THE MICHIGAN TECHNIC

THE OFFICIAL PUBLICATION OF THE ALUMNI AND UNDERGRADUATES
OF THE COLLEGES OF ENGINEERING AND ARCHITECTURE
UNIVERSITY OF MICHIGAN.

VOLUME XXXX | MAY, 1927 | NUMBER 4

THE HUMANITIES IN ENGINEERING EDUCATION

By PROFESSOR J. RALEIGH NELSON

ONE of the rather surprising developments in the field of engineering education during the past decade is the insistence on the value of the Humanities in the preparation of the engineering student for his profession. In the evolution of engineering curricula there has been an increasing emphasis on those subjects which have cultural value, and which have no immediate or practical bearing on the training of the student for a particular task. This demand for humanistic elements in the scheme of engineering education is, of course, only the natural fruitage of a fine old tradition, which from the very beginning aimed to raise agriculture and the mechanic arts to the rank of the learned professions; but coming to a conscious expression as it has in the present generation, it finds a ready response from the students of engineering themselves. It seems likely to meet their restless impatience at the narrow limits of the specialized courses, and to provide them with new and larger freedom in the choice of the means of education. Certainly it is an influence to be reckoned with in the swift changes that seem likely in the near future to result in the re-vamping of the whole scheme of engineering education.

PROF. J. RALEIGH NELSON

Since the terms "Humanities" and "humanistic" are bandied about, even by educators, as cabalistic names to conjure with, and by students, naturally enough, are confused with "human," "humane," "humanitarian," and all the other derivatives of the Latin word "homo," it may be well to agree upon the fundamental idea involved in the use of these words to distinguish certain classes of subjects in the curriculum. Historically, when the educational system was simpler,—and perhaps more fundamental, and technical education had not been born,—the Humanities and Theology shared the field between them. Theology taught one his relations to God. In an age of theological controversy, these relations were quite complicated enough to provide a man a life task. The Humanities, by contrast, were all those subjects which helped a man sense his relation to the world of men, his place in history, his obligations and duties to those about him, and to enter, by the magic of his imagination, into all the rich inheritance that was his through the records of literature and art. They made it possible for him to stand up and face life with a consciousness that he was a member of society, and a citizen of the world.

One has only to listen in on the discussions of engineering educators anywhere, or to read the re-

ports of committees and boards of investigation, to note that in their insistence on the important function of the Humanities, they have more or less consciously in mind this original meaning of the word. Certain it is that the term is used constantly to distinguish those studies that are non-professional, and which will be a part of the developmental experience of the student, rather than a part of his training for a job,—studies which will give him judgment and taste, rather than skill.

The Committee on the Study of Engineering Education in our own college defined the cultural or humanistic studies as those "which will be designed to develop the student's capacity to understand life, broaden his outlook on life, and enrich his enjoyment of life, and which, when correlated with specialized training, will tend to make him more useful to society." The object of such studies is well stated by the same Committee in its report on the aims of Freshman Assembly:

"To show more clearly and convincingly the fundamental dependence of sound engineering upon science, the increasing importance of human relationships in engineering, and the high value of linguistic training, and thus to broaden and deepen the student's interest in the non-technical elements of his curriculum.

"To present to the student some of the important human problems of the past and of the present, as a means of cultivating intelligent interest in and ability to think on extra-engineering matters."

The term "Humanities" is used among engineering educators, then, to distinguish those studies which are non-technical and which serve to broaden and deepen a student's educational experience, and to develop his sense of relationship to mankind, at large, of "humanity" in its original meaning.

The present demand for more of the Humanities in engineering education, is simply one evidence of a swing back to fundamentals that is likely to produce revolutionary changes in engineering education in the immediate future. The original curriculum brought back from France in 1849 by Professor Greene of Rensselaer Polytechnic Institute, was a combination of the curricula of "L'Ecole Centrale des Arts et des Manufacteurs," and of "L'Ecole Polytechnique." One-half of it aimed to lay a foundation of fundamental science as a basis for all engineering, the other half to develop proficiency in some special line. The enormous expansion of science and industry which followed the close of the Civil War resulted in the rapid development of highly specialized fields of engineering, and in a consequent emphasis on specialization in engineering education. Whereas in 1870 a student could choose his course from Civil, Mechanical, or Mining Engineering, in 1926 he had "57 varieties" or more for his choice. Little wonder that the curricula of the engineering colleges had become congested and chaotic.

PROF. J. RALEIGH NELSON, head of the English Department in the College of Engineering, is the Chairman of the Committee on English of the Society for the Promotion of Engineering Education, and has given of his time and energy unstintingly for the cause of Engineering Education for over 20 years. We believe that Prof. Nelson has shown here the trend of the best and most advanced thought regarding the principles and ideas to be inculcated during the study for a Bachelor's Degree in Engineering.—The Editor.

Meanwhile, two new influences were gradually developing—the engineering profession, and the science of education,—which served to check this tendency to specialization. Both these influences made themselves felt in a demand for a fair and honest appraisal of the situation, and an accurate account of stock. An investigation was undertaken concurrently from three different points of view; the National Industrial Conference Board made its contribution by studying the problem of the relationship between Engineering Education and American Industry; the professional societies, guarding jealously the professional spirit that shall prevent their work from becoming a mere trade, have attempted to define the requirements for successful service to their profession. These two bodies have done much to clarify the understanding of what is wanted. Their agreement is no coincidence. American industry needs leaders; the profession of engineering needs leaders. The call is for men,—men with initiative, independence of judgment, personality, and power. And in response to this clear definition of the demand placed on the engineering colleges, the Society of the Promotion of Engineering Education, financed by the Carnegie Foundation, has inspired and directed the engineering colleges to study their own case with a view to perfecting the means for turning out the product that is called for. The reports of all these research programs give evidence of a reaction against the specialization which resulted from the phenomenal industrial development of this country.

The preliminary report of the Board of Investigation, of the Society for the Promotion of Engineering Education, is especially well worth study, since it represents the co-operative effort of one hundred and thirty-four engineering colleges to make an accurate appraisal of the present situation in Engineering Education. The conclusions set forth in this report are based on the opinions of

(Continued on page 22)

If you do not have a sense of humor it is hard for you to develop it; but you can develop an enjoyment of fun. Only a few of us are witty and humorous. We have to be born with it and we cannot much increase the amount. The majority of our friends do not possess a keen sense of humor; and indeed all that they want us to have is an enjoyment of fun. Our jokes, our puns, and our wit may be very crude and musty, but that does not matter if we enjoy ourselves with our friends and do our best to be cordially humorous. That much we all can do.

I suppose every one will grade himself A on sense of humor and fun. Only the most mournful of my friends will acknowledge that they have no sense of humor and, at that, they half suspect they are mistaken.

What is your grade?

How much do you do for your friends?

Do you perform little acts of thoughtfulness? Do you see that they have matches for their cigarettes, that the chair is comfortable, that they get the evening paper? Are you consciously thinking of doing little courteous things for them that take no time but nevertheless show that you are thinking about them? Particularly, do you laugh at the right time when they need the laugh to make them happy, and is the laugh a joyful chuckle or a strained "Ha! Ha!"? I know that the man who is thoughtful of me in little ways is inherently unselfish, and I like that kind of person. So do you!

In developing a pleasing personality, it is of more importance to try to do little things for people than great monumental things. It is sometimes better to remember to ask a friend about his family than to give him a thousand dollars.

Where do you grade yourself on courteous thoughtfulness about the little comforts of your friends?

Are you a forceful, vigorous person or are you a dead one?

We like people who do things, who have convincingness, who hold their own in an argument without temper, whom we can depend upon to do things for us. We do not like ineffective people, without convictions, who speak slowly, dully, and monotonously; who will not argue, or if they do, get mad; who can be depended upon for nothing. How strong are your convictions? Do people listen when you talk? Do your friends ask your advice because they respect it?

What is your grade?

In closing may I repeat that a pleasing personality can be developed, in part, by attention to the following rules:

1. Like people; don't be a critic.
2. Let your friends do their fair share of the talking.
3. Enjoy fun even if you can't be a wit.
4. Be courteously thoughtful of the little comforts of your friends.
5. Develop convictions and get action.

ENGINEERING EDUCATION

(Continued from page 6)

hundreds of engineering teachers, of nearly a thousand prominent practicing engineers, and of more than six thousand alumni of the engineering colleges. It is, therefore, a fairly representative concensus of opinion of engineering educators and practitioners generally. It is animated by a more conscious professional ideal than any previous report of its kind. It emphasizes the unity and integral character of the engineering course, conceiving of it as an educational experience which aims to develop the student as a man of intelligence and resource, rather than to train him for a narrow specialty. But most notably, it demands a broader, more fundamental, more liberal, and more humanistic curriculum. It is agreed that there should be a core of fundamental studies occupying two-thirds of the course, leaving only one-third for specialization. It is also insisted that cultural or humanistic studies be an integral and essential part of this core of fundamentals. Approximately fifty-seven per cent of the replies favor giving the Humanities this recognition.

The subjects suggested as especially fitted to enrich the engineering curricula by their cultural content, are as follows:

Literature, History, Modern Languages, Psychology, Economics, Philosophy, Political Science, Art, Biology, and Geology.

It is interesting to note that in the list of non-engineering subjects fundamental to all engineering curricula, 95.5 per cent favor English Composition, 73.5 per cent English Speech, 45.5 per cent English Literature. This actually places English second to Mathematics and Physics only, as an essential element in the education of an engineer. The social and economic content of the engineering curriculum also receives a new emphasis. General Economics, Engineering Economics, Political Science, General History, History of Political Institutions, and cognate subjects, are suggested as valuable for this purpose by a large number of the replies to the questionnaire. The following sentences quoted from the report indicate the point of view of those who stress the importance of these subjects:

"There are two fairly distinct objectives to be kept in view; the first is the understanding of social institutions, and of the broad interplay of social forces; it is essentially philosophic and lies mainly within the educational office of the social scientist. The second is the capacity to deal with specific economic problems and social situations arising within

the realm of engineering, and this is a responsibility of engineering educators."

"The development of greater social insight and a larger sense of social responsibility should be a definite objective of the engineering profession, if it is to gain recognition for more than its technical proficiency."

"These considerations lend a high importance to the social sciences as an essential part of engineering education. These subjects should be taught by competent exponents, and primarily for cultural rather than for technical ends."

"Adequate and sustained emphasis should be given to the bearings of engineering on the broader problems of society, and to the social responsibilities of the engineering profession. The aim should be to indoctrinate the student with a sense of social obligation which will survive pre-occupation of technical detail in his early experience, and determine his attitude in the more responsible years of his maturity."

The report lays great emphasis on the progressive sequence of the sciences and related engineering subjects. It insists also, on a co-ordinated, progressive sequence of cultural subject,—"a band of humanistic subjects extending throughout the curriculum." Sixty per cent of the replies express the belief that the cultural subjects should be required throughout the four years. Many point out that these subjects are apt to be of greater interest and value to the student in the later years of his course, than in his thoughtless freshman year.

One sentence in this report is especially significant of the degree to which the humanistic idea has come to penetrate the whole field of engineering education, the ideal of making a man fit to serve his profession intelligently, and to live in his world with satisfaction to himself and profit to others. It is this:

"Given a proper choice of subject matter and activity, reinforced by the incentive of purpose, the inspiration of professional ideals and the effect of a professional objective in bringing the entire process to a focus, the result of engineering education should be a sound, general development, worthy to be compared with the result of any other collegiate program."

The increasing recognition of the value of the "Humanities" in the education of young men for the profession of engineering has met with a ready response from the students themselves. Engineering students have for a long time felt that they were being forced to prepare for specific tasks, when they needed, somehow, to be given the intelligence, judgment, resourcefulness, originality, initiative, which would fit them to meet situations and solve problems which no college faculty could possibly forecast. They have been conscious, too, of their need of the liberalizing effect of non-technical studies. They have appreciated their need for interests outside their technical field, in order to balance the narrowing effect of their professional work in the long stretch of years before them.

Whatever revision or reorganization of the curriculum shall result from this new emphasis on the more professional ideal of educating men, rather than training workmen, the students of engineering will welcome the opportunity for a larger range of choice in their studies,—this, in itself, a liberalizing experience,—and will feel that at last they are to have the richer and more stimulating educational experience which they have long desired.

—o—

THE COOLIDGE TUBE

(Continued from page 9)

by the rheostats in the filament circuit. At 100 KV a temperature of 132° C. was reached by the hottest part of the window, with 0.7 ma., in five seconds; at 200 KV the same temperature was reached with 0.6 ma., in five seconds; 340° C. was reached with 200KV and 1.3 ma. in ten seconds.

Inside the tube the cathode rays approach the window in a conical beam. Some scattering in this beam takes place in the window and then a great deal more on the outside.

Some experimenting has been done with this tube by its developers. A short summary of the results are now given.

Of twenty-four diamonds subjected to 200,000 volt cathode rays all but two stones showed blue fluorescence, one of these showed green and the other yellow fluorescence. None of these showed appreciable phosphorescence. Not one of the diamonds showed any color change.

Fused quartz showed a purple color which disappeared completely on heating before a Bunsen burner. On again raying the surface the purple coloration returns with perfect duplication of original pattern.

By fracturing the disc and then raying the fragments, it was shown that the inhomogeneity extended throughout the mass and is in no way connected with grinding and polishing operations.

Quartz crystals from several different sources have been rayed and the only ones showing any color change are those from Herkimer County, N. Y., and these turned brown.

Calcite crystals, upon being rayed, fluoresce strongly in the orange and remain highly luminous for several hours after raying. In addition to this they may show bright bluish-white scintillations. These have been observed while the crystal is undergoing bombardment and for as long as a minute after raying. By slightly scratching the