

# REPORT OF THE ACTING PRESIDENT

## SHOULD HOLD TO ITS TRADITIONS.

(Continued from page 2.)

### Needs of the Departments.

The immediate needs of the various departments should not pass unnoticed by me, even though they are more fully presented in the separate reports of those in charge.

Nearly all of the departments are in serious need of additional floor-space for laboratories, class-rooms, and places for students to study. The demand for better laboratory accommodations is perhaps most urgent in the Departments of Mechanical Engineering, Mining Engineering, and Chemistry. In the first of these departments some additional provision must be made at once in order that the recently purchased steam turbine and its accessories may be installed; and in the Chemical Department the much larger number of students who will take organic chemistry next year, owing to changes in the course schedules, can not be accommodated with the present facilities.

Additional equipment is also much needed by several departments. Some of the larger and most essential machines are as follows: a surface condenser, refrigerating plant, and impact tester are important to the Department of Mechanical Engineering, additions the need of which has been strongly urged by your visiting committee; new engine and speed lathes and other machines, as well as extensive repairs to the building are required by the laboratories of Mechanical Arts; a large storage battery is greatly needed by the Electrical Engineering Department; and a new boiler for the heating and power plant is essential before the beginning of the next school year.

### Educational Field of the Institute.

It is well, I believe, for the Corporation to take under consideration from time to time those fundamental principles which express the main purposes for which the Institute exists and which should determine the educational field which it is to occupy and the directions in which it is to be developed. In this belief, I here present my views for your consideration.

### Should Continue as an Undergraduate School.

First of all, I believe that all those connected with the Institute should clearly recognize that one of its main functions, as an independent scientific school, is to educate for the scientific and engineering professions young men who have previously received only a high-school education. It must remain in large measure a school for undergraduates, and must not allow itself through the influence of the policies of universities to become a graduate school for the professional training of the graduates or former students of other colleges. The question here at issue is not which is more advantageous—a professional training preceded by a liberal education of an elective character or a co-ordination of the two in a single prescribed course, but whether or not there is a large field for education of the latter type. Some may prefer to drive tandem, with a loose rein upon the leader, and some to drive abreast; but none wishes his freedom of choice restricted. By the establishment in this community of the Graduate School of Applied Science at Harvard University, and by a similar development at other universities throughout the country, ample provision will doubtless be made, as fast as the demand arises, for the engineering education of college graduates. It should be, on the other hand, the special care of the Institute to maintain and develop that combination of liberal and professional training for undergraduates for which it has stood from its foundation. If ever there should cease to be a demand for this type of education, or if ever it shall have been demonstrated that this type when properly developed produces only engineers and scientists of an inferior grade, then, and not till then, will it be time to consider the conversion of the Institute into a purely graduate school. To abandon at this stage the educational experiment which the Institute is making, instead of coping with the difficulties in its problem which have become apparent, would be a betrayal of the trust which its past imposes and a severe blow to the educational development of this country. There is as yet no indication that the sources that have directly fed the streams which are inundating our technological schools are drying up, nor is there as yet any adequate experience which warrants us in diverting those streams into a different channel. It is certainly desirable that the new type of engineering education be developed, in which cultural subjects are given as collegiate courses and the professional training in a graduate school;

but this is not our field of educational service. Such a development is to be welcomed in part because it is a stimulus to us to study the conditions for making our own type of education more effective. We must therefore not allow our attack upon the problems of undergraduate education to be weakened by theories as to the tendencies of professional education under university conditions, nor by inconclusive comparisons between the results attained in graduate schools of law and medicine and those that may be expected in similar schools of applied science.

### Should both Train and Broaden.

The second principle which I desire to emphasize is that already indicated by my preceding words, namely, that as an independent undergraduate school the educational problem of the Institute is necessarily of a two-fold character: for we have to develop a plan of education which is adapted to produce not only well-trained engineers, but also broad-minded, high-purposed men. We must aim to make the work of the students at the Institute and the conditions of their life outside such as lead to a duly proportioned development in these two directions.

It is sometimes said, however, that in attempting to solve this two-fold problem in a four-year undergraduate course, the Institute is undertaking a hopeless task. This contention I would meet by the statement that, whether or not it be hopeless to give a fully adequate education upon these two sides within the period of four years, it is our problem to do this in as large a measure as is possible; for to further increase this minimum period of study would close the doors of the institutions of technological education to a large number of young men whose financial resources are already taxed to the utmost. Moreover, the careers of Institute graduates in the past warrant the conclusion that the results attained in the past are as a whole satisfactory; and when the many possibilities of further development in the educational work and the conditions of student life are considered, the future outlook for a fuller success of the four-year course is a bright one. Before conceding the necessity of an extension of this period of study, we must at least consider the possibility of utilizing in part the intermediate summer vacations which now cover no less than one-third of the whole year; but to this matter I shall return when I come to consider the specific lines of development which are most imperative.

### Should Specialize in a Fifth Year.

The general principle which should determine the character of our four-year course of study—and this is fully recognized by our Faculty,—is that a liberal education be provided such as will develop character, breadth of view, and high ideals of service, and that the professional education be mainly confined to a thorough training in the principles of the fundamental sciences and in scientific methods, specific engineering subjects being only so far included as the remaining time permits and as the minimum requirements of professional practice demand. It should be our aim not to turn out at the end of a four-year course a specialist, but rather to provide for specialization in a fifth-year graduate course. By courageously eliminating from our fourth-year curriculum the most technical branches of instruction, however important they may be for the practising engineer, and by making more ample provision for them as subjects to be pursued in graduate courses, we shall, on the one hand, be able to make our undergraduate course more educational in the broadest sense, and, on the other hand, make more evident to the student the practical importance of returning for a fifth year to acquire the more specialized knowledge of the separate engineering professions. This, then, is the direction in which, in my judgment, the courses of study at the Institute should be developed; we will give in our four-year undergraduate course an even broader and deeper training than at present in cultural and fundamental scientific studies—a training which will still enable those students that are obliged to do so to enter at once upon the practice of their professions, handicapped somewhat, it may be, by the lack of technical experience, but with a sound knowledge of principles and a developed mental power which will gradually enable them to overcome this disadvantage; and, on the other hand, we will develop graduate courses of such a character as will obviously remedy this deficiency of insufficient specialization and will attract such graduates of scientific schools as are financially able to continue their education. We shall thus create a type of graduate school in which is offered ad-

vanced training for Bachelors of Science rather than for Bachelors of Arts.

But this is by no means the only function which the Institute should fill. It must aim to be the leader in the development of all grades of higher scientific and technological education, of which the mathematical, physical, and natural sciences form the main basis, exceptions only being made in cases, like those of medicine and agriculture, where ample provision has already been made by another class of institution. Some of the other directions in which our development must be continued or extended therefore deserve consideration.

We must, while not permitting any sacrifice of the instruction of our undergraduate students, encourage college graduates to enter the higher years of our regular courses and our advanced courses, and offer them such additional facilities as their different preparation demands. Future experience alone can determine whether such graduates will receive a better education in the graduate schools of universities in courses attended often not only by themselves but by college men without definite professional aim, or in scientific schools working side by side in the undergraduate courses with men earnestly devoted to preparation for their profession. The presence together of these two groups of men is certainly mutually advantageous: the graduate student from another institution tends to broaden the interests of his undergraduate associates; and the latter imbues the former with the spirit of hard work and seriousness of purpose which attendance at the scientific school has inspired. For these reasons we must not fail to provide suitable courses and conditions of work for the college graduates who are coming to us in constantly increasing numbers.

### Need for Research Work.

Development is also of the greatest importance in the direction of larger opportunities and inducements for research work and advanced studies in the pure and applied sciences which form the basis of our curriculum. An institution of learning which does not contribute through the researches of its instructing staff and graduate students to the advancement of science can not secure the highest grade of teachers, can not keep its courses of instruction upon the plane of broad and deep scholarship, and can not retain its educational prestige. I have already spoken of one kind of advanced courses which we are already developing—one which would provide the more specialized instruction in engineering subjects which industrial advances are making more and more imperative. Such a course, which hardly needs to be of more than one year's duration, leads to the degree of Master of Science. There is, however, a second kind of advanced course which is even more essential to the development of the highest type of scientist or engineer. This is a course in which the student, while pursuing more advanced studies in the underlying sciences, devotes himself mainly to the original investigation of problems in pure or applied science. It is investigation work of this sort which tends to develop the creative power of the man and his ability to handle new problems relating to the improvement of industrial processes and engineering methods. Such a course, when of two or three years' duration, may lead to the degree of Doctor of Philosophy or Doctor of Engineering. The Institute has already made encouraging progress in this direction; but the number of students engaged in such work has thus far been small. This matter of research work, both with reference to advanced students and the members of our own instructing staff, I shall consider more fully a little later.

### The Larger Problems of Development.

Let me next speak of what may be called the larger problems of development—of those lines of action which are essential to the fuller accomplishment of our educational purposes.

It is scarcely necessary to mention that one of the most important of these problems is the selection of a permanent president who has a true conception of the educational ideals of the Institute, combined with the high character, soundness of judgment, and power of initiative and of energetic execution, that will make him an effective agent in the realization of those ideals. The qualifications for the office are so numerous and varied that their combination in a single person is extremely rare; and all such persons are in great demand for the highest executive positions. With the consideration of this matter the Executive Committee is still actively engaged.

### Permanent Location.

Another matter of the greatest mo-

ment is the reaching of a decision as to the permanent location of the Institute, in order that its future development may be assured and its immediate needs adequately provided for. I shall not, however, discuss this question; for I know that you fully realize its vital significance. You have appointed a Committee of your body to deal with it; and that Committee will doubtless take action and report to you as promptly as possible. It will of course be appreciated that the first preliminary to any action must be a careful consideration of the means for financing the undertaking; and that the present monetary situation makes this impracticable. Friends of the Institute should, however, realize that again in its history the time has arrived when provision must be made for far-reaching improvements in the physical conditions under which its work is carried on. New buildings must be erected, new laboratories provided, and new equipment secured, in order that the Institute may retain its leadership in technological education. And these are not matters that can be much longer deferred.

### Need for Reduced Tuition.

Next in importance to this matter of making provision for our immediate needs and future development comes the question of reduced tuition fees or increased scholarship aid. The inadequacy of our endowment combined with the high cost of the kind of instruction furnished by the Institute, made it seem necessary a few years ago to increase our tuition fee to \$250—an amount which exceeds by one hundred dollars the fee charged at any other scientific school in New England. This increase will, I earnestly hope, be regarded as only a temporary expedient for which a remedy must be found at the earliest moment. The present high tuition not only is shutting out a large group of the most promising young men from the advantages of a scientific and engineering education, but is imposing upon another large group, or upon their parents, a financial burden which they are scarcely able to bear, and which forces such students to live and to work under conditions unfavorable to their health and social development. Any of the administrative officers of the Institute could recount numerous instances where the unanticipated need of purchasing a military uniform or a set of drawing instruments or some expensive book has been the last straw added to the financial load of the overburdened student, where men have been obliged to withdraw from the Institute because they could not raise the last fifty dollars of their tuition, or where they have been living on thirty or forty cents a day in order to meet it. Our high tuition is, moreover, sending young men more and more to the other less expensive institutions. Many of these take the full courses of study there, but there is a large and increasing number who for reasons of economy replace the first year or first two years of the Institute course by corresponding work at another institution and then enter the second or the third year of the Institute. There is involved in this plan a lack of continuity and of adequate preparation which is unfortunate. While we are not interested in bringing about any large increase in the number of our students, we are concerned in drawing to us young men of the highest quality. We must, therefore, not permit the financial resources of applicants to be the principle of elimination in any greater measure than is absolutely essential. There is, in my opinion, no form of educational expenditure which produces so large a return to the community as the higher training for the scientific and engineering professions of those comparatively few young men whose character and ability are such as to enable them to rise to positions of leadership. And this type is, I believe, most commonly developed among families which have sufficient means to send their sons to the high school, but yet are obliged to make them work at odd times to earn money towards their own support. Boys from poorer families are, unfortunately, not likely to have the opportunity of even a high school education, or the home surroundings or antecedents which conduce to intellectual development, while those from richer families are apt to lack the earnestness of purpose and inclination to subordinate the pursuit of pleasures to thorough preparation for a life of service which is acquired by the boy who has already learned to work. It is, however, just such families of small means which find it exceedingly diffi-