

The Assumptions of the ASEE Interim Goals Report

In this day of ever-accelerated acquisition of knowledge, surely no one can complain about suggestions that engineering students be required to take more time for study and in particular that they spend five years instead of four for the basic degree. It is the way in which the five years is to be spent which is open to criticism, and the way specified in the Interim Report of the ASEE Goals Committee is based on an assumption of profound importance, an assumption which is certainly open to challenge. That assumption is that the various branches of engineering are coming together and that there is no need to specialize in the first five years.

There are several ramifications of this basic assumption, as follows:

1. There is enough material common to all fields of engineering without any specialization to occupy productively five years of study.

2. There is no further need of specialists trained to one level (a nonresearch level), a need which is now filled by our B.S. men in, for example, chemical engineering.

3. Three additional years (certainly no one would contemplate a total educational period beyond eight years) is sufficient to train a specialist, *a specialist of the highest competency*.

All these ramifications are open to serious criticism.

The first is, perhaps, least objectionable; yet it has many disadvantages. Presumably, all engineers would study elementary subject matter in all existing important fields. This is simply wasteful. The fact that various disciplines exist cannot be denied, and it is certainly wasteful for one who contemplates work in the electrical industries to study heat and mass transfer. It is equally wasteful for a prospective engineer in the chemical industries to study solid state physics. I do not mean to imply that such studies would not be valuable, but there are many other valuable subjects which are now excluded.

The second ramification is simply absurd, it seems to me. There is an enormous amount of work to be done

in the field of engineering which requires no research ability or training. Those jobs having to do with production problems, management, sales, and some of those pertaining to development are not concerned with research. Furthermore, the need is for engineers of a specific discipline, for example electrical engineers, not for generalists without any field of special competence. If an electrical manufacturer requires knowledge of chemical problems, he now can hire a chemical engineer; he does not have to look around for an electrical engineer who took a couple of courses in the chemical field. What is so bad about this? Will the manufacturer be any better off with a generalist who does not know either electrical or chemical problems very well?

The third ramification, indeed the whole basic assumption, is in crashing disagreement with the simplest facts. The trend in all fields of knowledge is to more and more specialization. This trend has been described by Rose and Marier^{*} in terms of triangles. In the past there was a series of broad triangles which overlapped at their bases, representing low peaks of specialization and overlapping of generalizations at the bottom. Now we have a series of tall triangles with no overlapping, representing the higher peaks of specialization and the separation at the bases of elementary material. This may be an unhappy trend, even a wrong trend, but it is the trend. If we want to train excellent, progressive engineers to the peak of specialization, it is necessary to start early. This observation is not meant as a criticism of the increasing importance of interdisciplinary endeavors. Such ventures are to be commended, but surely they cannot replace existing disciplines. The one essential of an effective interdisciplinary program, which many people seem to forget, is excellent individual disciplinary programs.

It seems to me that we should all critically examine these three assumptions. If they are valid one really cannot object to the recommendations of the Goals Committee. If they are wrong, then we should let ourselves be heard. The gratuitous remark of the report that "The task of educators is not to resist the changes that will inevitably occur ..." is meaningless except as a blood-pressure elevator; if the basic assumptions are wrong, the task of educators is to resist with all their powers.

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^{*} Dyson Rose and John Marier, "Is a Great Tradition Eroding?" *Saturday Review* (Sept. 2, 1967).