The active life of the temperate zone with its comforts and abundant food supply produces the tallest statures.

The greatest extremes of small stature are found among the Negrillos of Central Africa and the Aymaras of Central South America, in the jungles of excessive heat and poor food supply. Next to these come the Eskimos, Lapps and Siberians, with ice and excessive cold and poor food supply. On the other hand, the littoral and southern Baltic regions in Europe, the western part of Asia, eastern Africa, and the plains and pampas of the Americas with their active life, abundant food supply and temperate climate produce the tallest statures.

Certain stocks may move into areas for which they are not fitted and remain for a time, and such conditions exist throughout the world to-day where recent movements of peoples have taken place, but ultimately there is a survival of the stock best fitted for the environment, and the unfitted stocks disappear by amalgamation, eradication or dispersal.

Sea areas and probably sea food have an influence in reducing stature. The present Mediterranean peoples and the primordial British have small statures and so does Japan, yet they came from taller continental stocks. The Central Americans and Fuegians are smaller than the continental peoples near-by. The Malays and southern Asiatics are smaller than the peoples of the interior of the continent. Other instances might be cited.

There is some evidence that the seaboard statures of the United States are less than those of the interior, but other factors enter here.

Looked at in its broadest sense, environment molds the individual, selection retains the fittest under different environments, and heredity carries on the results.

R. BENNETT BEAN

THE FUNCTIONS OF SECTION M—ENGINEERING[1]

FROM time to time during the ages of his development man has accidentally discovered or invented various devices and processes that have enabled him to raise himself above the level of the rest of the animal kingdom, to better cope with the forces of nature and to adapt himself to his environment. With slowly accumulated experience he improved and developed these devices and processes until they came into general use among his fellows. Each forward step in man's ascent has been thus marked by some epoch-making discovery that expanded his power and improved his status. Doubtless from the beginning some men more than their fellows were endowed with powers of observation, deduction and ingenuity, and it is to them that the real progress of the race has been due. To such men various types of construction work were intrusted, and their experience and knowledge were passed on from generation to generation by a kind of apprenticeship and by word of mouth. Master craftsmen were thus developed who possessed some knowledge of materials and the design and construction of structures. It was from such ancestors that the modern engineer sprang.

Naturally with advancing knowledge of science, the work of the engineer—as the master craftsman came to be called—was profoundly affected. The uncertainties of his work were reduced and gradually analytical methods with reliable scientific data replaced the method of trial and error, although, alas! the latter is still employed in an altogether unjustifiable degree by engineers and by many industries. Frequently in the solution of an industrial problem it is necessary to guess because of the indeterminate nature of the problem. If one continues to guess as the problem recurs, it indicates a low order of intelligence and foresight among those who are responsible for the answer.

As a class engineers are now more concerned with the adaptation of existing knowledge to their needs than with the extension of knowledge. Occasionally their needs are such that they are, perforce, led to explore somewhat the boundaries between the known and the unknown, but they are generally content if this process develops empirical relations that satisfy for the moment their peculiar requirements or if some difficulty in design or operation is temporarily met. While for a time empirical methods may be sufficient, sooner or later every engineer and every industry will recognize the necessity for precise knowledge of processes and materials and for exact methods of analysis that can only be supplied through the aid of the fundamental sciences. No industry can feel secure until it is fully aware of the scientific basis of its various activities. Accretions to knowledge result from scientific research and developments in industry follow the adaptation of such knowledge through industrial research. Upon the combined result of scientific and industrial research depends the progress of civilization and the improvement of man's status.

Until recently men responsible for the design and construction of structures and for the control of industry were trained as apprentices and their effectiveness depended upon their natural adaptability for such work and their practical experience. The devel-

[1] Address of the vice-president and chairman of the Section of Engineering, American Association for the Advancement of Science, Nashville, December, 1927.

opment of scientific and technical education has, however, greatly modified the training of such men and it has increased their efficiency. The advancement of science has been so rapid during recent years that now even the best product of a technical school is only moderately well equipped to avail himself of the latest achievements of physicists, chemists and other specialists in the fundamental sciences. More and more the engineer must work in close cooperation with those concerned with these sciences, and, for certain classes of work, his own training will need to be greatly modified and expanded.

The dawning of a professional consciousness among American engineers dates from the organization of the American Society of Civil Engineers in 1852. This society was designed as a medium for enlarging the acquaintanceship among engineers and for the interchange of professional knowledge and experience. In 1852 there were few men other than civil engineers and military engineers who were engaged in activities of an engineering nature. There were millwrights, the antecedents of the mechanical engineer, who were versed in the installation and utilization of machinery, but a class consciousness among such men that would raise them above the level of the artisan had not yet developed. The rapid expansion of knowledge of the physical sciences and of industry that began in the latter half of the nineteenth century, increased the need for men competent to meet the expanding problems of industry and so specialized the work of the engineer that various divisions of the profession soon came to be recognized. It was inevitable that such specialization would develop a need for the organization of additional societies designed to promote the interests of these newer divisions of engineering and of the men concerned with them. Thus, the American Institute of Mining Engineers, whose name was recently changed to the American Institute of Mining and Metallurgical Engineers, was organized in 1871, the American Society of Mechanical Engineers in 1880, and the American Institute of Electrical Engineers in 1884. While these four organizations, which have come to be called the "founder societies," have taken leadership among engineering organizations, it is interesting to note that one society, the Western Society of Engineers, was organized in 1860, soon after the founding of the American Society of Civil Engineers. With the continued and rapidly increasing knowledge of science and its applications to the engineering industries, there has been during the present century a tremendous expansion in the number of specialized national engineering organizations, such as the American Society of Refrigerating Engineers, the American Society of Heating and Ventilating Engineers and the Institute of Radio Engineers and of local clubs and societies until there are now, I am told, over six hundred engineering societies of all kinds in the United States.

In 1874, Articles of Incorporation of the American Association for the Advancement of Science were granted by the commonwealth of Massachusetts. The purpose of the association, as defined by the constitution adopted on December 29, 1919, is "to promote intercourse among those who are cultivating science in different parts of America, to cooperate with other scientific societies and institutions, to give a stronger and more general impulse and more systematic direction to scientific research and to procure for the labors of scientific men increased facilities and a wider usefulness." In 1881 the association organized Section D, to promote interest in mechanical science; in 1885 the name of this section was changed to Mechanical Science and Engineering; in 1912 the section name was again changed to Section D (Engineering), and in 1919, when the new constitution was adopted, the old section became known as Section M (Engineering).

The functions of Section M have never been clearly defined. Presumably it was organized to promote the knowledge of engineering and to advance the interests of engineers, thus placing engineering in a class with those sections of the association that represent the fundamental sciences. Engineering, however, can not be classed as a fundamental science, although it is concerned with the application of such sciences to the constructive and industrial arts. It has often been characterized as an applied science, although the term would seem to be a misnomer, for there is no other science than pure science.

The manner in which the section can promote effectively the interests of engineers is by no means clear. When one considers the infinite variety of engineering associations that already exist it seems unlikely that Section M will function effectively if it is simply one of over six hundred engineering societies, each having very much the same aims. The mechanical engineer will pledge his allegiance to one or more national and local associations that are devoted to the particular interests, and especially to the technique, of his own profession; and so with the adherents of each of the other divisions of engineering. No profit will accrue from the continued multiplication of engineering associations; in fact, engineers generally recognize that the profession has already gone too far in the organization of national professional societies and that it would be a very great advantage to them if the number of such organizations could be greatly reduced. Apparently Section M has generally been considered as simply a non-specialized technical society with functions similar to those of any other engineering society. So long as this conception of the purposes of the section exists it is inconceivable that it will occupy a position of any importance in the minds of engineers. Unless, therefore, its characteristics can be so modified that it occupies a place among its sister organizations that is unique, it has no justification for continued existence.

As has already been explained, the engineer is concerned with the adaptation of existing knowledge to the needs of the constructive arts; while the fundamental scientist is concerned with the advancement of learning through scientific research, and is rarely interested in the practical application of the results of his work. Because of the nature of their professional duties very few engineers find the time or the opportunity to keep abreast of the advances in abstract knowledge after the completion of their formal training, and, as a consequence, they are unacquainted with, if not positively indifferent to, the newer developments in science that might revolutionize their own work if these developments could be quickly assimilated and adapted to use.

There is, then, an opportunity for Section M to occupy a place of peculiar usefulness as the common meeting ground of the creators of scientific knowledge and of those who adapt such knowledge to the use and benefit of mankind. I would, therefore, suggest that a serious effort be made to so modify the aims of the section that it will effectively promote the association of scientists and engineers, and enable the latter to voice his scientific needs and his achievements in adapting science to industry, and the former to attempt to forecast the possible practical applications of some new theory that has been recently developed or of a discovery which, if it can be made useful, will be revolutionary in its character. I recognize the difficulties that are inherent to this plan but I hope that they may be overcome. Under such an arrangement it would seem to me that the programs for the section meetings might very properly include papers presented by representatives of the different divisions of engineering that will present the latest applications of scientific knowledge in each of these divisions, and by the exponents of the fundamental sciences that will present and interpret the possible applications of the latest discoveries in the several sciences. The advantages of such programs would seem to be obvious for, as has already been explained, the older societies are generally more concerned with the technique of engineering than with its theoretical or fundamental scientific basis.

In addition to programs for the meetings of Section M, such as I have just described, it would seem desirable that the American Association for the Advancement of Science foster the publication of a journal that will endeavor to present in a popular form the latest scientific data and discoveries with suggestions of their possible applications, so that engineers and those who are responsible for the management of our industries may more quickly than formerly have access to and utilize such information.

If, therefore, Section M can in some manner establish a bond of interest and sympathy between engineers and scientists so that the former will become more scientific and the latter more practical, the future of the section will become secure.

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EUGENE ALLEN SMITH

EUGENE ALLEN SMITH became State geologist of Alabama on April 18, 1873, and served continuously in that capacity until his death on September 7, of this year, or more than fifty-four years' service. Michael Tuomey was the first State geologist, appointed to the place when the State Legislature of 1847–48 created the department, with final approval on January 4, 1848. However, from the results accomplished by the Smith survey, it would seem that Eugene Allen Smith was also the Geological Survey of Alabama. He did not write all its reports, but he certainly dominated the entire program and policy of the survey. He published some very long and detailed accounts of Alabama's natural resources, to which almost all of his writings were confined, but most of his contributions were in the form of short and concise accounts, rather than exhaustive monographs. Furthermore, his writings cover a wide variety of subjects from the oldest rocks in the crystalline area to the recent sands at the seashore; from the metals to clays and sulphur; from agriculture to gold mining. In addition to his writings which found their way into print, he must have issued thousands of volumes in the form of letters and reports. No matter how unimportant the sample or the inquiry, it was his habit of sending back a courteous and complete reply. The office is filled with a tremendous mass of correspondence, including many volumes of copies made by presses in the days before carbon paper and the typewriter.

Eugene Allen Smith was born at Washington, Autauga County, Alabama, October 27, 1841, the son of Samuel Parrish and Adelaide Julia (Allen) Smith. On his mother's side his ancestry is traceable back to Governor William Bradford through Allyns, Phelps, Bishop, Fitch, Walcott and others. He attended the private school at Prattville and entered the public schools of Philadelphia at the age of 11. His work in the Philadelphia schools was a great inspiration to him, and in his own words: "I read