

LETTERS

Princeton, N. J.

EDITOR:

To one engineer who has worked most of his professional life in civilian industry, the April issue of *E&S* was most stimulating. It appeared that a three-way debate was taking place between Professors Sabersky and Corcoran and Dr. DuBridge.

Professor Sabersky lucidly expounded a problem of great concern to many practicing engineers: How, if at all, will future engineers be trained? Professor Corcoran seemed to provide an answer to kindling the imagination and mobilizing the fervor of the engineering recruit. President DuBridge eloquently pleaded the case of the private institution seeking non-government funds.

Professor Sabersky's question—"Who Will Take the Lead in Engineering Education?"—had been answered for me earlier this year by other members of the engineering faculty—not Caltech. During an informal quest for engineering graduates at all degree levels to work in industrial R&D, I was made to understand that the search would be more productive elsewhere. The Institute has trained many brilliant "engineers" in the past several decades. A very large number—possibly a majority—have gone either into teaching or into the aerospace industry. This perhaps because they hoped not to be confronted with urgent, unstructured, technical problems relevant to human needs.

Why then should I respond, or urge my business associates to respond, to President DuBridge's plea? The plain fact is that the largest share of the Institute's recent product has gone onto the federal payroll, directly or indirectly. If we believe Professor Sabersky, this was a tacit choice by the faculty and administration. Why then should they not encourage the government to foot the bill? My interests and those of my associates are centered on civilian economic and social needs as they can be served by a basic mechanical industry. What connection has the Institute's research and edu-

ational activities with these interests?

But technologists *are* being trained and some do find their proper place as engineers in civilian industry. The adjustment is traumatic to some. Others come eagerly after learning elsewhere that they are engineers after all, not physicists or mathematicians. In the end most find satisfying and rewarding professional careers. Perhaps a goal of engineering educators should be to help such individuals find their careers sooner and less painfully. Another goal might be to diminish the ranks of those trained in physics and math but who are not able to contribute in those disciplines and who instead spend sterile careers rehashing the work of the Maxwells and Von Kármáns.

Obviously these problems are recognized by Professors Sabersky and Corcoran. Indeed, they have approaches to solutions in mind. But will their colleagues and their administration join and support them in selecting and training young men to respect and assist the practicing engineer in his struggle to find solutions to massive civil problems which face us here on earth?

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A reply from Frederick Lindvall, chairman of the division of engineering and applied science.

The spectrum of activities in the total engineering function is very broad, and no single pattern of engineering education can be expected to give adequate coverage. Diversity within a given school, if size permits, and diversity among schools reflecting their internal and external environment and resources is an existing, developing pattern. The Engineers' Council for Professional Development recognizes in its accrediting process the concept of differences with certain minimum standards of basic and engineering sciences. Emphasis in most engineering curricula is on the funda-

mentals which will not be made obsolete by advances in technology.

A second trend is the recognition of the fact that graduate study is an essential part of professional preparation. Caltech was one of the pioneer schools in the development of such education. Research is a necessary ingredient of graduate education, and we have sought to have our research as well as course work compatible with and drawing strength from our resources in the science divisions. Our research and teaching thus tend to focus on fundamental problems in new technology and future trends as we can discern them and on unsolved problems which may exist in established technologies and applications.

Financial support of our engineering research, including facilities and support of the students, is greatly in excess of Caltech's internal resources for this purpose. External contract support has made possible the present level of research. With very minor exception, federal agencies have been the source of funding. The research proposals are generated by our faculty for investigations of their choice. However, in engineering particularly, the work undertaken has some relevance to the mission of the granting agency and does not necessarily relate directly to engineering R&D interests of a large part of private industry. A subtle bias may thus have been created which tends to influence students toward those industries which are doing engineering and R&D similar in kind to that of the student's academic research.

We believe that we should have a better balance of research support coming from the private and the public sectors. Yet, over the years, we have found it very difficult to get private industrial research grants under terms compatible with normal academic policies of publication and freedom of discussion. We would welcome greater industrial support for research and fellowships to build a better "image" of engineering in industry generally.