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Decline in Industrial Engineering

As president of a university with a school of engineering and as a director of large manufacturing corporations, I am more and more convinced that the steady decline of some of our major industries, such as steel, automobiles, energy, and mass transportation, is closely related to our lack of competitiveness in engineering in these fields.

Excessively high wages, union work rules, and unreasonable government regulations are usually offered as reasons for the difficulties of these industries. I argue that the quality of management and the quality of engineering are at the root of some of our most serious problems, at least in the crucial fields mentioned above. An excessive proportion of executives are products of business schools and are not technically oriented, and an excessive proportion of our engineers are inadequately trained.

These inadequacies in training begin in our high schools, where the teaching of mathematics and physical sciences is degenerating. Low salaries and low prestige are driving qualified teachers, particularly science teachers, into other fields.

In West Germany, France, Switzerland, Japan, and the Soviet Union, students typically arrive at engineering schools with a solid background in advanced calculus and theoretical physics. They usually have 7 years of postsecondary education before being hired by industry. In the United States, students are hired after only 4 years of college, the first year of which is often remedial, to make up for the deficiencies of our secondary school system. This provides at best only 2 years of training for engineering.

The appetite of industry for engineers at present is such that there is relatively little financial reward in spending a fifth year getting a master's degree or going on to a Ph.D. in engineering. As a consequence, industry receives few people with an advanced education in engineering and the supply of faculty for engineering schools is becoming more and more precarious. While a great deal of educational effort is expended by companies to train recently graduated engineers for their first job, this does not make up for the fact that continuing education for engineers is primitive as compared, for example, to the postgraduate education that hospitals, universities, and medical associations provide for health professionals.

The effects of these shortcomings are already visible. Our nuclear plants are poorly designed, and it is in large part because of this (not just regulatory changes) that there are more and more expensive change-orders. Because relatively little attention has been paid in this country to the probes upon which the cybernetic systems in the steel industry should be based, steel companies are arranging for Japanese engineers to install the process controls that they have been unable to plan internally. Domestic companies seem incapable of engineering such relatively simple projects as subway cars; both New York and San Francisco have selected French cars for their systems. Foreign automobiles, particularly Japanese ones, are preferred by a large part of our population, on the basis not of price but of better design.

At the same time, an Administration that wants to "reindustrialize America" and "rearm America" is eliminating all funds for engineering education and most funds for science education from the budget of the National Science Foundation. The small instrumentation program launched by the Department of Defense and the modest gift program from industry made possible by the new tax laws are not satisfactory substitutes.

We need to restructure our secondary school science curriculum and make it possible to support engineering schools for a fifth year of training. We need support for training and salary supplementation for mathematics and physics teachers in high schools. We need equipment for both high schools and schools of engineering. Only a massive effort to improve science education in our high schools and engineering education in our universities can keep our young people competitive with young engineers in other advanced industrialized nations.—JEAN MAYER, *President, Tufts University, Medford, Massachusetts 02155*