THE NEW RESPONSIBILITIES OF PHYSICISTS

By H. D. Smyth

UNTIL the Second World War, physics belonged to the physicists. Discussions, disagreements, and debates about experiments or theories in physics were carried on within a small group of highly trained men. This happy situation ended in 1940. It has probably ended permanently. The developments of nuclear science and of electronics have brought physics and physicists into a new place in our society and in our Government. To understand clearly the complexities of our present position let me recall, by way of contrast, a scientific controversy of the 1920's.

In the spring of 1923 Arthur Compton reported at the Washington meeting of this Society on the measurement of wavelengths of scattered x-rays. In May of that year he published a paper suggesting the recoil of the scattered electron as an explanation for the loss of energy from the incident radiation. In the subsequent year and a half other experts in the field of x-rays at first were unable to verify Compton's experimental measurements and unwilling to accept his theory. A genuine scientific controversy developed. Nobody questioned the integrity or motivation of the men involved. Nevertheless, there was violent disagreement and disbelief between the two sides.

Professor Duane was probably the leading opponent of Compton's views. I remember his report at the Washington meeting of December 1924. After some earlier papers from other sources indicating experimental evidence for the Compton effect, Professor Duane in discussion not only accepted their results, but said that one of his students was about to present a paper which he felt gave even more conclusive proof of the existence of the Compton effect. So far as I know, this paper ended the controversy.

I remember this controversy very clearly because it seemed to me to be in the best tradition of science. First, there was an apparent difference in observation and a real difference in interpretation. There was vigorous argument and detailed criticism, but the means were at hand to settle the argument and when further experimental refinements were introduced, there remained no basis for an honest difference of opinion. The controversy ended without rancor or suspicion.

So far as I know, this issue was raised, debated and settled within the small community of physicists of the period. It had no immediate effect on our military strength or on our political policy. No pressures were brought to bear on either side other than the pressure of scientific tradition to ascertain the truth. I fear such a controversy could hardly be so simply and satisfactorily settled today.

The problems and conclusions of physics are no longer of interest only to the scientists. To be sure, some of us are still working on the frontier of science, on the fundamental particles and the laws that govern their behavior. At the moment this area appears to have no immediate application but our experience has shown that the gap between pure science and military technology is vanishing. The contribution that physics made to World War II has created an entirely new situation.

The number of people in the profession has multiplied at least five-fold. The intimate personal relationship which used to exist among physicists has largely disappeared.

Many members of the profession are now engaged in secret work, a fact which creates a host of new difficulties for physicists. Today most research in physics in this country is supported directly or indirectly by the Federal Government. One reason for this is the great increase in the size of installations necessary for this research and their resultant increase in cost. One consequence of this situation is a much greater emphasis on cooperative research. Another is the necessity of greater organization and red tape.

Many of the younger people in the profession have never known the kind of freedom that existed in science in the earlier period.

Much of our work is concerned with problems of military technology. Results obtained in physics laboratories have a profound effect on our whole military situation and are consequently of great political and international importance.

Not only has the relation of physics to the outside world changed, but that world itself has changed profoundly. This country faces a totally new situation. For the first time in our history we are confronted by a potential enemy of massive military strength. We are confronted by an enemy whose standards and beliefs are totally different from ours, and whose attitude toward the western world is hostile.

Besides the dangers of direct attack, we know that we face real internal dangers of espionage and sabotage. We must assume that there are among us unscrupulous and disloyal men whose allegiance is not to this Government or to its ideals. The very fact that science has now given us weapons of incredible power makes this internal danger more serious than it might otherwise be.

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We have need for men of level heads and cool judgment, as well as for men of skilled technical knowledge. Today Government must continually have the advice of physicists; political and military problems must continually be considered in the light of scientific advances. A new relationship between military and political leaders on the one hand, and scientists on the other, has emerged. It is essential that this new relationship be understood.

We must remind military and political leaders that the strength of science is based on freedom of inquiry, freedom of discussion, and freedom of dissent. We must not allow one group of scientists to be set against another in the public mind for reasons of personal advantage to one faction or another in or out of the Government. Such misrepresentations can result only in great harm to science itself, to scientists, and to the country. Scientists must continue to be used as essential advisers to all branches of the military establishment, even if their views are occasionally unpopular.

Physicists must never forget where the strength of their profession lies. We must retain our absolute loyalty to honesty and truth. We must also exercise a certain humility, and show a willingness to accept different points of view. We must continually urge a careful and objective evaluation of all relevant data in matters where we are asked for advice.

At the same time we must also remember that we will have to participate in decisions involving many factors that cannot be evaluated scientifically. In contributing to such decisions physicists must collaborate with political and military leaders who have different backgrounds and points of view. Here again a certain humility is to be recommended.

Decisions even on technical questions must sometimes be made before relevant experiments are completed. In the development of new weapons speed may be of such obvious importance that the procedures of rational peacetime development have to be scrapped. Occasionally scientists are called upon to make predictions on the basis of data too scanty to support logical analysis.

Besides these changes in the direct professional responsibilities which a physicist must carry, there are a number of new problems which demand even greater poise and tolerance on our part. Most of us now are working for the United States Government. This means that we are associated with a large and incredibly complex organization. We often appear to be serving many masters. Through all the irritations that arise from such a situation we must remember that we are serving only one master, the Government of the United States and the cause of freedom for which it stands.

More specifically, we must recognize the new prominence of physics has brought a number of inconveniences and dangers. There is a tendency in this country to believe that a man who has made a striking success in his own specialty is automatically a sage whose wisdom can illuminate any problem. Surely physicists ought not to be so naive as to accept this principle.

Finally, there is the question of secrecy and the so-called security system which is supposed to protect it. There is a certain type of mind that revels in secrecy and conspiracy. Such minds are not likely to be attracted by the pursuit of physics. By and large, physicists dislike secrecy and everything that goes with it. It is antithetical to the fundamental tenets of science to which we all subscribe. I would go farther and say it is contrary to the fundamental principles on which our western society is based. Nevertheless, we know that today secrecy is necessary, that some degree of secrecy about our technical advances must be accepted in order that we may be sure to preserve our freedom. In considering the system of clearances, the criteria of classification and all the other paraphernalia set up to maintain secrecy, we must recognize the novelty and difficulty of the situation in which this country finds itself. We must be patient with the inevitable clumsiness of our attempts to meet this situation. Secrecy is a necessary evil. While we recognize the need of secrecy, we must continually work to reduce the evil it brings with it.

I have reviewed some of the changes that have occurred in the last fifteen years in the position of physics in this country. They do not dismay me. Certainly our adjustment to new conditions has not been perfect. Military men, civilians in the Government, and physicists themselves have contributed their share of stupidities and mistakes in meeting these new situations. Reactions have ranged from hysterical fear of the end of the world to the naive belief that physics and physicists should return to the splendid isolation of thirty years ago. Vanity, ambition, and animosity have been occasionally displayed, by physicists as well as by others. Yet I think, by and large, it is amazing that the new partnership between science, the military, and the civilian branches of the Government continues to be so fruitful. The over-all loyalty, honesty, and intelligence of the men concerned have been amply demonstrated.

We need to make the partnership better. More directly than ever before we are working for this country and its ideals. There has been recent talk of reluctance by scientists to work for the Government. In individual cases where a man finds that circumstances prevent his being effective then a scientist, like any other Government servant, can and should resign. That does not mean his usefulness to the country need come to an end. The problems facing our profession are great, but patience, courage, and common sense will solve them.

If physicists have new responsibilities we also have new opportunities. Thirty years ago we devoted our minds to the enlargement of knowledge with all the integrity and imagination that we could muster. It was a noble pursuit, fitting for free men in a free world. We must continue it. But now we have the opportunity to devote our skills and knowledge to a larger ideal. The honesty and clarity of mind that made science great are needed to preserve and extend human freedom.