Letters

Research at the Grass Roots?

In the past year or so, most scientists have become aware of the declining percentages of young people who enter the fields of science and science teaching. Most articles decry the decline in physics, chemistry, and mathematics students, but the number of students entering the life sciences and even the number of applicants to medical schools also are declining. Clearly, young people are taking a dim view of both basic and applied sciences as a career.

Many diagnoses and correctives have been suggested. Some of these are stopgap, emergency solutions that give no assurance of changing the fundamental public attitudes from which this problem arises. It is plain that the solution depends on the average man's developing an understanding and appreciation of, and therefore, an interest in the importance and value of science to him personally. So far, no successful way of achieving this objective has been reported.

It might help us approach this problem if we recall that people could not always be divided into scientists and nonscientists, as at present. In the early days of modern science, scientists were generally part-time, amateurs. Many earned their living as druggists, physicians, engineers, teachers, or farmers, in daily contact with their fellow-citizens. Many lived in small communities and no doubt performed many of their leisure-time experiments before the very eyes of their friends and neighbors. Pasteur's famous anthrax experiment took place at the edge of town before a group of curious villagers in the year 1881. Franklin's famous kite experiment also comes to mind. In those times scientists were not full-time specialists working with gadgets, instruments, and ideas totally alien to the everyday experience of their neighbors and associates.

Early scientists performed valuable fundamental research with the crude (but adequate) instruments that they could build personally or afford to buy. There were few scientific books and publications. Library needs were simple. Thus, research was possible at almost any place. As science has developed since then, research has become centralized in our universities, in government and industrial laboratories, and in a few institutes generally located in large cities. Science has become the full-time work of a relatively few specialists working in comparative isolation from the rest of society. This historical change, plus the official secrecy surrounding atomic and other military science, has isolated scientists and their work from the day to day experience of the nonscientist.

But much valuable research still is done with simple, inexpensive instruments. One way of restoring public understanding of, and interest in, science would be to decentralize scientific research so that the average citizen would once again have personal contact with it as he did in earlier times. Modest research centers could be developed in our high schools and perhaps in some of our small-town hospitals as well. Science can be returned to the grass roots. With present-day communication and transportation facilities, no high school or hospital in the United States is more than a few hours from a university or other research center, which could provide the library and other technical support and guidance necessary to develop such a program. Funds from local or national foundations interested in fostering science could yield tremendous dividends in public interest and support, not to mention the direct discoveries that would also result.

If we hope to get and maintain the interest of good science teachers in the future, we must give them a chance to participate in research, as this plan would do. Anyone today who has the desire and the energy to master a science well enough to teach it is not likely to be satisfied to teach for long, unless he also has a chance to participate in the pleasures and stimulation of research. We know that this is true of university science teachers. Who would attempt to staff a university science department where no research was possible? Why should we imagine that the dreams and aspirations of high-school teachers are different? Likewise, if science is to have intelligent public support it must operate in a "glass house."

Warren Weaver has recently stated, "many would treat scientists one-third of the time as amusing but beneficial eccentrics, one-third of the time as sorcerers, and one-third of the time as irresponsible rascals" [*Science* **122,** 1258 (1955)].

Most scientists will agree that this is a fair description of the attitude of the general public. How then can science hope to attract enough young people unless a way is found to change this public myth? Clearly, science cannot compete with business in terms of money or power, or with most other professions in terms of security. If science is to receive its proper share of the best young minds, its special challenges and pleasures must be made known to the public generally in such a way that a scientific career receives careful consideration by every bright high-school student.

The quality of research shown at science fairs indicates that many high-school teachers and students have the ability to do first-class research. If these teachers could have the necessary financial and scientific support, not only would some valuable discoveries result, but, more important, millions of youngsters and through them millions of parents would get firsthand knowledge of science at the workbench. They would be able to experience science, and not just read or hear about it. Can anyone doubt that this would make a difference in the public attitude toward science? Science fairs and exhibits can never be a substitute for personal experience.

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IGY in Denmark

While I was writing my tenth article on the International Geophysical Year and going on to my *n*th article on the shortage of scientists in Denmark, it struck me that the IGY might be used to stimulate interest in science, and that carefully planned information on Danish participation in the IGY program might interest some youngsters in choosing science as a career.

I went to my chief editor, Mogens Aller of the Aller Press, Ltd. (publishers of weeklies and magazines), and asked him to give me a free hand to act on the behalf of the Aller Press. I was allowed to dispose of "a couple of thousand dol-