

Looking Ahead . . .

By Frederick Seitz

WE celebrate the 25th Anniversary of the American Institute of Physics. The occasion is a notable one not only to those of us who have been active professionally during most or all of the past 25 years but also to those who begin their professional careers with the knowledge that physics is well established in our country. The Institute itself is not remarkable in the material sense. Its capital is small; its holdings in real estate are not impressive. Many of its most significant activities are routine. It is important because it symbolizes the collective unity of a group of individuals who occupy an exceptional position in the nation.

We may observe that American physics was already quite mature when Karl Compton and his associates decided that the Institute should be formed. It was clear to them in 1931 that our profession was a field of great cultural interest whose applications to modern society could be enormous. The new stature had been guaranteed during World War I when the value of physics and physicists in ordnance and communications became evident. By 1931 the internal structure of our field showed enough differentiation that an additional organization, somewhat more general than the American Physical Society, was needed to unify it.

Even though American physics had outgrown swaddling clothes in 1931, it requires no great perception to realize that the professional life of the physicist has altered since. In a sense the change is marked by substantial loss of the daily tranquility and the individual independence which characterized the professional life of that time. The reasons for these alterations are related to profound changes in the status of the profession within our country. Since the changes of the recent past imply continuing changes for the future, we may attempt to analyze their sources and project them into the future.

There is no doubt that fundamental research, which underlies the position of physics in society at present, has grown enormously in the United States during the last 25 years. Yet, in the main, the growth is of a quantitative rather than a qualitative nature. The principal qualitative change involves increased emphasis on team work. This shift in emphasis is the result both

of attitudes acquired during wartime research and of the large-scale programs made possible since by governmental support of science. By 1931 several American physicists had been awarded Nobel prizes. Although the number is about four times larger at the present time it is important to observe that the soil was very well nurtured by 1931. The critical period for the establishment of fundamental physics in our country was nearer 1901 than 1931.

Soon after 1931, a large number of European physicists transferred their professional attachments and their loyalty to the United States, enriching our community in an important way. Yet I believe that close analysis will show that this transfer is not the principal source of the great change which has occurred within the last 25 years. The influence of the new citizens resembled somewhat the effect of an important vitamin upon a living organism, in contrast with the effect of caloric foods. It is worth noting that among the eleven living Americans who have won Nobel prizes in physics, all but two received their basic training in American institutions.

The great change is not primarily related to a new role of physics in industry. For example, physics was well established in the electrical industry by 1931.

It is also clear that the change is not related to a new role of physics as an elementary science, or as a source of instruments and standards for other professional fields. The good elementary course in physics for chemists, engineers, or medical students of 1931 is not basically different from the good course of today. The Bureau of Standards was completely mature by 1931.

It is clear that the really great change in our profession lies in its new relation to governmental affairs, for it has received almost official recognition as a field of paramount importance to modern government. We may rightfully assume a degree of satisfaction and pride in this development, since all of us have worked directly or otherwise to attain it. There is no more appropriate form of pride than that based on the knowledge that one has been able to serve his country well in both peace and war.

Our professional relationship with the government in-

volves two general roles. First, we have the responsibility for spending governmental funds in promotion of pure and applied research. This role has had a far-reaching effect on research by promoting team work, as well as increasing individual scientific effort. Second, many physicists have become involved in a highly critical way in the determination of policy on matters of great public interest. The second role represents an exceedingly significant innovation and has entailed the greatest change in the status of physicists in the nation.

Whether we like it or not the newly established relationship is here to stay in some form as long as the fate of our country hinges in a critical way upon physical matters and upon the peculiar form of logical thinking which belongs to the professional physicist.

I believe that the great changes which will come to our profession in the next 25 years will center about adjustment to this relationship. Our role is so new and the traditions governing it so poorly formulated at best that at least another generation will pass before we will regard the service as a natural one.

This does not say that other aspects of physics will remain unaltered. We can expect continued fruitful research of the most basic type and an increase in the team effort which has characterized physics since 1940. Indeed, the rapidly expanding journals indicate the trend of events very clearly. Similarly we can expect continued expansion of physics in the applied research laboratory and in the classroom. These changes, however, will probably continue to be as much quantitative as qualitative in nature. Matters affecting our relation to our government may yet require far more major adjustments.

In order to achieve the desired equilibrium in his new relationship with the government it is very important that the responsible physicist consciously adopts attitudes that are somewhat different from those he normally uses in his profession. This is true, above all, when the physicist becomes involved in the determination of national policy. All scientific professions operate somewhat in the manner of oligarchies. The opinions of a few outstanding individuals are usually valued far more than the opinions of the many. A scientific profession tends to be divided into major schools of thought, one of which may exercise enormous authority at least for a time. We know from experience that this is not necessarily a bad thing for science since it concentrates attention on special issues. If a major school of opinion commits a major error no great damage is done. At worst an important discovery will be delayed. Another school, perhaps less esteemed initially, will bring greater glory to itself by the discovery. The corresponding practice in matters relating to governmental trust obviously can result in great disaster. The judgments of physicists holding governmental trusts may prove wrong on occasion. However, such judgments have not resulted in national disaster because a balance between differing opinions was always attained before national policy was established. We must make certain that we continue to use the authority given to us in a



Frederick Seitz, Research Professor in the Physics of Solids at the University of Illinois, has been Chairman of the Board of Governors of the American Institute of Physics since 1954. (Laura Gilpin photo)

way which maintains this record. Our advisory boards and committees must contain full representation of important dissenting opinions on all matters which affect our national fate in an essential way.

It is hardly necessary to add that we must also adjust our activities relating to governmental affairs so that we do not jeopardize the core of our own professional life. We can serve our government and our profession but we cannot regard the first type of service as a substitute for the second and still survive as a scientific profession. Our contribution to the government must be regarded as a special form of responsibility to society made obligatory by circumstances.

To view the matter in reverse, it is also clear that the institutions of government must attain increased balance in relations affecting scientists who cooperate with government. The writer is one of those who has noted with alarm the serious harm committed to a distinguished physicist, who has served his country loyally and well in its hour of need, by a special interpretation of security rules. Security measures remain indispensable in this imperfect world. Their application must be tempered, however, by clear recognition of the rights and dignity of the individual. Let us hope that this case, and those like it which have received less attention, will prove to mark the turning point toward the establishment of more satisfactory relations.