Science and Engineering

Engineering

L. A. HAWKINS, at the annual convention of the National Electric Light Association:

I shall waste no time in demonstrating the relationship between science and engineering which is implied in the title of this paper. That engineering springs from scientific discovery, even as the oak from the acorn, would be easy to demonstrate, but I am sure the proof before this audience would be superfluous.

No other great industry has so explicitly recognized its indebtedness to science as has the electrical industry in its selection of its nomenclature. The electrical engineer in his daily speech pays constant tribute to those humble and widely scattered workers in science who laid the foundations of his art. When he expresses in words the most fundamental of electrical relations, he commemorates the achievements of the French Ampere, the Italian Volta, and the German Ohm. When he deals with alternating current circuits, with inductance and capacity, he pays oral homage to the great American pioneer, Joseph Henry, and to the English Faraday, the greatest of them all. In the names of his magnetic units he has recognized the contributions of Gauss in Germany, Oersted in Denmark, and Maxwell in England.

Such recognition is indeed fitting. The great electrical industry had its origin in the patient experiments conducted by these pioneers in their small and ill-equipped early laboratories.

With the work of Maxwell and Hertz in the '80's, more than forty years ago, which developed and demonstrated the electromagnetic theory, and showed that light, radiant heat and electricity are identical in nature, differing only in wave length, the physics of electricity seemed complete. It seemed probable that all the great discoveries had been made. The electrical industry had begun, basing its engineering on existing scientific knowledge, and on that original basis it has developed for the ensuing forty years, finding it a wholly adequate foundation for its tremendous growth. In the development of some of the devices now utilizing electric power, such as X-ray and radio tubes, new physical principles were involved, but the generation, transmission and distribution of electrical energy are still resting solely on the physics of Maxwell's day.

Does this mean that since then there have been no important advances in physical science? Quite the contrary. I think all physicists will agree that more important physical discoveries have been made in the past generation than in all the previous history of the human race. "Revolution" is a word much overworked by advertisers, but it is literally descriptive of what has happened to physics in the past thirty-two years. The most firmly established truths of thirty-two years ago have been overthrown or profoundly altered. Things which then definitely were accepted as forever unknowable have had their true nature revealed and have become the foundations of our new knowledge.

A generation ago science accepted the boundaries of our stellar universe in the direction of the infinitely great, and the boundaries of the atom in the direction of the infinitely small, as permanent limits to human knowledge. Today astronomers know that our universe with all its millions of stars is only one of myriad similar universes separated from us and from each other by inconceivable distances measurable only in millions of light years, while physicists know that the atom is a miniature planetary system composed of electrons moving at enormous velocities in tiny orbits around a central positive nucleus.

Thirty-two years ago among the basic principles of science were the conservation of matter and energy, the immutability of the elements, the wave theory of radiant energy, the indivisibility of the atom, and the universality of the Newtonian dynamics. All of these principles have been greatly modified or definitely overthrown. Matter and energy are not separate entities, each fixed in amount through eternity. On the contrary, what we call matter may radiate itself away in the form of energy, and probably in the last analysis matter and energy are one.

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A recent investigation shows that girls of practically all ages spend more time than boys in reading books for amusement.

Government's Need of Science

Sociology

DEXTER S. KIMBALL, before the annual meeting of the American Engineering Council:

Autocratic government orders things much more efficiently because it can call to its aid, if it will, the special skill and knowledge necessary for the solution of these problems. But it is better to be poorly self-governed than it is to be well governed in an arbitrary manner. The outstanding problem of democracy therefore is to call to its aid the groups of specially trained men who can assist in these matters. At the present time the tendency in government appears to be toward government by special interests or "Blocs." Thus we hear much of the organized farmers, the merchants' bureaus, the lumber interests, the bankers, and so on. The influence of these groups, it is true, is indirect, but it is often effective. Thus at the present moment a congressional committee is holding hearings on tax reduction surrounded by groups of appellants, each clamoring for relief from taxation for the bloc it represents. The committee sitting like a jury will endeavor to evaluate the evidence and decide what to do. May Heaven help them and send them wisdom, for theirs is a difficult situation. Trying a man for murder is a much simpler jury affair.

Perhaps the most disheartening aspect of the situation is the widespread indifference of people at large to these changed conditions. The average citizen is pleased to enjoy the comforts of life that modern methods have brought to him, but apparently does not give much thought to the difficult social and economic changes that appear to be inseparably connected with the production of these comforts. Or if he belongs to the older school of thought he deplores the decadent age and mourns for the "good old days" that existed somewhere in the dim past, just where, no one knows.

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