

These are amongst the top 10 with large laboratories for research and of course there are a number of others. It is pointed out that these are simply examples of university response to national needs.

Of course the universities had to educate and they had to provide these facilities for extended research, and, it followed that this was also the stimulus for enriching teaching, and for expanding the areas of teaching. For instance in 1945, there probably was not an engineer in the world who knew what nuclear energy was. This is 1964, 20 years later, and we will have in use at the end of this year one million kilowatts of atomic-power-generating-capacity, pouring its electricity onto the lines of the utilities, and by 1970 it is said we will have five million, projected. In addition we also have the atom-powered Navy !

There is not a senior engineer who carried this out who was educated for it. Think of the educational problem involved. When the General told you of the startling progress and the brief period for the doubling of knowledge, he automatically inferred that the lifetime of a practicing scientist-engineer is at least 40 years. But look back 40 years. What was he taught? He never heard about the revolutionary new field of molecular biology as an example. He was not really acquainted with the relationship and properties of atoms and molecules except in a very theoretical sort of way. Today there is no such thing as a scientist who does not take due cognizance of such basic knowledge.

Well, then, the educational institutions had a problem. We will leave it at that. They responded ably. The present development, since we are asked to talk about the present state of science, is that they have a further responsibility that has not yet been suitably discharged, --and that is postdoctoral education. This means that our existing crop of Ph. D. 's--and I am sure there are many in this audience--as educated today, are going to be unable to deal with the advanced problems of 5 years from now--certainly not even for 10 years from now.

It was Dr. Eugene Vigner, the famous physicist from Princeton, who, in his annual address I believe, in 1947, /if my memory is right/ before the annual meeting of the American Association for the Advancement of Science, said, in effect, "Gentlemen, this is a revolution in our knowledge." Remember now, the atomic bomb had burst, and atomic energy was out in the open for all to see from the Smythe report, and so he could talk about it. He said,