

## You Can't Put Tail-fins on Data

One hears a great deal these days to the effect that we should have more scientists and engineers; that we should have more technical education; that we should go all-out with "crash programs," "beefed-up" curricula, and so on to solve the acute shortage. Well, it may be so. This observer certainly will agree that we need more *first-class* scientists and engineers just as we need more *first-class* lawyers, doctors, statesmen, and everyone else. The greater need, however, is for a better educated, more discerning public at large, a citizenry capable of distinguishing truth from error and fact from fancy. Since such discernment is the essence of science, it might be that our greatest contribution to the grave problems of our time would be more scientific education, and not necessarily more scientists.

This suggestion is made not because scientific education is necessarily applicable to the broader problems of life but rather because such education is strict, difficult, disciplined, and thorough—adjectives which do not exactly describe most of the group-oriented "togetherness" which passes for education these days. Certainly most of our students are capable of a lot more advanced work than they are now given. Certainly they could profit by the study of a field of knowledge in which orderly thinking is of paramount importance. And they could gain thereby some capacity for critical judgment, which would be most useful in ordinary life.

A properly taught course in almost any field of science could arouse in the high school student

1. A respect for critical inquiry. Science, and particularly natural science, began with asking questions about the world around us. Evoking a questioning attitude in students should be one of the first aims of a teacher. It is this aspect of science which leads, particularly in physical science and engineering, to the statement of a problem. It is this which can lead a neophyte to a concentration of his thinking and to a critical examination of the questions he is asking. A good student may soon learn that his questions are outpacing his capacity to find answers; there we have the beginnings of a specialist.
2. A sense of order. Nearly every branch of science and engineering stresses classification. When the

natural world is explored, points of sameness and points of difference appear. These, too, can help a student with concentration of his thinking.

3. A respect for demonstrable truths. In science everything is capable of independent experimental verification. The chemistry laboratory is particularly suited for this. The idea that substances gain weight on combustion is not inherent in our natures. It can, however, be proved incontrovertibly in a simple experiment, and this could be used as a basis for explanations to the student that such proof is possible for every idea and concept in science.
4. A healthy skepticism. Once the questions are asked, skepticism about the answers follows. Physics and chemistry are full of erroneous starts which were corrected only by doubters. The caloric theory of heat and the phlogiston theory of combustion are typical. The student may even learn to question what he sees on the TV screen.
5. A sense of self-criticism and responsibility. The scientific worker poses a problem, devises a way to make measurements, observes the data, and reports his results. This is done quietly and without fanfare and with the full knowledge that some skeptical readers will probably doubt his conclusions. The scientist knows that he cannot dress up the data with tail-fins, he cannot obscure the issue by sheer lung power, and he cannot lure the skeptic into acquiescence by the soft sell, the hard sell, or even beautiful girls.

Acquaintance with such a branch of knowledge through reading scientific books and papers is certain to influence favorably the maturing process of a student. It is, of course, true that the problems of life are vastly more difficult than the special problems of science and engineering. But life can very probably be met more successfully through the aid of the scientific approach, with its free inquiry, orderliness, skepticism, and responsibility. Perhaps all our high school students should have some experience with it.

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