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THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY[1]

INSTALLATION ADDRESS

By Dr. SAMUEL W. STRATTON

RETIRING PRESIDENT AND CHAIRMAN ELECT OF THE CORPORATION

THE administration of the affairs of a large educational institution has become in many respects as great a problem as that of industry. The interests of the former are generally more diversified, its organization more complex and its administration more difficult, from many points of view.

Academic freedom, which generally refers to one's right to an opinion in his own field and to teach accordingly, is often interpreted to cover a much wider range of subjects, hence we do not always find the team work in the faculty that is found in industry or in the football team. In an institution like this, the coordination of the work between departments having many common interests is one of the most important phases of administration.

Notwithstanding the many interests common to all the scientific and technical departments, there is necessarily a great diversity between them in the later years of the courses and in graduate work.

At the institute there are twenty or more undergraduate courses and options leading to degrees. In all these graduate work is going on and growing rapidly. The inter-departmental relations as to this advanced work involve administrative problems of great importance.

Every department depends upon others for instruction in some of the subjects included in its own curricula. Few research projects are taken up that do not involve cooperation as to personnel and equipment between different departments. Conditions set up for convenience in departmental organizations are not always those most favorable to investigational

[1] Addresses given at Cambridge, Massachusetts, June 6, 1930.

work. Our course in engineering administration has shown conclusively that an engineering training supplemented with the fundamentals of business is an excellent preparation for the work of administration, especially in industry.

In every group of men entering the institute, some men are found who are by nature fitted for this class of work, and special training is provided for them. Others are endowed with the spirit of discovery; when the training of these is supplemented by advanced mathematics and science, they often become research men of the highest type. To discover these types of men and prescribe suitable courses of training for them is a most important educational problem. Men succeed best when following an occupation they enjoy.

To adjust the grade of each man's work in accordance with his ability rather than a fixed minimum as a standard for all is essential to efficiency in education if we are to do the best by the men. Some can accomplish much more than others with the same effort. Why not give them the opportunity?

A question of major importance in the administration of the affairs of a professional school is that of interesting successful men in the training of those who are to follow in their professions. Among the graduates of the institute are to be found many of the foremost leaders in all the branches of science and technology with which it is concerned. These men can and do contribute the benefit of a wealth of experience. To encourage and foster this sort of contact is worthy of our most serious attention.

Cooperation with industry in this same respect is also important. Industry as well as the professions should assist in preparing the specifications of the types of men they need, and which we are in the business of training. The cost of training men in science and technology is much greater than is generally understood. When one of the early English physicists was asked by a visitor if he might see his laboratory, the physicist called a servant and directed that the laboratory be brought in. Contrast this with the great modern research laboratories, educational or industrial, with equipment for undertaking the most delicate investigations, or those requiring huge compressors, furnaces, generators or other facilities necessary to produce the conditions which the scientist of to-day must have at his disposal.

By far the most serious problem confronting an institution training men in the fields of science and technology is that of maintaining a suitable instructing staff; men who are leaders, and who inspire in others the same qualification.

During the past decade or so, many industrial concerns have learned what a few discovered earlier—the value of scientific research. During this period large numbers of young scientists have been taken into industry where they are rendering valuable service, much of it research of the highest order. Hence the supply of such men now available for educational work is very small. Naturally this demand has raised the pay of competent scientific men nearer to what they are worth and which educational institutions must meet by better pay, and especially by conditions favorable to original investigations.

It is encouraging to note that some concerns are cooperating with educational institutions in the maintenance of instructors and equipment in order to insure a supply of men who often become their most valuable asset.

To meet the mounting costs of a technical education the institute has twice raised its tuition in the past four years, which now covers about one half of the cost of instruction and expenses accessory thereto, not including buildings. We at the institute do not forget that the buildings about us and their equipment were provided for in the most part by men who are grateful for their own training and those who appreciate the part the graduates of the institute have taken in the building up of great industries.

The founders of the institute saw with prophetic vision and provided for the relation that must exist between instruction in technology and that of the basic sciences involved. They realize that progress in the fields of applied science goes hand in hand with the discovery of fundamental principles. Their most vivid imagination could not have forecast the growth of science and the consequent development in the fields of technology. Out of physics have grown:

Electrical engineering with many subdivisions, rigidly exacting as to the most advanced modern physics for a foundation.

Aeronautical engineering with its basic aerodynamics.

Modern hydraulics, involving hydrodynamics.

Geodesy, the most precise form of surveying.

Developments in steam and internal combustion engines, applications of the principles of thermodynamics.

Out of chemistry have grown:

Chemical engineering, the adaptation of chemical processes to production on a large scale. The petroleum industry owes it present success to the chemical engineer.

Physical chemistry, involving the most precise measurements of physics in the determination of constants and laws upon which progress in the science of chemistry and its application depends.

Refrigeration engineering, based upon the laws of heat transfer.

Electro-chemistry, dealing with reactions at high

temperatures so essential in metallurgical and other industrial processes; also the conditions under which metals are deposited electrolytically. Out of these great industries have sprung up as if by magic.

The cryogenic field is one in which both physics and chemistry are brought to bear in the production of low temperatures, the liquefaction of gases, the production of gases essential in both science and industry. The striking laboratory experiments of a decade or two ago were the forerunners of great industries of to-day.

In the field of metallurgy, applications of physics and chemistry form one of the newest and most important branches of science and its applications. The metallurgist juggles with metals and produces mixtures at will with almost any given properties, without which many modern industrial developments would have been impossible.

This is true to an amazing extent of all the materials we use, the bricks with which we build the refractories that line the furnaces of industry, the finest porcelain, the cement, the glass and all the materials of construction.

The fuel question is the most important of the automotive industry. The clothes we wear and the papers we read involve the use of scores of materials. In connection with the use and production of all these materials, new fields of technology have arisen based upon physics and chemistry of the most fundamental nature.

It is becoming difficult to classify science as pure and applied. Engineering and technology involve the most difficult problems in the fields of pure science. Industries are calling for and producing the most fundamental scientific data. Hence, in the training of men we must not overlook the intent of the founders of the institute as to the relations between the basic sciences and technology even though each has advanced far beyond their most sanguine vision.

To maintain the ideals of the founders and the best traditions of the institute, they must be interpreted in the light of modern science and the problems of the day. All its functions must be carried on in an atmosphere of research, if it is to be a blazer of trails to new fields and not merely the follower of beaten paths.

Recognizing these facts, the corporation has adopted a plan of organization which will permit of the administration of the affairs of the institute in accordance with the requirements of the present, and the conditions under which it can perform its functions most efficiently. This new plan provides for both a chairman of the corporation and a president of the institute; heretofore the latter has served in both capacities. In the present case the retiring president becomes chairman of the corporation, who at this time wishes to express his great appreciation of the support given him as president and the hope that these friendly, helpful relations will continue while he is its chairman.

Alumni and Friends of the Massachusetts Institute of Technology:

I have the honor of presenting to you the choice of the corporation for the next president of the Massachusetts Institute of Technology—Professor Karl Taylor Compton, chairman of the department of physics at Princeton University—eminent investigator in the field of physics, with a long list of original contributions to knowledge in this branch of science to his credit.

Honored by degrees from many institutions for his brilliant work in science.

Member of the National Academy of Sciences and an active leader in the organized bodies of American scientists.

Sympathetic with the applications of science in the fields of engineering and industry.

Who rendered most important scientific service during the late war.

And above all, a man who is universally loved and admired by all who know him.

To you, President Compton, I commend a corporation composed of successful men actively interested in the affairs of the institute. As its leader I foresee a constructive cooperation with you:

A loyal faculty, appreciative of your leadership,

A serious energetic, self-governed student body, which will be your greatest inspiration.

INAUGURAL ADDRESS

By Dr. KARL T. COMPTON

PERMIT me to take this opportunity briefly to discuss certain features of the Massachusetts Institute of Technology which have induced me, with real enthusiasm, to cast my lot with you as a part of this new organization. I venture to hope that this is appropriate because the significance of these considerations is not primarily to me personally, but to every one who is interested in science, and in the contributions which science has made and will in the future make to the happiness and welfare of mankind.

The three most pertinent questions in evaluating any institution would seem to be, "What is its pur-