and E. W. WEBSTER. Rotational Scanning of Breast Malignancies with Supervoltage Radiation. *Am. J. Roentgenology and Radium Therapy Nuclear Medicine* 68, pp. 435–447, September, 1952.

TRUMP, JOHN G., K. A. WRIGHT, W. W. EVANS, J. H. ANSON *and Staff of Lahey Clinic.* High Energy Electrons for the Treatment of Extensive Superficial Malignant Lesions. *Am. J. Roentgenology and Radium Therapy Nuclear Medicine* 69, pp. 623–629, April, 1953.

TUCKER, CARLTON E. Completing PBX Calls: To Persons Away from Their Phones. *Telephony* 144, pp. 22–24, 32–34, February, 1953.

TUCKER, CARLTON E. Watchman Takes PBX Calls from any Telephone. *Telephony* 144, pp. 22, 37, May 30, 1953.

VAN RENNES, ALBERT B. Pulse-Amplitude Analysis in Nuclear Research, Part I Voltage Discriminators. *Nucleonics* pp. 20–27, July 10, 1952.

VAN RENNES, ALBERT B. Pulse-Amplitude Analysis in Nuclear Research: Part II Single-Channel Differential Analyzers. *Nucleonics* pp. 22–28, August 10, 1952.

VAN RENNES, ALBERT B. and W. M. GRIM, JR. Compensation Against Effects of Grid-Cathode Capacitance in Pulse-Height Selectors. *Rev. Sci. Institutes* 23, p. 563, October, 1952.

VAN RENNES, ALBERT B. Pulse-Amplitude Analysis in Nuclear Research. Parts III and IV. Multichannel Analyzers. *Nucleonics* 10, pp. 32–38, September 10, 1952; pp. 50–56, October 10, 1952.

VON HIPPEL, ARTHUR R. Piezoelectricity, Ferroelectricity, and Crystal Structure. *Physik* 133, pp. 158–173, September, 1952.

VON HIPPEL, ARTHUR R., E. P. GROSS, J. G. JELATIS and M. GELLER. Photocurrent, Space-Charge Build-up and Field Emission in Alkali Halide Crystals. M. I. T. *Lab. Insulation Res. Tech. Rept.* No. 59. p. 38, February, 1953.

WIDROWITZ, BERNARD. The 16 by 16 Metallic Memory Array, Model 1. M. I. T. *Digital Computer Lab. Tech. Rept.* No. 216, p. 65, September 25, 1952.

WIESNER, JEROME B. M. I. T. and the Electron. *Industry* (Assoc. Industries Mass.) September, 1952.

DEPARTMENT OF ENGLISH AND HISTORY

BLUM, JOHN M., E. E. MORISON and M. S. RICE. *The Letters of Theodore Roosevelt.* Cambridge: Harvard Univ. Press, 1952.

BOWLES, EDMUND A. Leonardo da Vinci and Music. *Good Listening* 1, no. 7, December, 1952.

BOWLES, EDMUND A. Instruments at the Court of Burgundy (1363–1467). *Galpin Soc. J.* No. 6, pp. 41–51, July, 1953.

DEUTSCH, KARL W. Communication Theory and Social Science. *Am. J. Orthopsychiatry* 22, pp. 469–483, July, 1952.

DEUTSCH, KARL W. Review of *The Bias of Communication*, by Harold A. Innis. Univ. of Toronto Press, 1951. *Canadian J. Econ. and Political Sci.* 18, pp. 388–390, August, 1952.

DEUTSCH, KARL W. On Communication Models in the Social Sciences. *Public Opinion Quarterly* 16, pp. 356–380, Fall, 1952.

DEUTSCH, KARL W. Communication in Self-governing Organizations. (A Chapter in *Freedom and Authority in Our Time;* edited by Lyman Bryson and others. Twelfth Symposium: Conference on Science, Philosophy and Religion. pp. 271–288. New York: Harper, 1953.)

DEUTSCH, KARL W. Tragedy and Karl Jaspers. (Introduction to *Tragedy Is Not Enough*, by Karl Jaspers. pp. 7–20. Boston: Beacon Press, 1953.)

DEUTSCH, KARL W. The Growth of Nations: Some Recurrent Patterns of Political and Social Integration. *World Politics* 5, no. 2, pp. 168–195, January, 1953.

DEUTSCH, KARL W. Review of *The Rise and Fall of Civilization; An Inquiry into the Relationship between Economic Development and Civilization*, by Shepard B. Clough. New York: McGraw-Hill, 1951. *J. Econ. History* 13, no. 1, pp. 109–110, Winter, 1953.

KOEHL, ROBERT L. The Politics of Resettlement. *Western Political Quarterly*, 6, pp. 231–242, June, 1953.

LIEPMANN, KLAUS. *Bach for Beginners*. Transcribed and edited by Klaus Liepmann. New York: G. Schirmer, 1952.

LIEPMANN, KLAUS. *The Language of Music*. New York: Ronald Press, 1953.

MAHONEY, THOMAS H. D. Review of *The Korea Story* by John C. Caldwell. Chicago: Henry Regnery Co., 1952. *Am. Acad. Pol. Soc. Sci. Annals* 285, pp. 230–231, January, 1953.

MAHONEY, THOMAS H. D. Review of *Korean-American Relations: Documents Pertaining to the Far Eastern Diplomacy of the United States*. Vol. I, *The Initial Period, 1883–1886*: edited by George M. McCune and John A. Harrison. Berkeley: University of California Press, 1951. *The Historical Bulletin* 31, pp. 240–241, May, 1953.

MANN, ARTHUR. Review of *The Americans at Home*, by David Macrae. New York: E. P. Dutton, 1952. *New England Social Studies Bull.* 10, p. 26, December, 1952.

MANN, ARTHUR. Gompers and the Irony of Racism. *Antioch Rev.* 13, pp. 203–214, June, 1953.

RAE, JOHN B. Review of *The Rise of Modern America*, by Arthur M. Schlesinger. New York: Macmillan, 1951. *Midwest J.* 4, p. 155, August, 1952.

RAE, JOHN B. Review of *This American People*, by Gerald W. Johnson. New York: Harper, 1952. *Freedom and Union* 7, pp. 29–31, August, 1952.

RAE, JOHN B. Review of *The Era of Good Feelings*, by George Dangerfield. New York: Harcourt, Brace, 1952. *Freedom and Union* 8, pp. 29–30, May, 1953.

RAE, JOHN B. Review of *James Watt and the History of Steam Power*, by Ivor B. Hart. New York: Henry Schuman, 1949. *Explorations in Entrepreneurial History* 5, pp. 253–254, May 15, 1953.

ROSTOW, WALT W. Review of *A Concise Economic History of Britain*, by Sir John Clapham, Cambridge [England]: University Press, 1949. *Am. Econ. Rev.* 43, no. 1, pp. 175–177, March, 1953.

ROSTOW, WALT W. A Note on "The Diffusion of Ideologies." *Confluence* 2, pp. 31–42, March, 1953.

ROSTOW, WALT W. Review of *The Theory of Economic Policy in English Classical Political Economy*, by Lionel Robbins, New York: St. Martin's Press, Inc., 1952. *J. of Economic History* 13, pp. 212–214, Spring, 1953.

ROSTOW, WALT W. Notes on a New Approach to U. S. Economic Foreign Policy. *World Politics* 5, pp. 302–312, April, 1953.

ROSTOW, WALT W. Review of *Round About Industrial Britain, 1830–1860*, by Fay C. Ryle. Toronto: Univ. of Toronto Press, 1952. *J. Political Econ.* 61, pp. 269–270, June, 1953.

ROSTOW, WALT W. Review of *Toward a General Theory of Action*; edited by T. Parsons and E. Shils. Cambridge, Mass.: Harvard Univ. Press, 1951. *World Politics* 5, pp. 530–554, July, 1953.

WRIGHT, C. C. General Education in the Social Sciences. *New England Social Studies Bull.* 10, pp. 18–23, March, 1953.

SCHOOL OF INDUSTRIAL MANAGEMENT

(Including the Undergraduate Course in Business and Engineering Administration)

BROWN, CARROLL J. Europe and the Dynamic Nature of Industry. *Tech. Eng. News* 34, pp. 25–29, February, 1953.

CLARK, W. VAN ALAN, JR. and W. E. RITCHIE. Economic Lot-Size and Inventory Control. *Nat. Assoc. Cost Accountants Bull.* 34, pp. 772–782, February, 1953.

CLARK, W. VAN ALAN, JR. and W. E. RITCHIE. The Dynamics of the Manufacturing Interval. *Advanced Management.* pp. 15–18, April, 1953.

CLARK, W. VAN ALAN, JR. Towards Better Control of Improvement Costs. *The Controller* 21, pp. 178–183, April, 1953.

CROSS, JAMES S. *Vertical Integration in the Oil Industry.* Cambridge, Mass.: School of Industrial Management, Massachusetts Institute of Technology, 1953.

CROSS, JAMES S. Higher Costs, Lower Margins Predicted Under Divorcement of Oil Marketing. *Nat. Petroleum News* 45, no. 25, p. 14, June 24, 1953.

DEWING, ARTHUR S. *Financial Policy of Corporations*, Fifth Edition. New York: Ronald Press, April, 1953.

GOODWIN, HERBERT F. Why Not Enjoy Your Job. *Office Executive Magazine* 27, p. 20, July, 1952.

HILL, THOMAS M. *and Others.* Accounting Principles and Taxable Income. *Accounting Rev.* 27, pp. 427–430, October, 1952.

JAMES, ROBERT G. Air Force Production Handbook. Cambridge: Harbridge House and USAF, 1953.

KEMPSTER, JOHN H. The Use of the Published Articles and Research Studies of the National Association of Cost Accountants as Aids to Teaching. *Nat. Assoc. Cost Accountants Bull.* 34, No. 12, Sect. I, August, 1953.

KEMPSTER, JOHN H. The Use of the Publications of the National Association of Cost Accountants in College Teaching. *Nat. Assoc. Accountants Cost Bull.* 34, No. 12, Sect. I, August, 1953.

SCHELL, ERWIN H. Dealing with Difficult Personalities. *Advanced Management* 38, pp. 23–25, January, 1953.

SCHELL, ERWIN H. Trends in Managerial Qualifications and Techniques. *The Analysts J.* 9, no. 3, p. 34, 35, June, 1953.

SHAPIRO, ELI. Discussion of the *Development of Historical Series on Sources and Uses of Corporate Funds*, by Loughlin F. McHugh. (In Universities-National Bureau Committee for Economic Research Conference on Research in Business Finance. New York: Nat. Bur. for Econ. Research, 1952.)

SHAPIRO, ELI, G. BLITCHELL and M. KESTNBAUM. What are the Prospects of More Inflation? Univ. of Chicago Round Table No. 752, August 24, 1952.

SHAPIRO, ELI and W. H. STEINER. *Money and Banking: An Introduction to the Financial System.* New York: Henry Holt Co., 1953.

STAUDT, THOMAS A. The Manufacturers' Agent. *Elec. Wholesaling* 33, pp. 83–87, November, 1952.

STAUDT, THOMAS A. *The Manufacturers' Agent as a Marketing Institution.* Wash., D. C.: G.P.O., 1952.

STAUDT, THOMAS A. How to Use Manufacturers' Agents. *Indus. Marketing* 37, no. 10, pp. 46–49, 52, 88, 92, 169–174, October, 1952.

STAUDT, THOMAS A. Quantity Limits and Public Policy. (Chapter in *Marketing: Current Problems and Theories*; edited by S. F. Otteson. Bloomington, Indiana: Indiana Univ. Press, 1953.

SUMMERFIELD, JOHN R. Review of *Business Organization and Combination* by Richard N. Owens. Fourth Edition. New York: Prentice Hall, Inc., 1951. *Accounting Rev.* 27, p. 415, July, 1952.

DEPARTMENT OF FOOD TECHNOLOGY

GOLDBLITH, SAMUEL A. and B. E. PROCTOR. Evaluation of Food Sterilization Efficiency. *Nucleonics* 10, pp. 28–29, September, 1952.

HARRIS, ROBERT S. and K. V. THIMANN. *Vitamins and Hormones*, Vol. X. New York: Academic Press, 1952.

HARRIS, ROBERT S. Vitamins. *The American Annual* pp. 755–756, 1953; New York: Encyclopedia Americana, 1953.

HARRIS, ROBERT S. *and Others.* Composicion de las Plantas Alimentícias de la América Central. VI. Costa Rica; VII. Honduras; VIII. Guatemala; *Pan American Union Sanitary Office Boletín* 30, pp. 31–59, Enero, 1953; 34, pp. 352–371, Abril, 1953; 34, pp. 492–507, Mayo, 1953.

LOCKHART, ERNEST E. and J. STANFORD. The Taste Interrelationship of Monosodium Glutamate and Sucrose. *Food Research* 17, pp. 404–408, July–August, 1952.

LOCKHART, ERNEST E. Training Students to Solve Flavor Problems. 44th Annual Convention Flavoring Extract Manufacturers' Assoc. of the U. S. *Proc.* pp. 79–83, May 11–13, 1953.

LOCKHART, ERNEST E. Why Sugar in Soft Drinks? *The Sugar Molecule* 7, pp. 5–12, Spring, 1953.

NICKERSON, JOHN T. R., B. E. PROCTOR and S. A. GOLDBLITH. Public Health Aspects of Electronic Food Sterilization. *Am. J. Public Health* 43, pp. 554–560, May, 1953.

PROCTOR, BERNARD E., S. A. GOLDBLITH, C. BATES and O. HAMMERLE. Biochemical Prevention of Flavor and Chemical Changes in Foods and Tissues Sterilized by Ionizing Radiations. *Food Technology* 6, pp. 237–242, July, 1952.

PROCTOR, BERNARD E. and D. S. BHATIA. Effects of High-Voltage Cathode Rays on Aqueous Solutions of Tryptophan, Tyrosine, Phenylalanine and Cystine. *Biochemical J.* 51, pp. 535–538, July, 1952.

PROCTOR, BERNARD E. and S. A. GOLDBLITH. Dosimetry Research on the Kilocurie Cobalt-60 Source of the Department of Food Technology of the M. I. T. (Tech. Rept. No. 3, Part I, on Contract No. AT(30-1): 1164 with U. S. Atomic Energy Commission. September 1, 1952.)

PROCTOR, BERNARD E., J. A. STERN and M. A. HERLIN. An Electronic Method for Continuous Determination of Rapid Temperature Changes in Thermal Death-Time Studies. *Food Research* 17, pp. 460–465, September-October, 1952.

PROCTOR, BERNARD E., S. A. GOLDBLITH and J. T. R. NICKERSON. An Investigation of Factors Relating to the Processing of Fruits and Vegetables Treated by Supervoltage Cathode Rays. Progress Report, June 1953, on Contract N 140s-38817B, Bureau of Supplies and Accounts, United States Navy.

PROCTOR, BERNARD E., J. T. R. NICKERSON, S. A. GOLDBLITH and E. E. LOCKHART. The Determination of Methods for Optimum Processing and Packaging of Raw Beef Slices and Raw Ground Beef Treated by Supervoltage Cathode

Rays. Final Report, June 1953, on Contract N 140s-28087B, Bureau of Supplies and Accounts, United States Navy.

PROCTOR, BERNARD E. and D. S. BHATIA. Mode of Action of High-Voltage Cathode Rays on Aqueous Solutions of Amino Acids. *Biochemical J.* 53, pp. 1–3, January, 1953.

PROCTOR, BERNARD E. and J. H. HAYNER. Investigations Relating to the Possible Use of Atomic Fission Products for Food Sterilization. *Food Technology* 7, pp. 6–10, January, 1953.

PROCTOR, BERNARD E., S. DAVISON, D. A. LANG, B. KAN, C. J. BATES and M. KAREL. Studies on the Dosimetry and Bactericidal Effects of Gamma Radiations from a Cobalt-60 Source. *Radiology* 60, pp. 732–736, May, 1953.

DEPARTMENT OF GEOLOGY AND GEOPHYSICS

FAIRBAIRN, HAROLD W. and J. F. SCHAIRER. A Test of the Accuracy of Chemical Analysis of Silicate Rocks. *Am. Mineralogist* 37, pp. 744–757, September-October, 1952.

FAIRBAIRN, HAROLD W., L. H. AHRENS and L. G. GORFINKLE. Minor Element Content of Ontario Diabase. *Geochim. et Cosmochim. Acta* 3, pp. 34–46, 1953.

HAHN, THEODOR, H. S. O'DANIEL, H. MUELLER and T. HAHN. Zur Struktur von $3CaO \cdot SiO_2$: Untersuchung mit Patterson-Synthesen. 2. Mitteilungen. *Neues Jahrbuch für Mineralogie Monatshefte.* pp. 1–15, February, 1953.

HURLEY, PATRICK M. and R. R. SHOREY. Discrimination of Thoron Alpha Activity in Presence of Radon. *Am. Geophys. Union Trans.* 33, pp. 722–724, October, 1952.

HURLEY, PATRICK M. and H. W. FAIRBAIRN. Alpha-Radiation Damage in Zircon. *J. Appl. Phys.* 23, p. 1408, December, 1952.

HURLEY, PATRICK M. and H. W. FAIRBAIRN. Radiation Damage in Zircon: A Possible Age Method. *Geol. Soc. Am. Bull.* 64, pp. 659–673, June, 1953.

MENCHER, ELY *and Others*. Geology of Venezuela and Its Oil Fields. *Am. Assoc. Petroleum Geologists Bull.* 37, pp. 690–777, April, 1953.

PARKS, ROLAND D. and E. J. GEALY. *Materials Survey — Manganese.* Wash., D. C.: Nat. Security Resources Board and U. S. Bureau of Mines, 1952.

SHROCK, ROBERT R. and W. H. TWENHOFEL. *Principles of Invertebrate Paleontology.* Second Edition. New York: McGraw Hill, 1953.

DEPARTMENT OF GRAPHICS

COONS, STEVEN A. Conic Constructions from the Projective Viewpoint. *J. Eng. Drawing* 17, pp. 22–24, February, 1953.

RULE, JOHN T. and S. A. COONS. Notes on the Projections of a Circle. *J. Eng. Drawing* 16, no. 3, pp. 27–28, November, 1952.

RULE, JOHN T. Opportunities and Responsibilities of Graphics in an Engineering Educational Program. *J. Eng. Drawing* 17, no. 2, pp. 7–10, May, 1953.

DEPARTMENT OF MATHEMATICS

FRANKLIN, PHILIP. *Differential and Integral Calculus.* New York: McGraw-Hill, 1953.

IWASAWA, KENKICHI. On the Rings of Valuation Vectors. *Annals of Math.* 57, pp. 331–356, March, 1953.

LEVINSON, NORMAN and E. A. CODDINGTON. Perturbations of Linear Systems with Constant Coefficients Possessive Periodic Solutions. *Contributions to the Theory of Nonlinear Oscillations* 2, pp. 19–35, Princeton: Princeton Univ. Press, 1952.

LEVINSON, NORMAN and E. A. CODDINGTON. Uniqueness and the Convergence of Successive Approximations. *Indian Math. Soc. J.* 16, pp. 75–81, June, 1952.

LEVINSON, NORMAN. Certain Explicit Relationships Between Phase Shift and Scattering Potential. *Phys. Rev.* 89, pp. 755–757, February 15, 1953.

LIN, CHIA-CHIAO and D. W. DUNN. The Stability of the Laminar Boundary Layer in a Compressible Fluid for the Case of Three-dimensional Disturbances. *J. Aero. Sci.* 19, p. 491, July, 1952.

LIN, CHIO-CHIAO. A Critical Discussion of Similarity Concepts in Isotropic Turbulence. *Symposia Appl. Math. Proc.* 4, pp. 19–27, 1953.

LIN, CHIA-CHIAO. On Taylor's Hypothesis and the Acceleration Terms in the Navier-Stokes Equations. *Quarterly Appl. Math.* 10, pp. 295–306, January, 1953.

LIN, CHIA-CHIAO. On the Stability of the Laminar Mixing Region Between Two Parallel Streams in a Gas. *N.A.C.A. Tech. Note* 2887, January, 1953.

LIN, CHIA-CHIAO. A Simplified Formulation of the Similarity Concepts in Isotropic Turbulence. *J. Aero. Sci.* 20, p. 286, April, 1953.

MARTIN, WILLIAM T. and S. BOCHNER. Local Transformations with Fixed Points on Complex Spaces with Singularities. *Nat. Acad. Sci. Proc.* 38, pp. 726–732, August, 1952.

MARTIN, WILLIAM T. and S. BOCHNER. Hartogs' Theorem in Complex Spaces with Singularities. *Indian Math. Soc. J.* 16, no. 3, pp. 137–146, September. 1952.

MARTIN, WILLIAM T. and S. BOCHNER. Complex Spaces with Singularities. *Annals Math.* 57, pp. 490–516, May, 1953.

NASH, JOHN. Real Algebraic Manifolds. *Annals Math.* 56, pp. 405–421, November, 1952.

NASH, JOHN, J. P. MAYBERRY and M. SHUBIK. A Comparison of Treatments of a Duopoly Situation. *Econometrica* 21, pp. 141–154, January, 1953.

NASH, JOHN. Two Person Cooperative Games. *Econometrica* 21, pp. 128–140, January, 1953.

REISSNER, ERIC. Stress Strain Relations in the Theory of Thin Elastic Shells. *J. Math. and Phys.* 31, pp. 109–118, 1952.

REISSNER, ERIC. Pure Bending and Twisting of Thin Skewed Plates. *Quarterly Appl. Math.* 10, pp. 395–397, 1952.

REISSNER, ERIC. On Non-Uniform Torsion of Cylindrical Rods. *J. Math. and Phys.* 31, pp. 214–221, 1952.

REISSNER, ERIC. A Problem of Finite Bending of Circular Ring Plates. *Quarterly Appl. Math.* 10, pp. 167–173, 1952.

REISSNER, ERIC and R. A. CLARK. A Problem of Finite Bending of Toroidal Shells. *Quarterly Appl. Math.* 10, pp. 321–334, 1952.

REISSNER, ERIC. Reihenentwicklung eines Integrals aus der Theorie der Elastischen Schwingungen. *Math. Nachrichten* 8, pp. 149–153, 1952.

REISSNER, ERIC, R. W. FRALICH and J. MAYERS. Behaviour in Pure Bending of a Long Monocoque Beam of Circular Arc Cross Section. N.A.C.A. Tech. Note 2875, 1953.

REISSNER, ERIC. A Problem of the Theory of Oscillating Airfoils. In *Proceedings* of the First U. S. National Congress of Appl. Mechanics, Chicago, Illinois, June, 1951. pp. 907–916. New York: Am. Soc. Mech. Engrs., 1952.

SALEM, RAPHAEL and A. ZYGMUND. Sur les Series Trigonometriques dont les Coefficients ont des Signes Aleatoires. *Acad. des Sciences Compt. Rend.* 236, pp. 571–573, Février, 1953.

SALEM, RAPHAEL. Sur une Proposition Equivalente a l'Hypothèse de Riemann. *Acad. des Sciences Compt. Rend.* 236, pp. 1127–1128, Mars, 1953.

SAMPSON, JOSEPH H., JR. A Note on Automorphic Varieties. *Nat. Acad. Sci.* 38, pp. 895–898, October, 1952.

SERRIN, JAMES B. Two Hydrodynamic Comparison Theorems. *Rational Mech. and Analysis* 1, pp. 563–572, October, 1952.

THOMAS, GEORGE B., JR. *Calculus and Analytic Geometry.* Cambridge, Mass.: Addison-Wesley, 1953.

WHITEHEAD, GEORGE W. On the Freudenthal Theorems. *Annals Math.* 57, pp. 209–228, 1953.

WIENER, NORBERT. Cybernetics. *Scientia* pp. 233–235, September, 1952.

WIENER, NORBERT. *Ex-Prodigy.* New York: Simon and Schuster, 1953.

WIENER, NORBERT. Review of *Modern Science and Modern Man,* by James B. Conant. New York: Columbia Univ. Press, 1952. *Harvard Ed. Rev.* 23, pp. 65–67, Winter, 1953.

WIENER, NORBERT. The Concept of Homeostasis in Medicine. *College of Physicians of Philadelphia Trans. and Studies* 20, No. 3, pp. 87–93. February, 1953.

WIENER, NORBERT. The Future of Automatic Machinery. *Mech. Eng.* 75, pp. 130–132, February, 1953.

WIENER, NORBERT. Optics and the Theory of Stochastic Processes. *Optical Soc. Am. J.* 43, pp. 225–228, April, 1953.

DEPARTMENT OF MECHANICAL ENGINEERING

BUCKINGHAM, EARL. Dimensions and Tolerances for Mass Production. *Machinery* 59, pp. 163–169, May, 1953.

CLOUGH, WILLIAM R., M. E. SHANK and M. ZAID. The Behavior of SR-4 Wire Resistance Strain Gages on Certain Materials in the Presence of Hydrostatic Pressure. *Soc. Exper. Stress Anal. Proc.* 10, no. 2, pp. 167–176, 1953.

COLLINS, SAMUEL C. Helium Liquefier. *Science* 116, pp. 289–294, September 19, 1952.

COLLINS, SAMUEL C. and F. J. ZIMMERMANN. Cyclic Adiabatic Demagnetization. *Phys. Rev.* 90, p. 991, June 1, 1953.

CRANDALL, STEPHEN H. On a Stability Criterion for Partial Difference Equations. *J. Math. and Phys.* 32, pp. 80–81, April, 1953.

DAHL, NORMAN C. Toroidal Shell Expansion Joints. A.S.M.E. *Trans.* Paper No. 53-APM-30.

FAULDERS, CHARLES R. An Interferometric Study of the Boundary Layer on a Turbine Nozzle Blade. *A.S.M.E. Trans.* Paper No. 53-S-36. (Also Abstract in *Mech. Eng.* 75, p. 495, June, 1953.)

FENG, I-MING. Metal Transfer and Wear. *J. Appl. Phys.* 23, pp. 1011–1019, September, 1952.

FENG, I-MING. Lubricating Properties of Molybdenum Disulfide. *Lubrication Eng.* 8, p. 285, December, 1952.

FENG, I-MING and B. G. RIGHTMIRE. The Mechanism of Fretting. *Lubrication Eng.* 9, pp. 134–136, 158–161, June, 1953.

HESSELSCHWERDT, AUGUST L., JR. Solar Energy and Space Heating. *Heating, Piping and Air Cond. Contractors Nat. Assoc. Official Bull.* 59, pp. 66–72, August, 1953.

KAYE, JOSEPH. Review of *Introduction to Heat Transfer*, by Aubrey I. Brown and S. M. Marco. Second Edition. New York: McGraw-Hill, 1951. *J. Appl. Mech.* 20, p. 315, June, 1953.

LEE, SHIH-YING and J. F. BLACKBURN. Contributions to Hydraulic Control: 1. Steady-State Axial Forces on Control-Valve Pistons. 2. Transient-Flow Forces and Valve Instability. *Am. Soc. Mech. Engrs. Trans.* 74, pp. 1005–1011, 1013–1016, August, 1952.

LOEWEN, ERWIN G. and M. C. SHAW. On the Analysis of Cutting Tool Temperatures. *A.S.M.E. Trans.* Preprint 53-S-15, April, 1953.

MAUNDER, LEONARD and R. N. ARNOLD. The Motion Due to Slow Precession of a Gyroscope Driven and Supported by a Hooke's Joint. *Instn. Mech. Engrs. Proc.* Appl. Mech. Suppl. 1B, no. 3, pp. 77–98, 1952.

MCCLINTOCK, FRANK A. Fatigue Tests of Single Crystals of Ingot Iron. In *Proceedings* of the First U. S. National Congress of Appl. Mech., Chicago, Illinois, June, 1951. pp. 653–659, New York: Am. Soc. Mech. Engrs., 1952.

MCCLINTOCK, FRANK A. and S. J. KLINE. Describing Uncertainties in Single-Sample Experiments. *Mech. Eng.* 75, no. 1, pp. 3–8, January, 1953.

MURRAY, WILLIAM M., *Editor*. Fatigue and Fracture of Metals; A Symposium Held at the M. I. T., June 19–22, 1950. New York: Technology Press and John Wiley & Sons, 1952.

OROWAN, EGON. Creep in Metallic and Non-metallic Materials. *Proceedings of the First National Congress of Applied Mechanics* pp. 453–472, June, 1951.

REETHOF, GERHARD. Using Hydraulic Pressure Relief Valves Correctly. *Appl. Hydraulics* 6, pp. 89–94, May, 1953.

ROGOWSKI, AUGUSTUS R. *Elements of Internal Combustion Engines.* New York: McGraw-Hill, 1953.

ROHSENOW, WARREN M. A Method of Correlating Heat Transfer Data for Surface Boiling of Liquids. *A.S.M.E. Trans.* 74, pp. 969–976, August, 1952.

SCHWARZ, EDWARD R. Statistics in the Textile Industry. *Am. Soc. for Quality Control Suppl. Bull.* August, 1952.

SCHWARZ, EDWARD R. Science Looks at Textile Quality Control. *Canadian Textile J.* 70, p. 56, March 27, 1953.

SHAPIRO, ASCHER H. and S. J. KLINE. The Effect of Cooling on Boundary Layer Transition in a Gas. (Final report submitted to National Advisory Committee for Aeronautics under Contract NAw-6125, September, 1952.)

SHAPIRO, ASCHER H. Review of *Aircraft Jet Power Plants*, by Franklin P. Durham. New York: Prentice-Hall, Inc., 1951. *J. Appl. Phys.* 23, p. 1416, December, 1952.

SHAPIRO, ASCHER H. and S. J. KLINE. On the Normal Shock Wave in any Single Phase Fluid Substance. *Proceedings* of the Sixth Heat Transfer and Fluid Mechanics Institute. 1953.

SHAPIRO, ASCHER H. Review of *Supersonic Flow and Shock Waves*, by R. Courant and K. O. Friedrichs. New York: Interscience Publishers, 1948. *J. Appl. Mech.* 20, p. 156, March, 1953.

SHAPIRO, ASCHER H., C. W. HURD and K. P. CHESKY. Influence of Viscous Effects on Impact Tubes. *J. Appl. Mech.* 20, pp. 253–256, June, 1953.

SHAPIRO, ASCHER H. and R. SIEGEL. Effect of Heating on Boundary-Layer Transition for Liquid Flow in a Tube. Final Report Submitted to the Office of Naval Research Under Contract N5ori-07871, June, 1953.

SHAW, MILTON C. *Lubrication.* Delft: Koninklijk Instituut van Ingenieurs, October, 1952.

SHAW, MILTON C., N. H. COOK and P. A. SMITH. The Mechanics of Three Dimensional Cutting Operations. *A.S.M.E. Trans.* 74, p. 1055, August, 1952.

SHAW, MILTON C., P. A. SMITH and N. H. COOK. The Rotary Cutting Tool. *A.S.M.E. Trans.* 74, p. 1065, August, 1952.

SHAW, MILTON C. A Yield Criterion for Ductile Metals Based Upon Atomic Structure. *Franklin Inst. J.* 254, p. 109, August, 1952.

MEDICAL DEPARTMENT

DALRYMPLE, WILLARD and T. A. WARTHIN. Subacute and Chronic Hepatitis, Diagnosis and Treatment. *Medical Clinics of North America* 36, pp. 1341–1355, September, 1952.

FARNSWORTH, DANA L. Doctors Afield: Albert Schweitzer, Physician, Philosopher, Theologian, Musician. *N. E. J. Med.* 247, pp. 62–64, July 10, 1952.

FARNSWORTH, DANA L. Mental-Health Aspects of Civil Defense. *N. E. J. Med.* 247, pp. 209–216, August 7, 1952.

FARNSWORTH, DANA L. Psychiatry and Higher Education. *Am. J. Psychiatry* 109, pp. 266–271, October, 1952.

FARNSWORTH, DANA L. Doctors Afield: David Livingstone, Missionary, Physician, and Explorer. *N. E. J. Med.* 247, p. 899, December 4, 1952.

FARNSWORTH, DANA L. Problems of Young People. *National Assoc. Deans of Women J.* 16, pp. 109–115, March, 1953.

FARNSWORTH, DANA L. Health in Colleges. *N. E. J. Med.* 248, pp. 543–552, March 26, 1953.

FARNSWORTH, DANA L. The Dean and the Psychiatrist: A Symposium, Potential Problem Areas of Mutual Interest to the Dean and the Psychiatrist. *Mental Hygiene* 37, pp. 209–218, April, 1953.

FARNSWORTH, DANA L. Doctors Afield: Mark Hopkins, Physician, Educator. *N. E. J. Med.* 248, pp. 821–822, May 7, 1953.

HARDY, HARRIET L. Medical Progress — Occupational Medicine. *N. E. J. Med.* 247, pp. 473–483 and 515–524, September 25, 1952; October 2, 1952.

HARDY, HARRIET L., H. FOREMAN, T. H. SHIPMAN and E. L. BELKNAP. Use of Calcium EDTA in Cases of Lead Intoxication. *Arch. Ind. Hygiene Occupational Med.* 7, p. 148, February, 1953.

HARDY, HARRIET L. An M. I. T. Enterprise in Occupational Health. *The Technology Review* 55, pp. 315–318, 328, 330, 332, April, 1953.

HARRIS, HERBERT I. Repression and the Electro Encephalogram. *Psychoanalytic Quarterly* 21, pp. 402–406, July, 1952.

MEANS, JAMES H. The Best Medicine for the Patient. *Atlantic Monthly* 190, pp. 53–57, December, 1952.

MEANS, JAMES H. Medicine and the State. *The Practitioner* (London) 170, pp. 56–60, January, 1953.

MEANS, JAMES H. Government in Medicine — How Much. *Atlantic Monthly* 191, pp. 46–50, March, 1953.

MEANS, JAMES H. The Need for Iodine. *Medical Bull.*, St. Louis Univ. 5, pp. 59–66, April, 1953.

DEPARTMENT OF METALLURGY

AVERBACH, BENJAMIN L., C. S. ROBERTS and M. COHEN. The Mechanism and Kinetics of the First Stage of Tempering. *Am. Soc. Metals Trans.* 45, pp. 576–604, 1953.

AVERBACH, BENJAMIN L. Retained Austenite Determinations by X-Ray Methods. *J. Metals* 5, pp. 87–88, January, 1953.

BACKOFEN, WALTER A. and G. F. GALES. Heat Treating Stainless Steel for Orthodontics. *Am. J. Orthodontics* 38, pp. 755–765, October, 1952.

BACKOFEN, WALTER A. and B. B. HUNDY. Torsion Texture of 70-30 Brass and Armco Iron. *J. Metals* 5, pp. 61–62, January, 1953.

BACKOFEN, WALTER A. and B. B. HUNDY. Mechanical Anisotropy in Some Ductile Metals. *Institute of Metals J.* 81, pp. 433–438, May, 1953.

BEVER, MICHAEL B. Problems. (An Appendix in *Physical Chemistry of Metals*, by L. S. Darken and R. W. Gurry. pp. 493–524. New York: McGraw-Hill, 1953.)

BEVER, MICHAEL B. and L. B. TICKNOR. Heats of Solution of Group IB Metals in Liquid Tin. *Am. Inst. Mining & Met. Engrs. Trans.* 194, pp. 941–945, September, 1952.

BEVER, MICHAEL B. and J. E. REYNOLDS. On the Reversal of the Strain-induced Martensitic Transformation in the Copper-Zinc System. *Am. Inst. Mining & Met. Engrs. Trans.* 194, pp. 1065–1066, October, 1952.

BEVER, MICHAEL B. Radioactive Tracers in Physical Metallurgy Research. *Am. Soc. Metals Trans.* 45A, pp. 278–311, 1953. Also in: *Modern Research Techniques in Physical Metallurgy.* Cleveland: *Am. Soc. Metals*, pp. 278–311, 1953.

BEVER, MICHAEL B. and L. B. TICKNOR. The Energy Stored During the Cold Working of a Gold-Silver Alloy. *Acta Metallurgica* 1, pp. 116–122, March, 1953.

BEVER, MICHAEL B. and A. B. MICHAEL. On the Distribution of Sodium in Modified Al-Si Alloys. *J. Metals* 5, pp. 679–680, May, 1953.

CHIPMAN, JOHN. Il Comportamento Chimico Dello Zolfo nel Ferro e nella Fabbricazione dell'acciaio. *Metallurgia Italiana* 44, pp. 502–511, October, 1952.

CHIPMAN, JOHN. Chemical Behavior of Sulfur in Iron and Steelmaking. *Metal Progress* 62, no. 6, pp. 97–107, December, 1952.

CHIPMAN, JOHN and NILS CHRISTENSEN. Slag-Metal Interaction in Arc Welding. Engineering Foundation. *Welding Research Council Bull.* 15, pp. 1–14, January, 1953.

CHIPMAN, JOHN, B. M. SHIELDS and N. J. GRANT. Thermal Conductivity Method for Analysis of Hydrogen in Steel. *J. Metals* 5, pp. 180–184, February, 1953.

CHIPMAN, JOHN and N. A. GOKCEN. The Aluminum-Oxygen Equilibrium in Liquid Iron. *J. Metals* 5, pp. 173–178, February, 1953.

CHIPMAN, JOHN, H. INOUYE and J. W. TOMLINSON. Electrical Conductivity of Wüstite Melts. *Faraday Society Trans.* 49, pp. 796–801, July, 1953.

CHIPMAN, JOHN. Svavlets Jämviktsförhållanden vid Tackjärns-Och Ståltillverkningen. *Jernkontorets Annaler* 137, no. 2, pp. 37–59, 1953.

COHEN, MORRIS and F. S. BUFFINGTON. Self-Diffusion in Alpha Iron Under Uniaxial Compressive Stress. *Am. Inst. Mining & Met. Engrs. Trans.* (J. Metals) 194, pp. 856–860, August, 1952.

COHEN, MORRIS, L. L. SEIGLE and B. L. AVERBACH. Thermodynamic Properties of Solid Nickel-Gold Alloys. *Am. Inst. Mining & Met. Engrs. Trans.* (J. *Metals*) 194, pp. 1320–1327, December 1952.

COHEN, MORRIS, *Editor. Modern Research Techniques in Physical Metallurgy*: A Seminar Held During the Thirty-Fourth National Metal Congress and Exposition, Philadelphia, October 18 to 24, 1952. Cleveland, Ohio: *Am. Soc. Metals*, 1953.

CUFF, FRANK B., JR. and N. J. GRANT. Stress-Rupture Characteristcs of Unalloyed Titanium Plotted. *Iron Age* 170, no. 21, pp. 134–139, November 20, 1952.

CUFF, FRANK B., JR. Compressive Pattern in a Deposited Titanium Surface. *Metal Progress* 63, pp. 114–116, February, 1953.

ECONOMOS, GEORGE. Behavior of Refractory Oxides in Contact with Metals at High Temperatures. *Ind. Eng. Chem.* 45, pp. 458–459, February, 1953.

ECONOMOS, GEORGE and F. E. VINAL. A High-Temperature Laboratory Catenary Kiln. *Am. Ceramic Soc. J.* 36, pp. 204–206, June, 1953.

FREYBERGER, WILFRED L., A. M. GAUDIN and F. E. SENFTLE. How Induced Radioactivity May Help Separate Minerals. *Eng. & Min. J.* 153, pp. 95–99, 174, 176, November, 1952.

FULTON, JAMES C., N. J. GRANT and J. CHIPMAN. Reduction of Silicon from Blast Furnace Type Slags. *J. Metals* 5, pp. 185–190, February, 1953.

GAUDIN, ANTOINE M. and W. D. CHARLES. Adsorption of Calcium and Sodium on Pyrite. *Mining Eng.* 5, pp. 195–200, February, 1953.

GAUDIN, ANTOINE M. and R. E. COLE. Double-Bond Reactivity of Oleic Acid During Flotation. *Mining Eng.* 5, p. 418, April, 1953.

GRANT, NICHOLAS J., A. JOUKAINEN and C. F. FLOE. Titanium-Copper Binary Phase Diagram. *Am. Inst. Mining & Met. Engrs. Trans.* (J. Metals) 194, pp. 766–780, July, 1952.

GRANT, NICHOLAS J., F. B. CUFF and C. F. FLOE. Titanium-Chromium Phase Diagram. *Am. Inst. Mining & Met. Engrs. Trans.* (J. Metals) 194, pp. 848–853, August, 1952.

GRANT, NICHOLAS J., I. S. SERVI and J. T. NORTON. Some Observations of Subgrain Formation During Creep in High Purity Aluminum. *Am. Inst. Mining & Met. Engrs. Trans.* 194, pp. 965–971, September, 1952.

GRANT, NICHOLAS J. and E. GREGORY. Aluminum Powder Products Compared. *Iron Age* 170, no. 26, pp. 69–73, December 25, 1952.

GRANT, NICHOLAS J. Regarding Sigma Phase Formation. *J. Metals* 5, p. 88, January, 1953.

GRANT, NICHOLAS J. and H. C. CHANG. Grain Boundary Sliding and Migration and Intercrystalline Failure under Creep Conditions. *J. Metals* 5, pp. 305–312, February, 1953.

GRANT, NICHOLAS J., I. S. SERVI and A. R. CHAUDHURI. Slip and Grain Boundary Sliding as Affected by Grain Size. *J. Metals* 5, pp. 217–218, February, 1953.

GRANT, NICHOLAS J., A. R. CHAUDHURI and J. T. NORTON. Metallographic Observations of the Deformation of High-Purity Magnesium in Creep at 500° F. *J. Metals* 5, pp. 712–716, May, 1953.

GRANT, NICHOLAS J. and J. K. Y. HUM. Austenite Stability and Creep-Rupture Properties of 18-8 Stainless Steels. *Am. Soc. Metals Trans.* 45, pp. 105–133, 1953.

GRANT, NICHOLAS and A. G. BUCKLIN. Creep-Rupture and Recrystallization of Monel from 700° to 1700° F. *Am. Soc. Metals Trans.* 45, pp. 151–176, 1953.

HAYWARD, CARLE R. *An Outline of Metallurgical Practice.* Third Edition. New York: D. Van Nostrand Co., 1952.

HAYWARD, CARLE R. Hydrogen as a Reducing Agent. *Eng. & Min. J.* 153, pp. 85–87, January, 1952.

HAYWARD, CARLE R. Gold in Fact, Fiction, and Finance. *The Technology Review* 55, pp. 207–210, 216, 218, 220, February, 1953.

KINGERY, WILLIAM D. and J. F. WYGANT. Thermodynamics in Ceramics. I. May, 1952, pp. 165–168; II. June, 1952, pp. 213–217; III. July, 1952, pp. 251–255; IV. August, 1952, pp. 294–297; V. September, 1952, pp. 344–347; VI. October, 1952, pp. 386–388. *Am. Ceramic Soc. Bull.* 31, pp. 165–388, May–October, 1952.

KINGERY, WILLIAM D. and M. HUMENIK. Surface Tension at Elevated Temperatures. I. Furnace and Method for Use of the Sessile Drop Method; Surface Tension of Silicon, Iron and Nickel. *J. Phys. Chem.* 57, pp. 359–363, March, 1953.

NORTON, JOHN T. and JOSEPH GURLAND. Role of the Binder Phase in Cemented Tungsten Carbide-Cobalt Alloys. *Am. Inst. Mining & Met. Engrs. Trans.* 194, pp. 1051–1056, October, 1952.

RAUTALA, PEKKA and J. T. NORTON. Tungsten-Cobalt-Carbon System. *Am. Inst. Mining & Met. Engrs. Trans.* 194, pp. 1045–1050, October, 1952.

RUDMAN, PETER S., P. A. FLINN and B. L. AVERBACH. Measurements of Clustering in Solid Al-Zn Alloys. *J. Appl. Phys.* 24, p. 365, March, 1953.

SCHUHMANN, REINHARDT, JR. and E. J. MICHAL. Thermodynamics of Iron-Silicate Slags: Slags Saturated with Solid Silica. *Am. Inst. Mining & Met. Engrs. Trans.* 194, pp. 723–728, July, 1952.

SHAW, MILTON C., N. H. COOK and IAIN FINNIE. The Shear Angle Relationship in Metal Cutting. *A.S.M.E. Trans.* 75, p. 273, February, 1953.

SHAW, MILTON C. Usinabilité des Métaux et Usure des Outils. *Revue Universelle des Mines* 9, p. 159, April, 1953.

SLOANE, ALVIN. *Mechanics of Materials.* New York: The Macmillan Co., 1952.

SMITH, PRESCOTT A. New Horizons for Machine Tools. *The Technology Review* 55, pp. 93–96, 130, December, 1952.

SODERBERG, C. R. Mechanical Engineering. *The Technology Review* 55, pp. 429–432, 442–444, June, 1953.

STERN, MILTON and H. H. UHLIG. Effect of Oxide Films on the Reaction of Aluminum with Carbon Tetrachloride. *Electrochem. Soc. J.* 99, pp. 389–392, October, 1952.

TAYLOR, HOWARD F. and C. W. BRIGGS. Feeding of Steel Castings at Greater-Than-Atmospheric Pressures. *Inst. British Foundrymen J.* 461, 1953.

TELKES, MARIA. Warmth for Comfort. (In *Centennial of Engineering*; edited by L. R. Lohr. pp. 926–941, Chicago: Centennial of Engineering, 1953.)

TELKES, MARIA. Nucleation of Supersaturated Inorganic Salt Solutions. *Ind. & Eng. Chem.* 44, pp. 1308–1310, June, 1952.

TELKES, MARIA. Fresh Water from Sea Water by Solar Distillation. *Ind. & Eng. Chem.* 45, pp. 1108–1114, May, 1953.

UHLIG, HERBERT H. and R. ELIASSEN. So-called Electrical and Catalytic Treatment of Water for Boilers. *Water Works Assoc. J.* 44, pp. 576–582, July, 1952.

UHLIG, HERBERT H. Corrosion Control in Water Systems. *Ind. & Eng. Chem.* 44, pp. 1736–1740, August, 1952.

UHLIG, HERBERT H. Corrosion Control by Magic: It's Wonderful. *Corrosion* 8, pp. 361–363, October, 1952.

UHLIG, HERBERT H. Developments in Corrosion During the Past Fifty Years, A Brief Review. *Electrochem. Soc. J.* 99, pp. 275C–276C, October, 1952.

UHLIG, HERBERT H. Prevention of Rust. *The Technology Review* 55, pp. 251–254, 288, 290, March, 1953.

UHLIG, HERBERT H. and G. E. WOODSIDE. Anodic Polarization of Passive and Non-passive Chromium-Iron Alloys. *J. of Phys. Chem.* 57, pp. 280–283, March, 1953.

UHLIG, HERBERT H. Effect of Local Action Currents on the EMF of the Weston Standard Cell. *Electrochem. Soc. J.* 100, pp. 173–177, April, 1953.

UHLIG, HERBERT H. and S. S. LORD, JR. Amount of Oxygen on the Surface of Passive Stainless Steel. *Electrochem. Soc. J.* 100, pp. 216–221, May, 1953.

WAGNER, CARL. Theoretical Analysis of the Diffusion Processes Determining the Oxidation Rate of Alloys. *Electrochem. Soc. J.* 99, pp. 369–380, October, 1952.

WAGNER, CARL. The Electrochemistry of Ionic Crystals. *Electrochem. Soc. J.* 99, pp. 346C–354C, December, 1952.

WHILLIER, AUSTIN. The Utilization of Solar Energy in South Africa. *South African Instn. Mech. Engrs. J.* 2, pp. 260–266, April, 1953.

WULFF, JOHN, F. H. BUTTNER, and H. UDIN. Determination of the Absolute Grain Boundary Energy of Gold at 1300° K. *J. Metals* 5, pp. 313–317, February, 1953.

WULFF, JOHN, E. L. BARTHOLOMEW, JR., K. J. KRYSTYAN and D. A. J. MILLAR. A Machine for Tensile Testing at Controlled Temperatures and Constant True Strain Rates. *Rev. Sci. Instr.* 24, pp. 196–202, March, 1953.

YANG, CHIN T. and M. C. SHAW. The Grinding of Titanium Alloys. Report to Watertown Arsenal, April, 1953.

YANG, CHIN T. and E. G. THOMSEN. Plastic Flow in a Lead Extrusion. *A.S.M.E. Trans.* 75, p. 575, May, 1953.

DEPARTMENT OF METEOROLOGY

STARR, VICTOR P. and R. M. WHITE. Schemes for the Study of Hemispheric Exchange Processes. *Royal Meteor. Soc. Quarterly J.* 58, pp. 407–410, July, 1952.

STARR, VICTOR P. and R. M. WHITE. Two Years of Momentum Flux Data for 31° N. *Tellus* 4, pp. 332–333, November, 1952.

STARR, VICTOR P. Note on the Classic Stability Problem. *Tellus* 5, pp. 105–106, February, 1953.

WILLETT, HURD C. Atmospheric Reactions to Solar Corpuscular Radiation. *Am. Meteor. Soc. Bull.* 33, pp. 255–258, June, 1952.

DEPARTMENT OF MODERN LANGUAGES

HALLE, MORRIS. The German Conjugation. *Word* 9, 1953.

HALLE, MORRIS, E. C. CHERRY and R. JAKOBSON. Toward the Logical Description of Languages in their Phonemic Aspect. *Language* 29, pp. 34–46, January–March, 1953.

ZNAMENSKY, GEORGE A. *Conversational Russian.* New Edition with Supplementary Exercises. Boston, Mass.: Ginn, 1952.

DEPARTMENT OF NAVAL ARCHITECTURE AND MARINE ENGINEERING

ABKOWITZ, MARTIN A. and J. R. PAULLING, JR. The Ship Model Towing Tank at M. I. T. *Soc. Naval Arch. & Marine Engrs. Advance* Paper, No. 3, 1953.

DEPARTMENT OF PHYSICS

AISENBERG, SOL. Ionization Gauge Control Circuit. (In Report of the Thirteenth Annual Conference on Physical Electronics, 1953. Cambridge: M. I. T., 1953.)

AJZENBERG, FAY and T. LAURITSEN. Energy Levels of Light Nuclei, IV. *Rev. Modern Phys.* 24, pp. 321–402, October, 1952.

AJZENBERG, FAY. Deuteron Bombardment of Be^{9} and Classification of Levels of B^{10}. *Phys. Rev.* 88, pp. 298–304, October 15, 1952.

ALLIS, WILLIAM P. and S. C. BROWN. High Frequency Electrical Breakdown of Gases. *Phys. Rev.* 87, pp. 419–424, August 1, 1952.

BITTER, FRANCIS. *Currents, Fields, and Particles.* Preliminary Edition. Cambridge, Mass.: Technology Press, 1952.

BITTER, FRANCIS, R. F. LACEY and B. RICHTER. Optically Induced Nuclear Orientation. A Progress Report. *Rev. Modern Phys.* 25, pp. 174–177, January, 1953.

BITTER, FRANCIS. Looking Into the Nucleus. *Optical Soc. Am. J.* 43, pp. 233–236, April, 1953.

BOLT, RICHARD H. The Aircraft Noise Problem. *Acoustical Soc. Am. J.* 25, pp. 363–366, May, 1953.

BROWN, SANBORN C. and D. J. ROSE. Methods of Measuring the Properties of Ionized Gases at High Frequencies, III. Measurement of Discharge Admittance and Electron Density. *J. Appl. Phys.* 23, pp. 1028–1032, September, 1952.

BROWN, SANBORN C. Count Rumford's Concept of Heat. *Am. J. Phys.* 20, pp. 331–334, September, 1952.

BROWN, SANBORN C. and J. E. COYLE. An All-Metal Vacuum Valve. *Rev. Sci. Instr.* 23, pp. 570–571, October, 1952.

BROWN, SANBORN C. A Physicist Looks at Manuscripts. *Autograph Collectors' J.* 5, pp. 23–25, Fall, 1952.

BROWN, SANBORN C. *An Exhibition of the Scientific Works of Count Rumford.* Boston: American Academy of Arts & Sciences, 1953.

BUECHNER, WILLIAM W. and D. M. VAN PATTER. Investigation of the (d,p) and (d,a) Reactions of the Silicon Isotopes. *Phys. Rev.* 87, p. 51, July 1, 1952.

BUECHNER, WILLIAM W. and A. SPERDUTO. Magnetic Analysis of the Proton Groups from the Na^{23} (d,p) Na^{24} Reaction. *Phys. Rev.* 88, p. 574, November 1, 1952.

BUECHNER, WILLIAM W., H. A. ENGE and A. SPERDUTO. Magnetic Analysis of the Al^{27} (d,p) Al^{28} Reaction. *Phys. Rev.* 88, p. 963, December 1, 1952.

BUECHNER, WILLIAM W. and H. A. WATSON. Magnetic Analysis of the F^{19} (d,p) F^{20} and F^{19} (d,a) O^{17} Reactions. *Phys. Rev.* 88, p. 1324, December 15, 1952.

BURKE, BERNARD F. and M. W. P. STRANDBERG. Zeeman Effect in Rotational Spectra of Asymmetric-Rotor Molecules. *Phys. Rev.* 90, pp. 303–308, April 15, 1953.

CALLEN, EARL, W. F. LOVE and F. C. NIX. Magnetic Properties of Superconducting Alloys of Indium and Thallium. *Phys. Rev.* 87, pp. 844–846, September, 1952.

COLE, HENDERSON, JR. Approximate Elastic Spectrum of Acoustic Waves in AgCl from X-Ray Scattering. *J. Appl. Phys.* 24, pp. 482–487, April, 1953.

DALY, RICHARD T., JR. and J. R. ZACHARIAS. Doppler Effects in the Atomic Beam Magnetic Resonance Method. *Am. Phys. Soc. Bull.* 28, no. 3, p. 52, April 30, 1953.

DEUTSCH, MARTIN. Critical Survey of Techniques of Beta and Gamma-Spectroscopy. *Physica* 18, pp. 1037–1042, December, 1952.

DRELL, SIDNEY D. Recoil Correction to Bremsstrahlung Cross Section. *Phys. Rev.* 87, pp. 753–756, September 1, 1952.

DRELL, SIDNEY D. and E. M. HENLEY. Pseudoscalar Mesons with Applications to Meson-Nucleon Scattering and Photoproduction. *Phys. Rev.* 88, pp. 1053–1064, December 1, 1952.

DRELL, SIDNEY D. and R. D. LAWSON. Double Meson Photoproduction. *Phys. Rev.* 90, pp. 326–327, April 15, 1953.

ELKIND, MORTIMER M. Ion Optics in Long, High Voltage Accelerator Tubes. *Rev. Sci. Instr.* 24, pp. 129–137, February, 1953.

EVANS, ROBLEY D., J. C. AUB, L. H. HEMPELMANN and H. S. MARTLAND. The Late Effects of Internally-deposited Radioactive Materials in Man. *Medicine* 31, pp. 221–229, September, 1952.

FELD, BERNARD T. Nuclear Moments. *Annual Rev. Nuclear Sci.* 2, pp. 239–260, 1952.

FELD, BERNARD T. The Angular and Energy Distributions in Photomeson Production. (Abstract) *Phys. Rev.* 89, pp. 330–331, January 1, 1953.

FELD, BERNARD T. High Energy Nuclear Physics. *Nucleonics* 11, p. 42, February, 1953.

FESHBACH, HERMAN and W. HAUSER. The Inelastic Scattering of Neutrons. *Phys. Rev.* 87, pp. 366–373, July 15, 1952.

FESHBACH, HERMAN. The Coulomb Scattering of Relativistic Electrons and Positrons by Nuclei. *Phys. Rev.* 88, pp. 295–297, October 15, 1952.

FESHBACH, HERMAN and S. I. RUBINOW. A Variational Principle for Scattering. *Phys. Rev.* 88, pp. 484–487, November 1, 1952.

FESHBACH, HERMAN and M. LAX. Photoproduction of Mesons in Deuterium. *Phys. Rev.* 88, pp. 509–515, November 1, 1952.

FESHBACH, HERMAN and R. L. PEASE. The Theory of Hydrogen Three. *Phys. Rev.* 88, pp. 945–950, November 15, 1952.

FESHBACH, HERMAN and A. E. HEINS. The Coupling of Two Half Planes. Carnegie Institute of Technology, Department of Mathematics. *Tech. Rept.* No. 2. (Contract No. DA-36-061-ORD-113, Office of Ordnance Research.)

FESHBACH, HERMAN, C. E. PORTER and V. F. WEISSKOPF. The Formation of a Compound Nucleus in Neutron Reactions. *Phys. Rev.* 90, pp. 166–167, April 1, 1953.

GOODMAN, CLARK and G. A. NORTON. Interlocking Concrete and Lead Blocks for Radiation Shielding. *Nucleonics* 11, pp. 52–53, March, 1953.

GOODMAN, CLARK, A. E. FRANCIS and J. J. G. MCCUE. Inelastic Scattering of Neutrons by Cd^{111}. *Phys. Rev.* 89, pp. 1232–1236, March 15, 1953.

HAFFNER, JAMES W., P. M. ENDT, H. A. ENGE and W. W. BUECHNER. Excited States of Mg^{25} from the Al^{27} (d,a) Mg^{25} and Mg^{24} (d,p) Mg^{25} Reactions. *Phys. Rev.* 87, pp. 27–30, July 1, 1952.

HARRISON, GEORGE R., J. E. ARCHER and J. CAMUS. A Fixed-Focus Broad-Range Echelle Spectrograph of High Speed and Resolving Power. *Optical Soc. Am. J.* 42, pp. 706–712, October, 1952.

HARVEY, GEORGE G., E. R. PIORE, E. M. GYORGY and R. H. KINGSTON. A High Vacuum Recording Spectrograph for the Study of Radiation from Solids in the 100–800A Range. *Rev. Sci. Instr.* 23, pp. 8–12, January, 1952.

HARVEY, GEORGE G. and E. M. GYORGY. The Spectroscopy of the Solid State: Copper and Chromium. *Phys. Rev.* 87, pp. 861–862, September 1, 1952.

HERLIN, MELVIN A. and H. E. RORSCHACH, JR. The Resistance Minimum in Magnesium at Low Temperatures. *Phys. Rev.* 87, p. 193(a), July 1, 1952.

HERLIN, MELVIN A. and H. E. RORSCHACH, JR. The Resistance Minimum in Magnesium. (In Proceedings of the ONR-GE Cryogenics Conference, Schenectady, October 6, 1952. p. 151.)

HERLIN, MELVIN A. and V. MAYPER, JR. Second Sound Velocity Below 1° K as a Function of Pressure. (Letter) *Phys. Rev.* 89, p. 523, January 15, 1953. (Also in Proceedings of the ONR-GE Cryogenics Conference, Schenectady: October 6, 1953, p. 29.)

HINE, GERALD J. and M. A. VAN DILLA. Gamma-Ray Diffusion Experiments in Water. *Nucleonics* 10, no. 7, pp. 54–58, July, 1952.

HINE, GERALD J., G. D. PRESTWICH and T. H. COLVIN. Average Energy of Secondary Electrons in Anthracene Due to Gamma-Irradiation. *Phys. Rev.* 87, pp. 1030–1031, September 15, 1952.

HOUSTON, JOHN M., R. E. BURGESS and H. KROEMER. Corrected Values of Fowler-Nordheim Field Emission Functions v(y) and s(y). *Phys. Rev.* 90, p. 515, May 15, 1953.

INGARD, KARL UNO. A Review of the Influence of Meteorological Conditions on Sound Propagation. *Acoustical Soc. Am. J.* 25, pp. 405–411, May, 1953.

INGARD, KARL UNO. Review of *Advanced Fluid Dynamics and Fluid Machinery* by R. C. Binder. New York: Prentice-Hall, 1951. *Acoustical Soc. Am. J.* 25, p. 578, May, 1953.

KEATING, DAVID T. and B. E. WARREN. Effect of a Low Absorption Coefficient on X-Ray Spectrometer Measurements. *Rev. Sci. Instr.* 23, pp. 519–522, October, 1952.

KERMAN, ARTHUR K. Theory of Nuclear Magnetic Moments. Chalk River, A.E.C.L., LT 35, 1952.

KRAUSHAAR, WILLIAM L. and G. S. JANES. Photoproduction of Positive π Mesons on Hydrogen. *Phys. Rev.* 90, p. 341, April 15, 1953.

MALETSKOS, CONSTANTINE J., F. BRONNER and R. S. HARRIS. Effect of Phytates on Ca^{45} Absorption in Children on Breakfasts of Moderate Calcium Content. *Federation Proc.* 12, no. 1, March, 1953.

MALETSKOS, CONSTANTINE J., R. E. REID *and Others*. The Circulating Red Cell Volume and Body Hematocrit in Normal Pregnancy and the Puerperium. *Am. J. Obstetrics and Gynecology* 61, pp. 1207–1217, June, 1953.

MARGOLIS, BERNARD. Neutron Capture Cross Sections. *Phys. Rev.* 88, pp. 327–331, October 15, 1952.

McCLELLAND, CLYDE L. *and Others*. Low-Power Thermal Test Reactor for Nuclear Physics Research. *Nucleonics* 11, pp. 38–41, May, 1953.

MEDICUS, HEINRICH A. and H. T. EASTERDAY. Isomeric Transitions in Tc^{93} and Tc^{96}. *Phys. Rev.* 89, pp. 752–754, February 15, 1953.

MORSE, PHILIP M. Excitation of Molecular Rotation Vibration by Electron Impact. *Phys. Rev.* 90, p. 51, April 1, 1953.

MOWER, LYMAN. Tables for Second Born Approximation Scattering from Various Potential Fields. *Phys. Rev.* 89, pp. 947–950, March 1, 1953.

OLBERT, STANISLAW. Application of the Multiple Scattering Theory to Cloud-Chamber Measurements. I. *Phys. Rev.* 87, pp. 319–327, July 15, 1952.

OLBERT, STANISLAW, M. ANNIS and H. S. BRIDGE. Application of the Multiple Scattering Theory to Cloud-Chamber Measurements. II. *Phys. Rev.* 89, pp. 1216–1227, March 15, 1953.

ROSENGREN, JACK W. and W. S. GILBERT. Deuteron Photodisintegration at High Energies. *Phys. Rev.* 88, pp. 901–905, November 15, 1952.

ROSENGREN, JACK W. and J. M. DUDLEY. High Energy Photoproton Production by 322-Mev Bremsstrahlung. *Phys. Rev.* 89, pp. 603–605, February 1, 1953.

SATTEN, ROBERT A. An "Algebra" of Possibilities Relating Regions in Object and Image Space for a System of Thin Lenses. *Optical Soc. Am. J.* 42, pp. 955–959, December, 1952.

SATTEN, ROBERT A. Analysis of the Spectrum of the Nd^{+++} Ion in the Bromate Crystal. *J. Chem. Phys.* 21, pp. 637–648, April, 1953.

SLATER, JOHN C. A Soluble Problem in Energy Bands. *Phys. Rev.* 87, pp. 807–835, September 1, 1952.

SLATER, JOHN C. Ferromagnetism and the Band Theory. *Rev. Modern Phys.* 25, pp. 199–210, January, 1953.

STRANDBERG, MALCOM W. P. Centrifugal Distortion. *N. Y. Acad. Sci. Annals* 55, Art. 5, pp. 808–813, November, 1952.

STRANDBERG, MALCOM W. P. and J. R. ESHBACH. Apparatus for Zeeman Effect Measurements on Microwave Spectra. *Rev. Sci. Instr.* 23, pp. 623–628, November, 1952.

STROKE, HINKO H., V. JACCARINO and B. BEDERSON. The Nuclear Spin and Magnetic Moment of $55Cs^{134}$. *Phys. Rev.* 87, pp. 676–677, August 15, 1952.

STROKE, HINKO H., J. G. KING and V. JACCARINO. The Hyperfine Structure of Iodine. *Am. Phys. Soc. Bull.* 28, no. 3, p. 52, April 30, 1953.

WALL, NATHAN S. and H. E. GOVE. The Angular Distribution of Gamma Rays in the C^{12} (p,p'r) Reaction. *Canadian J. Physics* 31, pp. 189–193, February, 1953.

WARREN, BERTRAM E. and B. L. AVERBACH. X-Ray Diffraction Studies of Cold Work in Metals. (Chapter in *Imperfections in Nearly Perfect Crystals.* New York: Wiley, 1952.)

WARREN, BERTRAM E. and B. L. AVERBACH. The Diffuse Scattering of X-Rays. (Chapter 5 in *Modern Research Techniques in Physical Metallurgy*; a Seminar Held During the Thirty-Fourth National Metal Congress and Exposition, Philadelphia, October 18 to 24, 1952, pp. 95–130. Cleveland: Am. Soc. Metals, 1953.)

WARREN, BERTRAM E. and B. L. AVERBACH. Separation of Stacking Fault Broadening in Cold Worked Metals. *J. Appl. Phys.* 23, p. 1059, September, 1952.

WARREN, BERTRAM E. and MACLYN MCKEEHAN. X-Ray Study of Cold Work in Thoriated Tungsten. *J. Appl. Phys.* 24, pp. 52–56, January, 1953.

WILLARD, DANIEL and B. DAYTON. The Decay of a Neutral V Particle into Two Mesons. *Phys. Rev.* 91, pp. 348–350, July 15, 1953.

ADMINISTRATION

BURCHARD, JOHN E. The State of Architecture in Australia. *Arch. Record* 112, pp. 105–119, 216–217, 221. August, 1952.

BURCHARD, JOHN E. People Who Can Think. *Educ. Record* (Am. Council on Education) 34, pp. 113–120, April, 1953.

HARRISON, GEORGE R. *Physics as a Career.* New York: American Institute of Physics, 1952.

HUNTER, DARD. *Papermaking in Pioneer America.* Philadelphia: Univ. of Pennsylvania Press, 1952.

KILLIAN, JAMES R., JR. Worthy to be Confident. *The Technology Review* 54, pp. 478, 536+, July, 1952.

KILLIAN, JAMES R., JR. Military Research in the Universities. *J. Eng. Educ.* 43, pp. 13–17, September, 1952.

KILLIAN, JAMES R., JR. Partnership for Progress. *The Technology Review* 55, pp. 23–26, November, 1952.

KILLIAN, JAMES R., JR. Wellsprings of Industrial Progress. (In Southern Research Institute 1952 *Report*, February, 1953.)

KILLIAN, JAMES R., JR. Science: Ally, not Foe, of Religion. *Christian Register*, March, 1953.

MATTILL, JOHN I. University Research Potential (Design Abstracts). *Machine Design* 24, pp. 278–288. September, 1952.

MATTILL, JOHN I. College and University Research in Physics. *Physics Today* 5, pp. 14–18, September, 1952.

MATTILL, JOHN I. Chemical Engineering Schools Now Let Profs Pull Double Load. *Chem. Eng.* 59, pp. 134–137, August, 1952.

MATTILL, JOHN I. College and University Research Resources. *Sci. Monthly* 75, pp. 234–239, October, 1952.

MATTILL, JOHN I. College and University Research in Chemistry. *J. Chem. Educ.* 29, pp. 556–559, November, 1952.

MATTILL, JOHN I. Science and Public Relations. *J. Eng. Educ.* 42, pp. 507–511, June, 1952.

MATTILL, JOHN I. Schools Have Potential for Increased Work. *Ceramic Industry* 59, pp. 63–64, August, 1952.

MATTILL, JOHN I. Science Publicity — Challenge and Dilemma. *The Technology Review* 55, pp. 203–206, 220–224, February, 1953.

SKOLNIKOFF, EUGENE B. An American at Oxford. *The Technology Review* 55, pp. 155–157, 176, 178, January, 1953.

VERZUH, FRANK M. Solution of Boundary Value Problems on Automatic Computing Equipment. *M. I. T. Statistical Services Rept.* S-1, August 22, 1952.

VERZUH, FRANK M. Description of the M. I. T. General Purpose Control Panels for the Model Card-Programmed Calculator. *M. I. T. Statistical Services Rept.* S-10, December 15, 1952.

VERZUH, FRANK M. Description of the M. I. T. CPC Board No. V — A 13-Digit Floating-Decimal Board. *M. I. T. Statistical Services Report* S-14, June 25, 1953.

CENTER FOR INTERNATIONAL STUDIES

BATOR, FRANCIS M. Consumption and Investment Propensities: Comments. *Am. Econ. Rev.* 43, pp. 139–145, March, 1953.

HSIA, RONALD H. *Price Control in Communist China.* New York: Institute of Pacific Relations, 1953.

MILLIKAN, MAX F. Soviet Economic Growth. (In *Capital Formation and Allocation;* edited by Abram Bergson. pp. 97–100, Evanston, Illinois: Row, Peterson & Co., 1953.)

MILLIKAN, MAX F. *Income Stabilization in a Developing Democracy.* New Haven, Conn.: Yale University Press, 1953.

PAAUW, DOUGLAS S. Chinese National Expenditures in the Nanking Period. *The Far Eastern Quarterly* 12, pp. 3–27, November, 1952.

PAAUW, DOUGLAS S. Economic Policy in Communist China. (An Introduction to *Price Control in Communist China* by Ronald Hsia). New York: Institute of Pacific Relations, 1953.

PERLMUTTER, HOWARD V. and G. DE MONTMOLLIN. Group Learning of Nonsense Syllables. *J. Abnormal and Social Psych.* 47, pp. 762–769, October, 1952.

PERLMUTTER, HOWARD V. and M. W. HOROWITZ. The Concept of the Social Group. *J. Social Psych.* 37, pp. 67–95, January, 1953.

PERLMUTTER, HOWARD V. Group Memory of Meaningful Material. *J. Psych.* 35, pp. 361–370, April, 1953.

SPULBER, NICOLAS. What Do We Know About Soviet Economy? *Problems of Communism,* no. 4, pp. 23–28. (Reprinted from *Commentary,* August, 1952.)

SPULBER, NICOLAS. Effects of the Embargo on Soviet Trade. *Harvard Bus. Rev.* 30, no. 6, pp. 122–128, November–December, 1952.

SPULBER, NICOLAS, *Consultant.* How Much Strength Behind the Curtain? *Fortune* 47, p. 114, Feburary, 1953.

DIVISION OF INDUSTRIAL COOPERATION

ABRAHAMS, SIDNEY C. and H. J. GRENVILLE-WELLS. Upper Level Precession Photography and the Lorentz-Polarization Correction, Part II. *Rev. Sci. Instr.* 23, pp. 328–331, July, 1952.

ABRAHAMS, SIDNEY C., E. GRISON and J. KALNAJS. The Crystal Chemistry of Cesium Penta and Hexasulfide. *Am. Chem. Soc. J.* 74, p. 3761, August, 1952.

ABRAHAMS, SIDNEY C. and B. A. CALHOUN. The Low-Temperature Transition in Magnetite. *M. I. T. Lab. Insulation Res. Tech. Rept.* 61. Also in *Acta Crystallographica* 6, p. 105, January, 1953.

ABRAHAMS, SIDNEY C. and E. GRISON. The Crystal Structure of Cesium Hexasulfide. *Acta Crystallographica* 6, pp. 206–213, February, 1953.

ABRAHAMS, SIDNEY C. and W. R. BLACKMORE. A Shielding Device for X-Ray Diffraction Cameras. *M. I. T. Lab. Insulation Res. Tech. Rept.* 63. February, 1953.

ABRAHAMS, SIDNEY C. and H. J. GRENVILLE-WELLS. Upper Level Precession Photography and the Lorentz-Polarization Correction. *M. I. T. Lab. for Insulation Res. Tech. Rept.* 66. February, 1953.

ABRAHAMS, SIDNEY C. On the Disorder in Crystalline 2-2 Dinitro Propane at Room Temperature. (ONR, Army Signal Corps and Air Force). *M. I. T. Lab. for Insulation Res. Tech. Rept.* 60. February, 1953.

ABRAHAMS, SIDNEY C. and B. A. CALHOUN. Low Temperature Adaptor for the Norelco High Angle Spectrometer. *Rev. Sci. Instr.* 24, p. 397, May, 1953.

AKUTOWICZ, EDWIN J. *Topics in Probability. M. I. T. Lincoln Lab. Tech. Memo* 16 October, 1952.

BALLANTINE, H. T., T. F. HUETER and M. S. COHEN. Ultrasonic Instrumentation for Medical Diagnostics (Clinical Studies at Mass. General Hospital). (In M. I. T. *Acoustics Lab. Quarterly Progress Report* July–September, 1952. p. 20.)

BARKOFSKY, E., R. C. HOPKINS and S. DORSEY. Microsecond Photography of Rocket in Flight. *Electronics* 26, pp. 142–147, June, 1953.

BERGNA, HORACIO E. Adsorption Studies of Flotation Agents on Silver Iodide (Research Progress Report NYO-3672, MITS-18, Richards Mineral Engineering Laboratory, M. I. T., January 31, 1953, April 30, 1953).

BREUNING, SIEGFRIED M. Ice-Free Roads Still Not in Sight. *Highway Research Abstracts* 23, p. 15, April, 1953; *New England Construction* 17, p. 148, April 15, 1953; *Traffic Engineering* 23, p. 278, May, 1953. *Engineering News Record* 150, p. 88, May 14, 1953; *Public Works* 84, May, 1953.

BROWN, DAVID R. and E. ALBERS-SCHOENBERG. Ferrites Speed Digital Computers. *Electronics* 26, pp. 146–149, April, 1953.

BRYAN, JOSEPH G., D. V. TIEDEMAN and P. J. RULON. Application of the Multiple Discriminant Function to Data from the Airman Classification Battery. *Human Resources Res. Center*, San Antonio, Texas; *Research Bulletin* 52–37, December, 1952.

BRYAN, JOSEPH G. and D. V. TIEDEMAN. Predicting College Field of Concentration. *Harvard Studies in Career Development*, No. 1, February, 1953. Cambridge, Mass.: Harvard Univ. Press, 1953.

BUSSGANG, JULIAN J. Crosscorrelation Functions of Amplitude-Distorted Gaussian Signals. *M.I.T. Res. Lab. Electronics Tech. Rept.* No. 216, March 26, 1952.

BUTTON, KENNETH J. Nuclear Cross Section for 37-Mev Positive Pions in Pb. *Phys. Rev.* 88, pp. 956–957, December 15, 1952.

CERRILLO, MANUEL V. and E. A. GUILLEMIN. III. Theoretical Considerations on Rational Fraction Expansions for Network Function. *M. I. T. Res. Lab. Electronics Tech. Rept.* 233. June 4, 1952.

CERRILLO, MANUEL V. On Basic Existence Theorems in Network Theory. M. I. T. *Res. Lab. Electronics Tech. Rept.* 246. November 10, 1952.

CERRILLO, MANUEL V. The "Cliff" Method of Approximate Integration and the Radiation from a Dipole over A Finite Conductive Ground. (In *Symposium on Microwave Optics;* McGill University, Montreal, Canada, June 25, 1953.)

CHANG, HSING C. and N. J. GRANT. Grain Boundary Sliding and Migration and Intercrystalline Failure Under Creep Conditions. *J. Metals* 5, pp. 305–312, February, 1953.

CHAO, KUO-CHIN. *Source Materials from Communist China,* Vol. III, on Fiscal, Monetary and International Economic Policies. M. I. T. Center for Int. Studies, 1952.

CHAO, KUO-CHÜN. *Selected Works in English for a Topical Study of Modern China,* 1840–1952. Cambridge: Regional Studies Program, Harvard University, November, 1952.

CHAO, KUO-CHÜN. *Northeast China* (Manchuria) *Today.* Cambridge: M. I. T. Center for Int. Studies, March, 1953.

CHAO, KUO-CHÜN. Chinese Land Policies. *Current History* 24, pp. 339–350, June 10, 1953.

CLARK, DONALD L. Production of 40-Mev π^+ and π^- Mesons in Seven Elements by 240-Mev Protons. *Phys. Rev.* 87, pp. 157–158, July 1, 1952.

CLARK, DONALD L., S. W. BARNES, J. P. PERRY and C. E. ANGELL. The Total Cross Sections of Positive Pions in Hydrogen. *Phys. Rev.* 87, pp. 669–670, August 15, 1952.

CORD, JOHN M. Behavior of Wall Panels Under Static and Dynamic Loads. Contract No. DA-49-129-Eng-158, Office of the Chief of Engineers, Dept. of the Army; Dept. of Civil and Sanitary Eng., M. I. T.; August 1952.

CRAMER, HARRISON E. and F. A. RECORD. Measurements of the Structure of Turbulent Flow at a Height of 2.3 Meters. Scientific Rept. No. 1, Diffusion Project. (Air Force Contract) Round Hill Field Station, August, 1952.

CRAMER, HARRISON E. A New Approach to the Problem of Turbulent Mixing. *J. Meteorology* 10, pp. 46–53, February 1, 1953.

CRAMER, HARRISON E. and F. A. RECORD. The Variation with Height of the Vertical Flux of Heat and Momentum. *J. Meteorology* 10, pp. 219–226, June 1, 1953.

DAVISON, SOL, S. A. GOLDBLITH, B. E. PROCTOR, B. KAN, C. J. BATES and M. KAREL. Studies on the Dosimetry and Bactericidal Effects of Gamma Radiation from a Cobalt-60 Source. *Radiology* 60, pp. 732–735, May, 1953.

DAVISON, SOL, S. A. GOLDBLITH, B. E. PROCTOR, B. KAN, C. J. BATES and M. KAREL. Dosimetry of a Kilocurie Cobalt — 6° Source. *Nucleonics* 11, No. 7, June, 1953.

DEBETTENCOURT, JOSEPH T. Instantaneous Prediction of Ionospheric Transmission Circuits by the Communication Zone Indicator ("COZI") I.R.E. Prof. *Group on Antennas and Propagation Trans.* 3, pp. 202–209, August, 1952.

DEGAN, JAMES W. *Dimensions of Functional Psychosis.* Richmond, Va.: Wm. Bryd Press, 1952. (Psychometric Monographs — Number 6.)

DE-SHALIT, AMOS. Cosine Interaction Between Nucleons. *Phys. Rev.* 87, p. 843, September 1, 1952.

DE-SHALIT, AMOS, K. GOPALAKZISHNAN and J. W. MIHELICH. Neutron Deficient Isotopes of Hg. *Phys. Rev.* 89, p. 908, March 15, 1953.

DE-SHALIT, AMOS. Effects of Departures from the Single Particle Model on Nuclear Magnetic Moments. *Phys. Rev.* 90, pp. 83–86, April 1, 1953.

DJÖRUP, R. S., R. F. HUETER and M. S. COHEN. Ultrasonic Attenuating in Biological Suspensions. (In *M. I. T. Acoustics Lab. Quarterly Progress Report.* pp. 22–23, January–March, 1953.)

ECONOMOS, G. and F. E. VINAL. A High Temperature Catenary Kiln. *Am. Ceramic Soc. J.* 36, pp. 204–206, June, 1953.

FALABELLA, GAETANO, JR. and J. R. MEYER, JR. The Determination of Inflow Distributions from Experimental Aerodynamic Loading and Blade Motion Data on a Model Helicopter Rotor in Hovering and Forward Flight. M. I. T. Aero-Elastic and Structures Research Lab. June, 1953 (NACA Contract D.I.C. 6951).

GOLD, LOUIS. Modified Distribution Function for Ethylene Oxide-Type Polymerization. *J. Chem. Phys.* 20, pp. 1651–1652, 1952.

GOLD, LOUIS. Relativistic Dynamics of a Charged Particle in Crossed Magnetic and Electric Fields with Application to the Planar Magnetron. *M. I. T. Lincoln Lab. Paper* October 31, 1952.

GOLD, LOUIS. On the Nature of the Transcendental Curves Associated with the Relativistic Trajectories of Charged Particles. *M. I. T. Lincoln Lab. Paper*, November 17, 1952.

GOLD, LOUIS. Method of Time-free Solutions for Radioactive Decay and Radionuclide Production. *J. Appl. Phys.* 24, pp. 88–90, January, 1953.

GOLD, LOUIS. Production of Nuclear Fuels by Induced Radioactive Chains. *Nucleonics* 11, pp. 40–45, April, 1953.

GOLD, LOUIS. An Approach to a Rationale in Ferrite Synthesis: Evaluation of Magnetic Moments. *M. I. T. Digital Computer Lab. Paper* E-539. April 28, 1953.

GOODENOUGH, JOHN B. Nucleation Centers for Domains of Reverse Magnetization. *Am. Phys. Soc. Bull.* 28, p. 10, April 30, 1953.

GREEN, WILLIAM D. Low Frequency Oscillator, Circular Sweep Generator and Circular Integrator. *M. I. T. Instrumentation Lab. Eng. Memo.* E228, January 2, 1953.

GRIM, WILLIAM M. and A. B. VAN RENNES. Compensation Against Effects of Grid-Cathode Capacitance in Pulse-Height Selectors. *Rev. Sci. Instr.* 23, p. 563, October, 1952.

GUERNSEY, GORDON L., G. MOTT, B. K. NELSON and A. ROBERTS. Construction and Calibration of a Fast Neutron Scintillation Spectrometer. *Rev. Sci. Instr.* 23, pp. 476–482, September, 1952.

GUERNSEY, GORDON L., G. MOTT and B. K. NELSON. Differential n.-p. Scattering Cross Section for 220 Mev Neutrons. *Phys. Rev.* 88, 1, pp. 15–19, October 1, 1952.

HATCH, RICHARD W. The American Battlefield. *Virginia Quarterly Rev.* 28, pp. 349–355, Summer, 1952.

HOWARD, VINCENT W. Influence of Elasticity in Closed Loop System Performance. (M. I. T. M.E. Dept. Mech. Engr. 1953). M. I. T.: Flight Control Laboratory, June, 1953.

HUETER, THEODORE F. A Temperature Invariant Impedance Point in the Frequency Response of Barium Titanate. (In *M. I. T. Acoustics Lab. Quarterly Progress Report* pp. 18–20, July–September, 1952.)

HUETER, THEODORE F., M. S. COHEN and W. S. BUTKUS. Two Frequency Apparatus for Bone Compensation. (In *M. I. T. Acoustics Lab. Quarterly Progress Report* pp. 20–22, July–September, 1952.)

HUETER, THEODORE F., M. S. COHEN and J. BERGER. Bone Compensation by Gamma Radiation. (In *M. I. T. Acoustics Lab. Quarterly Progress Report* pp. 24–25, July–September, 1952.)

HUETER, THEODORE F. and M. S. COHEN. Two-Frequency System for the Discrimination of Ultrasonic Signal Variations Through Multiple Attenuating Layers. (In *M. I. T. Acoustics Lab. Quarterly Progress Report* p. 19, October–December, 1952.)

HUETER, THEODORE F. and M. S. COHEN. Ultrasonic Two-Frequency System. (In *M. I. T. Acoustics Lab. Quarterly Progress Report* p. 23, January–March, 1953.)

HUETER, THEODORE F. Temperature Invariant Impedance Point in the Frequency Response of Circular Barium Titanate Transducers. (Letter to the Editor.) *Acoustical Soc. Am. J.* 25, p. 152, January, 1953.

HUETER, THEODORE F., M. S. COHEN, H. T. BALLANTINE, JR. and R. H. BOLT. Investigation of the Use of Ultrasound for the Detection of Intracranial Tumors. (USPHS Contract C-1129-C2) Progress Report for June, 1952–April, 1953. For President's Report.

JACCARINO, VINCENT, B. BEDERSON and H. H. STROKE. The Nuclear Spin and Magnetic Moment of $_{55}Cs^{134}$. *Phys. Rev.* 87, pp. 676–677, August 15, 1952.

JACOBS, JOHN F. A High-Speed Counter Employing Transistors. *M. I. T. Digital Computer Lab. Rept.* R-214, July 15, 1952.

JENSEN, WILLIAM P. Combustion Theory and Practice. *Chem. Eng.* 60, pp. 190–194, 221, June 1, 1953.

JONES, CLARENCE W. Use of H Field Coupling in Directional Couplers. *M. I. T. Lincoln Lab. Tech. Rept.* 19. March, 1953.

JUHÁSZ, STEPHEN J. and T. A. WIDELL. Metal Temperature in Regenerative and Recuperative Air Preheaters. *Royal Inst. Technology* (Stockholm) *Trans.* 54, pp. 1–50, 1952.

JUHÁSZ, STEPHEN J. and T. A. WIDELL. Metal Temperature in Regenerative and Recuperative Air Preheaters. *Acta Polytechnica* (Sweden) 103, pp. 1–48, 1952.

JUHÁSZ, STEPHEN J. and F. C. HOOPER. Direct Graphical Evaluation of Radiation Form Factor. *A.S.M.E. Paper* 52-F-19 September, 1952.

JUHÁSZ, STEPHEN J. and F. C. HOOPER. Hydraulic Analog for Studying Steady-State Heat Exchangers. *Ind. Eng. Chem.* 45, pp. 1359–1362, June 6, 1953.

JUHÁSZ, STEPHEN J. and F. C. HOOPER. An Electric Dewpoint Meter Cooled by the Vortex Tube. *Refrigerating Eng.* 60, pp. 1196–1197, November 11, 1952.

KEILSON, JULIAN and J. E. STORER. On Brownian Motion, Boltzmann's Equation, and the Fokker-Planck Equation. *Quarterly Appl. Math.* 10, pp. 243–253, October, 1952.

KLEINER, WALTER H. Crystalline Field in Chrome Alum. *J. Chem. Phys.* 20, pp. 1784–1791, November, 1952.

KLEINER, WALTER H. Orbital Effect in Neutron-Electron Magnetic Scattering. *Phys. Rev.* 90, pp. 168–169, April 1, 1953.

KOSTER, GEORGE F. Localized Functions in Molecules and Crystals. *Phys. Rev.* 89, pp. 67–77, January 1, 1953.

KRAG, WILLIAM E. A Dewar for Introducing Liquid Helium Below the Experimental Apparatus. *Rev. Sci. Instr.* 23, pp. 379–380, July, 1952.

KUCKES, A. F. and T. F. HUETER. Ultrasonic Absorption of Castor Oil as a Test Substance. (In *M. I. T. Acoustics Lab. Quarterly Progress Report* pp. 22–24, July–September, 1952.)

KUCKES, A. F., M. S. COHEN and T. F. HUETER. Ultrasonic Attenuation in Simple Biological Systems. (In *M. I. T. Acoustics Lab. Quarterly Progress Report* pp. 18–19, October–December, 1952.)

KUO, HSIAO LAN. Three-dimensional Disturbances in a Baroclinic Zonal Current. *J. Meteorology* 9, pp. 260–278, August, 1952.

LEBOW, IRWIN L., R. H. BAKER and R. H. REDIKER. A Transistor Switching Circuit with Stabilized Valley Point. *M. I. T. Lincoln Lab. Tech. Memo*, 11, July 22, 1952.

LEBOW, IRWIN L. and R. H. BAKER. The Transient Response of Transistor Switching Circuits. *M. I. T. Lincoln Lab. Group 24 Report*, December, 1952.

LEBOW, IRWIN L., R. H. BAKER and R. E. MCMAHON. Base Triggered Transistor Switching Circuits. *M. I. T. Lincoln Lab. Group 24, M24-17*, March, 1953.

LEMENT, BERNARD S. and S. C. DAS GUPTA. Stabilization of the Austenite-Martensite Reaction in a High Chromium Steel. *J. Metals* 5, pp. 530–536, April, 1953.

LIGDA, MYRON G. H. Horizontal Motion of Small Precipitation Areas as Observed by Radar. (In Proceedings of the Third Weather Radar Conference, Montreal, Canada: September, 1952.)

LIN, SU TANG and A. R. KAUFMANN. Helmholtz Coils for Production of Powerful and Uniform Fields and Gradients. *Rev. Modern Phys.* 25, pp. 182–190, January, 1953.

LIVENGOOD, JAMES C., A. R. ROGOWSKI and C. F. TAYLOR. The Volumetric Efficiency of Four-Stroke Engines. *S.A.E. Quarterly Trans.* 6, pp. 617–636, October, 1952.

LOEB, ARTHUR L. A Free Energy Model for the Hysteresis Loop. *Am. Phys. Soc. Bull.* 28, p. 10, April 30, 1953.

LUCE, R. DUNCAN. Two Decomposition Theorems for a Class of Finite Oriented Graphs. *Am. J. Math.* 74, pp. 701–722, July, 1952.

LYON, R. H. and T. F. HUETER. Response of a Piezoelectric Plate to a Localized Driving Force. (In *M. I. T. Acoustics Lab. Quarterly Progress Report* p. 6, October–December, 1952.)

McCUE, JOHN J. G. The Measurement of Frequency Modulation in Pulsed Magnetrons with a Microwave Interferometer. *M. I. T. Lincoln Lab. Tech. Rept.* 16, October, 1952.

McDONOUGH, JAMES O. and A. K. SUSSKIND. A Numerically Controlled Milling Machine. AIEE Special Publication S-53. New York: AIEE, 1953.

McDONOUGH, JAMES O. Punched Tape Guides, Milling Machine Cutters. *Electronics* 26, pp. 135–137, April, 1953.

McGILL, WILLIAM J. Multivariate Transmission of Information and its Relation to Analysis of Variance. Work Done for the Air Force at Res. Lab. Electronics, M. I. T. and Issued as U. S. Air Forces Human Factors Operations Res. Labs. Tech. Rept. 32, May, 1953.

McMAHON, ROBERT E., I. L. LEBOW and R. H. BAKER. A Two Transistor Shift Register. *M. I. T. Lincoln Lab. Group 24, M24–20.* May 22, 1953.

McNAMARA, FRANK L. and T. F. ROGERS. Direct Viewing of an Ultrasonic Beam in a Transparent Solid. *Acoustical Soc. Am. J.* 25, p. 338, March 1, 1953.

McNAMARA, FRANK L. and R. T. BEYER. A Variation of the Radiation Pressure Method of Measuring Sound Absorption in Liquids. *Acoustical Soc. Am. J.* 25, pp. 259–262, March 1, 1953.

MENYUK, NORMAN. Magnetization Reversal of Square-Loop Polycrystalline Materials by Domain Growth. *Am. Phys. Soc. Bull.* 28, p. 10, April 30, 1953.

MEYER, JOHN R., JR. and G. FALABELLA, JR. Some Remarks of the Effect of Flapping Hinge Offset on Rotor Blade Stall. *J. Aero. Sci.* 20, pp. 136–137, February, 1953.

MEYER, JOHN R., JR. and G. FALABELLA, JR. An Investigation of the Experimental Aerodynamic Loading on a Model Helicopter Rotor Blade. N.A.C.A. Tech. Note 2953, May, 1953.

MORROW, WALTER E., JR., D. J. GRAY and V. P. GURSKE. Wide-Deviation Frequency-Modulated Oscillator. *M. I. T. Lincoln Lab. Tech. Rept.* 11. August 6, 1952.

MOTT, G. R., G. L. GUERNSEY and B. K. NELSON. Total Cross Sections of Carbon and Hydrogen for High Energy Neutrons. *Phys. Rev.* 88, pp. 9–14, October 1, 1952.

NAIDITCH, SAM. The McLeod Gauge as a Primary Standard. Thirteenth Annual Conference on Physical Electronics, M. I. T. 1953.

NELSON, BRUCE K., G. GUERNSEY and G. MOTT. Neutron Energy Distributions from Be, C, and Pb Bombarded by 245 Mev Protons. *Phys. Rev.* 88, pp. 1–8, October 1, 1952.

NEUHAUS, D. and T. F. HUETER. Ultrasonic Image Formation of Scattering Objects. (In *M. I. T. Acoustics Lab. Quarterly Progress Report* p. 5, January–March, 1953.)

OSBORNE, LOUIS S., Y. GOLDSCHMIDT-CLERMONT and M. B. SCOTT. Photoproduction of Neutral Mesons in Hydrogen. *Phys. Rev.* 89, pp. 329–330, January 1, 1953.

PARMENTER, ROBERT H. The Acousto-electric Effect. *Phys. Rev.* 89, pp. 990–998, March 1, 1953.

PRATT, GEORGE W., JR. Wave Functions and Energy Levels for Cu^+ as Found by the Slater Approximation to the Hartree-Fock Equations. *Phys. Rev.* 88, pp. 1217–1224, December 15, 1952.

RABINOWICZ, ERNEST. Metal Transfer During Static Loading and Impacting. *Phys. Soc. London Proc.* B65, pp. 630–640, August, 1952.

RABINOWICZ, ERNEST and K. V. SHOOTER. The Transfer of Metal to Plastics During Sliding. *Phys. Soc. London Proc.* B65, pp. 671–673, September, 1952.

RABINOWICZ, ERNEST. Autoradiography of Metal Surfaces Using a Radiochemical Method. *Nature* 170, p. 1029, December 13, 1952.

RABINOWICZ, ERNEST and J. T. BURWELL. The Nature of the Coefficient of Friction. *J. Appl. Phys.* 24, pp. 136–139, February, 1953.

RABINOWICZ, ERNEST. On the Looseness of Wear Fragments. *J. Appl. Phys.* 24, p. 367, March, 1953.

RECORD, FRANK A. and H. E. CRAMER. The Variation with Height of the Vertical Flux of Heat and Momentum. *J. Meteorology* 10, pp. 219–226, June 1, 1953.

REED, IRVING S., R. H. BAKER, I. L. LEBOW and R. H. REDIKER. The Phase-Bistable Transistor Circuit. *M. I. T. Lincoln Lab. Tech. Memo.* 18. October 7, 1952.

REED, IRVING S. The Hankel Transform as Applied to Cylindrically Symmetric Two Dimensional Probability Distributions. *M. I. T. Lincoln Lab. Tech. Memo.* 30. April 27, 1953.

REED, IRVING S. The Asymptotic Behavior of the Remainder of the Exponential Series for Large n. *M. I. T. Lincoln Lab. Tech. Memo.* 32. May 21, 1953.

REED, IRVING S. Symbolic Design of Digital Computers. *M. I. T. Lincoln Lab. Tech. Memo.* 23. January 19, 1953.

REED, IRVING S. An Analysis of Signal Detection by the Sequential Observer. *M. I. T. Lincoln Lab. Tech. Rept.* 20. March 12, 1953.

REED, IRVING. Boolean Functions of a Real Variable and its Applications to a Model of the Digital Computer and Discrete Probability. *M. I. T. Lincoln Lab. Tech. Rept.* 12. August 14, 1952.

REED, IRVING S. Symbolic Synthesis of Digital Computers. *M. I. T. Lincoln Lab. Tech. Rept.* 15. October 17, 1952.

REED, RICHARD J. A Synoptic Study of the Mechanics of Cold-Low Formation. *U. S. Office Naval Research, Tech. Rept.* 13. (Dept. of Meteorology, M. I. T.)

REYNOLDS, CHARLES C., C. M. ADAMS and H. F. TAYLOR. Prediction of Mechanical Properties from Chemical Composition for Fully-annealed Ductile Cast Iron. *Am. Foundrymen's Soc. Trans.* Preprint No. 53-51, 1953.

RICH, EDWIN S. and R. R. RATHBONE. Computer Reliability. *Radio and Television News* (Radio, Electronic, Engineering Section) 49, pp. 10–12, 31, February, 1953.

ROSEBURY, FRED. High Temperature Thermoregulator (Lab. and Shop Notes). *Rev. Sci. Instr.* 24, pp. 398–399, May, 1953.

ROSENBLUM, EARL S., E. F. SHRADER and R. M. WARNER, JR. Absorption of 5.3 Mev, 10.3 Mev, and 17.6 Mev Gamma Rays. *Phys. Rev.* 88, pp. 612–617, November 1, 1952.

ROTH, HARRIET P. Metallography of Hafnium. *Metal Progress* 63, no. 6, pp. 84–89, June, 1953.

RUSSELL, ROBERT B. On the Zr-Hf System. *J. Appl. Phys.* 24, pp. 232–233, February, 1953.

SAFFORD, RICHARD W., H. S. BRIDGE, C. PEGROV and B. ROSSI. Cloud-Chamber Observations of the Heavy Charged Unstable Particles in Cosmic Rays. *Phys. Rev.* 90, pp. 921–933, June 1, 1953.

SCOTT, W. T. and J. J. G. MCCUE. Some Demonstration Experiments with a Projection Thermometer. *Am. J. Phys.* 20, p. 394(A), September, 1952.

SEIFERT, WILLIAM W. Experimental Evaluation of Control Systems by Random-Signal Measurements. I.R.E. *Convention Record*, Part I. Radar and Telemetry. pp. 94–98, 1953.

SMAKULA, ALEXANDER. *Physical Properties of Optical Crystals.* Washington, D. C.: U. S. Dept. of Commerce, 1952.

SMAKULA, ALEXANDER, J. KALNAJS and V. SILS. Inhomogeneity of Thallium Halide Mixed Crystals and its Elimination. *M. I. T. Lab. Insulation Res. Tech. Rept.* 67. March, 1953.

SMAKULA, ALEXANDER and M. W. KLEIN. Investigation of Crystal Growth by Thermal Etching and Oriented Overgrowth. *J. Chem. Phys.* 21, pp. 100–104, January, 1953.

SPENCER, RICHARD H., C. E. WARING and R. L. CUSTER. A Bridged Tee Detector for Nuclear Magnetic Resonance. *Rev. Sci. Instr.* 23, pp. 497–498, September, 1952.

SUTRO, LOUIS L., R. L. BEST, W. G. DROGUE and R. R. RATHBONE. Standard Test Equipment. M. I. T. *Digital Computer Lab. Project Whirlwind Rept.* R-215, September 1, 1952.

TANNENWALD, PETER E. Disintegration of Helium by 90 Mev Neutrons. *Phys. Rev.* 89, pp. 508–517, January 15, 1953.

TAYLOR, NORMAN H. Review of Input and Output Equipment Used in Computing Systems. (In [Proceedings] of the Joint AIEE-IRE-ACM Computer Conference, March, 1953, pp. 1–2.)

TEVIOTDALE, ALAN. Zever's Treatment of Ferromagnetism. *Phys. Soc. London Proc.* A65, pp. 957–958, November, 1952.

VANDERSCHMIDT, FRED and K. S. LION. Photographic Effects of Counter Discharges. (O.N.R. Tech. Rept.) M. I. T. *Lab. for Applied Biophysics.* May, 1953.

VINAL, FRANCIS E. Magnetic Ceramics-Ferrites. *QST* 37, pp. 44–46, February, 1953.

WINHOLD, F. J., P. T. DEMOS and I. HALPERN. The Angular Distribution of Fission Fragments in the Photofission of Thorium. *Phys. Rev.* 87, pp. 1139–1140, September 15, 1952.

LIBRARY

BOOTH, ROBERT E. New England College Libraries. *Library J.* 77, pp. 1857–1859, November 1, 1952.

HAZEN, MARGARET P. Library Editing. *Boston Chapter (S.L.A.) News Bull.* 19, pp. 4–5, 7, April, 1953.

HAZEN, MARGARET P. Technical Reports Workshop. *Boston Chapter (S.L.A.) News Bull.* 19, pp. 5, 7–8, May, 1953.

TATE, VERNON D. Defrosting a Frozen Asset: The Publication of Doctoral Dissertations. *College & Research Libraries* 14, pp. 35–38, 45, January, 1953.

TATE, VERNON D. Charles Hayden Memorial Library. *College & Research Libraries* 14, pp. 139–142, April, 1953.

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