ENGINEERING AND RELIGION[1]

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HIGHER education is primarily concerned with intellectual training and the acquisition of knowledge concerning existent facts. However, the importance of the development of the individual and his personality has come before engineering educators in more recent years. Much thought and discussion has been given to the fact that humanistic subjects (the so-called cultural subjects) have a part in the development of the student.

The early steps were merely the insertion of presumably beneficial humanistic subjects into the engineering curricula as separate and individual courses. Gradually there has come the recognition that there is need for an interrelation among these discrete humanistic subjects and that they should be an integral and coordinated part of the engineering curricula. Although the necessity for humanistic subjects in the engineering curricula is accepted, there is difference of opinion as to what proportion of an engineering curriculum should consist of humanistic subjects, and as to whether certain subjects should be included or omitted. In other words, the amount of humanistic subjects included in the engineering curricula, and the *extent* of their coordination and integration with these engineering curricula seems still to be much a matter of debate, but the *need* is an accepted fact. Generally speaking, the various opinions advanced on these matters are soundly based and entirely justified, provided full weight is given to the conditions of the individual engineering school where a particular method is being used.

In spite of all the thoroughgoing consideration that has been given to the all-around development of the individual engineering student and the many lengthy discussions that have been held concerning both the fundamental principles involved and also the detailed mechanisms for achieving the results, little attention seems to have been directed to determining whether the study of humanistic subjects provides a fundamental development of the individual student or whether it is somewhat of a superficial intellectual veneer. When we speak of the all-around development of a student, we may use the general and indefinite phrase that "we want to develop his personality." Because the term personality is so indefinite and may mean so many things to different people, we tend to throw this into the discard as being an undesirable term to use in dealing with engineers. Whether or not we are engineers, we rather generally are not satisfied in our discussions unless we define our terms—and personality is intangible and to most of us seems rather undefinable. Yet it has a very definite and strong meaning to all of us, a meaning that is closely related to the individual himself, his inward being, his innermost soul. And unless we can determine whether or how subjects of study affect a student's personality, we can not in any way be sure that they are broadening his view or developing him as a person who will be a useful citizen and a satisfactory member of society.

From a qualitative observation of graduates of engineering schools, it is evident that exposure to humanistic studies has some beneficial effect upon the development of a man's personality. There also appears to be evidence that the closer the coordination of the humanistic studies with the technical studies, and the more thoroughly the humanistic studies are integrated into the engineering curriculum, the greater and more beneficial will be the effect upon the individual student. Many reasons have been advanced to account for this desirable result. Probably all of them are in a large part correct, but probably all of them miss, in some degree, the vital point as to how the humanistic studies affect the inner man.

The personality of a student has been developing from its early days and has been influenced directly by his associates (family, friends, teachers), but through it all there is an influence that we as engineering educators seem inclined to overlook, if not actually to forget—the influence of religion. Religious faith is implanted in each individual as a small child, along with his first toddling steps or even earlier. Religious faith is one of the first things that mothers, either consciously or unconsciously, teach their children. It becomes ingrained in the person. It can not be overlooked. It has a direct and lasting effect on the development of the personality. Religious faith can be dampened until it is fairly non-existent, or it can be nurtured and cultivated into thoroughgoing convictions, based to a large extent upon reason.

Religious faith and religious conviction are an integral and essential part to each and all of us. They have been a stimulating force in the forwarding and developing of civilization through the ages. They must not, therefore, be forgotten or omitted in considering how best to develop the engineering student into full bloom in the engineering profession as a well-rounded and competent individual and a desirable member of society.

[1] Presented at the meeting of the Illinois-Indiana section, Society for the Promotion of Engineering Education, at the University of Notre Dame, April 20, 1940.

To my mind the education of an engineering student while in college may be considered as falling into three groups or channels: the acquisition of scientific and technical knowledge and training and ability to apply it, a broadening education of humanistic subjects, and the development of religious faith into substantially a reasoned religious conviction. It is a generally accepted practice in engineering schools to include the first two groups in their engineering curricula and to endeavor to bring them into a homogeneous entity, a sort of monolithic slab of engineering education with the humanistic subjects spreading among the scientific and technical subjects and impermeating them as the cement spreads throughout the sand and gravel and binds it together in a single structure. In non-denominational institutions, such as state universities, by our present American practices, religion may not be taught formally to all the students; the students must continue their education in religion on an individual, personal and informal basis with the religious organizations on the campus or with the churches in the vicinity. This makes it difficult, well-nigh impossible, to make their religious training an integral part of their formal education. At the same time their religious convictions are developing and are having strong influence—perhaps stronger than anything else—upon the development of their personality, which in turn will greatly affect their progress and achievement in later life. In my opinion there is strong argument for the taking of courses in religion during college education—courses that will make an intellectual approach upon religion and will aid the student in converting his unreasoned faith, which he has absorbed from parents and church, into a reasoned conviction. In institutions where courses in religion are offered, this result can be achieved by the student himself, but the greatest effectiveness can be accomplished if the religion courses, like the humanistic subjects, are brought into the engineering curricula as an integral and cognate part. The principles brought out in the courses of religion need to be utilized both in the humanistic subjects and in the technical subjects. Especially is this important in the upper class years when we, as engineering educators, are inculcating in our engineering students the ideals of the profession and the ideas of professional ethics.

At the University of Notre Dame, in addition to the requirement of courses in religion, the students have to take certain courses in philosophy. We are utilizing these philosophy subjects to aid us in coordinating the religious principles with the every-day life of the professional engineer. Philosophy may be considered as the bridge or tie between courses in religion and the technical subjects.

I feel that our objective in the engineering college at Notre Dame is to develop fine men who will be excellent citizens and first-rate engineers. I wish to quote from a discussion of the instruction in philosophy that Professor Roemer, of the Notre Dame philosophy department, has presented to me at my request:

> May I be allowed to submit that in this hectic struggle for existence while there is persistent demand for technicians in many fields of engineering, the engineer is apt to forget that before he is a professional man, he is first of all a *man*. If we who claim to be educators and builders of men forget that we are molding the minds and hearts of human beings who, like ourselves, have rights and duties in society, how can we expect our finished product to be complete?
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> Apart from religious doctrine, there are the cultural disciplines to which an educated man must need have submitted before he can be credited with having developed his intellectual faculty to its maturity. Chief of these cultural disciplines are those of language and those of fundamental philosophy. Here, logic enters so that the future executive may know how to think straight. He should be made familiar with the inductive or scientific method and also something of the purely deductive method which finds exemplification in the philosophy of mind and in ethics.

Before closing I wish to read some excerpts from the report of the Society for the Promotion of Engineering Education, "Committee on Aims and Scope of Engineering Curricula." These excerpts indicate the increasing recognition of the need of dealing with social problems by the engineering profession in general and by the individual engineer.

> From its very nature, engineering education operates under changing conditions which constantly challenge its processes and test its results. Its recent history has therefore been one of continuing appraisal and adaptation to changing needs.
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> Continuation of this process of self-examination seems now to be called for by new conditions, trends and attitudes that will be readily recognized: (a) The thoughtful public has become aware in recent years of the technological nature of our civilization and of the part that engineers must play in the solution of many of its problems. There is therefore a wide-spread insistence that the technological professions should be competent to evaluate the social problems with which they deal and to recognize the social forces which they create.
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> There is among engineering colleges a basic uniformity of aims, ideals, methods and standards of undergraduate instruction. This homogeneity is not the result of any imposed standardization; it is derived from a strong sense of solidarity among the different institutions and from the common ends they serve. In these circumstances there is ample opportunity for well-considered variations in curricula and for educational experimentation. . . . Diversity is, in fact, one of the basic characteristics of engineering services.

Engineering education rests on a foundation of science, of humanities and of social relationships. . . .

First (proposed policy), broadening of the base of engineering education, now in process, should be continued. Its roots should extend more deeply into the social sciences and humanities as well as into the physical sciences in order to sustain a rounded educational growth which will continue into professional life. Two stems are thus implied in the undergraduate curriculum which we have designated as the scientific-technological and the humanistic-social.

The humanistic-social studies should be directed toward (six objectives, one of which is stated as): 5. Development of moral, ethical and social concepts essential to a satisfying personal philosophy, to a career consistent with the public welfare and to a sound professional attitude.

Undergraduate curricula should be made broader and more fundamental through increased emphasis on basic sciences and humanistic and social studies.

No measures taken with respect to engineering education should limit the freedom that now exists for experimentation and change.

Proper consideration of social problems can not be given nor adequate solutions made unless we use the engineering method of obtaining all information pertinent to the specific problem. We do not have all information unless we have an understanding of religious faith and convictions, and their effect upon the actions and viewpoint of individuals. Since the engineer, increasingly in the future, will be concerned with social, in addition to technical and economic problems, it is important for him to have knowledge of religious principles and their result and effect on the individual. This in turn places the charge upon us as engineering educators to determine how far the training in religious principles should be brought into engineering training as a formal part of the curricula. I submit that religious faith and some knowledge of religious principles is ingrained in our students, and for this reason, so far as practicable, definite attention to integrating an intellectual study of religious principles and convictions into the engineering curricula is desirable, if not actually essential, for the best progress of the profession of engineering in its broadening scope in approaching social relationship in the future.

SCIENTIFIC EVENTS

SCIENTIFIC AND TECHNICAL DEVELOPMENTS OF USE IN THE WAR

A SPECIAL cable from London has been received by *The New York Times* which reads:

The government has set up a scientific brain trust headed by Lord Hankey to give the scientific workers of Britain more scope in inventive prosecution of the war and in countering the enemy's arms. Acknowledged leaders of various branches of science, whose appointment to the new scientific advisory committee was announced to-night, will form a central clearing house for new ideas.

Among the men on the committee are Sir William Bragg, member of wartime committees on food and fuel; Dr. Edward Victor Appleton, radio expert, who was called in by the government before the war to improve civil defense against bombers; Professor Archibald Vivian Hill, one of the world's foremost physiologists and a leading authority on aerodynamics and anti-aircraft defense.

From the public point of view the most immediate problem facing the new body is perfection of a weapon against night bombers.

An important job of the committee is to see that no new scientific or technical developments go neglected. Members will examine original ideas and pick out those they think can be used or developed after experiment. The members also will bring their individual and combined gifts to the services of their country.

A correspondent of the London *Times* writes under date of September 2 that the Canadian Government has announced the appointment of a committee of nine members which will administer the funds presented to patriotic citizens for assisting important technical projects and scientific investigations now being undertaken or proposed by the National Research Council with the object of increasing the efficiency of the Canadian war effort.

The chairman of the committee is Dean C. J. Mackenzie, acting president of the National Council, and the members include Sir Frederick Banting, J. S. Duncan (Deputy Minister for Air), Professor Otto Maass, head of the department of physical chemistry of McGill University, and Colonel Allen Magee, executive assistant to the Minister of National Defense. It is understood that the funds given or promised amount to nearly $1,000,000. The committee is empowered to coopt donors to serve as non-voting members.

DEDICATION OF THE NATURAL RESOURCES BUILDING AT THE UNIVERSITY OF ILLINOIS

ON the occasion of the dedication of the new Natural Resources Building of the University of Illinois on November 14 and 15, the Illinois Geological Survey of the State Department of Registration and Education, the Engineering Experiment Station of the University of Illinois and the Illinois Mineral Industries Committee extend an invitation to all the mineral industries of Illinois and of other states, and to all allied organizations, to join them in holding a mineral industries conference.

The official announcement points out that the com-