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Science and Engineering

The national debate about U.S. science and technology, although triggered by self-doubts caused by falling productivity and an increasingly adverse balance of trade, may have some lasting positive results. In his column in this space, Branscomb* discussed the need for a national commitment to excellence in science. I would like to discuss the need for a national commitment to closer ties between science and engineering.

If science is defined as the systematic knowledge of the physical world, then engineering may be defined as the knowledge of how to apply science for the use of mankind. It follows that engineering cannot exist without science and, conversely, that science supported with public funds must be mindful of the needs of engineering. In the past, engineering has drawn heavily on the physical sciences; for example, integrated circuits and computers have benefited greatly from solid-state physics and mathematics. It seems inevitable that new branches of engineering will emerge based on pioneering work in fields ranging from microbiology to geology.

There are historical, cultural, and other differences between scientists and engineers. Scientists commonly cooperate as individuals on a worldwide scale. Engineers tend to work more in teams within the same organization. A scientist is honored by having a natural phenomenon named after him. An engineer is promoted to head his team or company. Scientists publish, engineers patent their results. Relatively more scientists than engineers work in universities, perform research, and are supported with public funds.

Nevertheless, such distinctions are becoming blurred; engineers are publishing their results and scientists are patenting new organisms. I would like to see a conscious effort to forge a closer alliance between scientists and engineers. This would be in the national interest and should take place at different organizational levels. Mutual understanding and cooperation can be fostered either informally, by joint meetings and activities and overlapping individual memberships, or more formally, by written agreements and joint organizations. For example, the National Science Foundation could provide the focus for engineering that it already provides for science. Alternatively, this focus could be provided by a National Engineering Foundation closely connected to the NSF by interlocking directorates (that is, boards of directors with overlapping memberships).

On 13 December 1979, the engineering societies formed an umbrella organization called the American Association of Engineering Societies (AAES), which could in time develop joint activities with the AAAS. There is already cooperation between the Engineering Manpower Commission and the Scientific Manpower Commission, and there is a semiautonomous Engineers' and Scientists' Joint Committee on Pensions, for which AAES supplies the secretariat. Several engineering societies have followed the lead of the AAAS and established Congressional Fellowships. The annual analysis of the federal R & D budget by the AAAS was performed last year with the participation of other scientific and engineering societies.

These cooperative endeavors are excellent, but are still few and far between. Science and engineering play different but interlocking roles, both geared to improving the quality of life. A high-priority objective for both scientists and engineers should be that of improving the understanding of science and engineering by corporation boards and company management as well as by government agencies and offices. This can be achieved by educating those already in place, by increasing the number of scientists and engineers in decision-making positions, and by placing more emphasis on science and engineering in high school and college, where minimal standards of technical literacy should be required of all who aspire to graduate. These are goals to which all scientific and technical societies can dedicate themselves.—LEO YOUNG, *President, Institute of Electrical and Electronics Engineers, Inc., New York 10017*

*Lewis M. Branscomb, *Science*, 8 August 1980, p. 641.