4 October 1985, Volume 230, Number 4721

SCIENCE



# The Status of Engineering

The public is much more aware of scientists and science than of engineers and the pervasive role that engineering plays in society. Indeed, society as a whole has little appreciation of the nature of the changes in engineering or the rapidity with which they are occurring.

The media rarely present the scope of engineering and show little interest in the men and women who make engineering their profession. The result is that members of the public know very little about engineering systems although they interact daily with them. A further result is that the public has little appreciation for the engineers who design, produce, or maintain complex systems or how engineering touches every facet of their lives. The public generally is not aware that the interests of engineers lie in efficiency, usefulness, and low-risk industrial processes, plants, and devices.

Does this difference in public awareness matter? In the short run perhaps not, but in the long run very definitely yes, for two reasons. First, society rewards those who are appreciated and well known; the rewards attract talented people who better society as a whole. Only if engineering attracts talented individuals will our modern life be sustained. The second reason is that an informed public will make better decisions in this technological society.

Turn now to the premise that the nature of the changes in engineering is not well understood. At the turn of the century, electronics, plastics, computers, and flight were undiscovered. As a result, student engineers learned how to cast iron in foundries, operate a steam engine, use test machines, build roads, and not much else.

The rapid emergence of complex systems in the 20th century is the major difference between engineering before 1900 and in 1985. An automobile is a relatively simple system but complex enough to illustrate the point. The automobile now is a system of engineering systems, including electrical, hydraulic, mechanical, thermodynamic, and computer systems, all of which must function well at the turn of a key. Engineers today must be well enough informed to apply new materials, new devices (such as computers, robots, and "expert systems"), and new tools (lasers, optical devices, and chemicals) to systems.

We sense that the rate of change in engineering will increase. In recent decades, science through new discoveries has served as a major force driving the changes in engineering. In the future, the new sciences of information processing and biotechnology will bring further changes to engineering. But the force exerting the greatest pressure in the present is the urgent need to increase national productivity. A renewed emphasis on engineering is the only way to increase productivity, and nothing less than the future of the nation depends on how well engineering meets the challenge.

The media can help by approaching the engineering future in two ways: by presenting to the public basic information on the realities of complex systems and then by exploring the possible and probable impact of engineering research and development on these systems.

Educational institutions can help now and in the future through new approaches to engineering. In most colleges and universities, engineering is still very disciplinary in character and exhibits little interplay with science. The workplace, where engineering is critical to corporate progress, now needs engineers with a broad view of systems, technology, and science.

Engineering draws heavily on new science. A fruitful marriage of new science and engineering brought the success of the allies in World War II and the emergence of postwar Japan. Since the United States has no monopoly on scientific or engineering brainpower, we are in peril if we turn our backs and fail to give equal encouragement, support, and recognition to engineering and science.—D. KENNETH BAKER, *President, Harvey Mudd College, Claremont, California 91711*