STATESMANSHIP in SCIENCE

The following article is based on an address presented on September 29, 1960, at the ceremony for the award to K. K. Darrow of the Karl Taylor Compton Medal for Statesmanship in Physics. The Medal was presented by the American Institute of Physics during its annual Assembly of Society Officers and Meeting of the AIP Corporate Associates, which was held at Arden House in Harriman, N. Y.

By **Richard H. Bolt**

WHEN asked to define or discuss something, we tend to start with several examples. When asked to speak about statesmanship in science, I find it difficult to get beyond the first example. To me, statesmanship in science is that quality that was possessed, in abundance, by K. T. Compton. I am tempted to recount those attributes and attitudes that characterized his distinguished career of service to science and to society. But K. T. would want us to take another direction, I am sure. He would want us to look not to the past but to the future.

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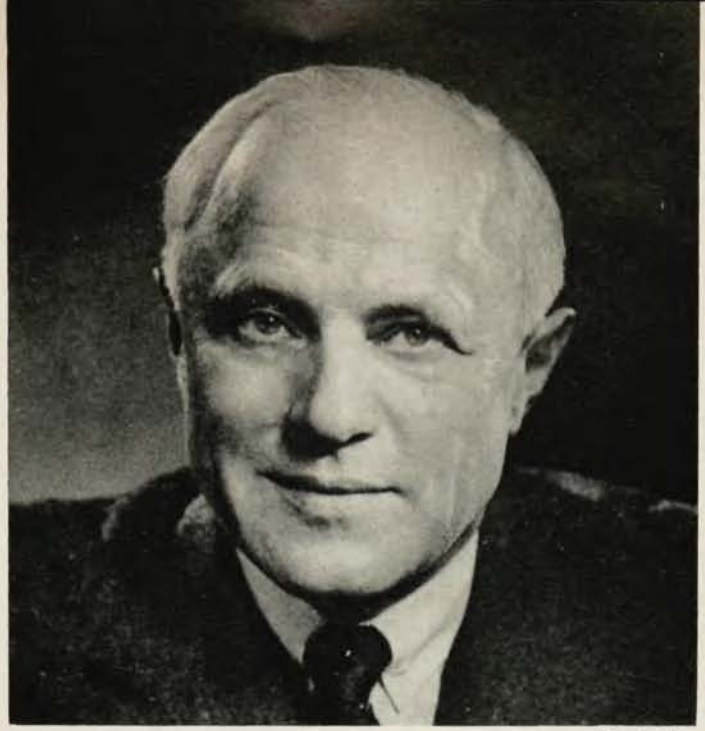
What, then, are the challenges of the future? What are the public issues, national and international, that can be resolved only in the light of a thorough understanding of the contributions of science to the social, economic, and political problems of our time? What qualities of leadership will these issues demand? In brief, what is the need for statesmanship in science?

Science was once something that few people did, that required little in the way of resources, and that most people scarcely noticed if, in fact, they knew it existed. Earliest science commenced when prehistoric man contemplated and sought to understand nature. Classical science started when the Greeks, Egyptians, and Babylonians introduced quantative descriptions of nature. Modern science began when Galileo and Newton and other renaissance philosophers conceived and tested basic generalizations regarding natural phenomena.

SCIENCE today may be said to have entered a fourth era. Science is now something that many people do, that requires much in the way of resources, and that most people notice. Now the needed resources for scientific research have increased from string and sealing wax and borrowed glassware to mile-scale accelerators and radio telescopes and launching sites. Now there are few people who are unaware of the existence of science and none who are totally unaffected by its consequences. Science has now shifted from being a relatively minor and long-range influence on civilization to being a major and immediate one.



Karsh photo

Karl Taylor Compton (1887–1954) was one of several dedicated physicists whose efforts led in 1931 to the founding of the American Institute of Physics, and during its first five years he served as the Institute's first chairman. In 1957, the AIP established the Karl Taylor Compton Medal in memory of his distinguished career as physicist and statesman of science.

With this shift has come a new kind of responsibility of scientists. Their only responsibility before was to pursue the search for objective, verifiable knowledge regarding nature. Now things are different, and, as far as one can tell, they are going to stay different. The public has seen that science can lead to cures for disease, to innovation in military defense, to supplementation of diminishing natural resources—to technological "miracles" that have vastly increased man's physical capabilities. One must expect, therefore, that society will increasingly hold scientists responsible for the solution of its critical problems and for the betterment of life.

In another way, too, science is now a public affair. In addition to its promise of utility, science can now absorb a significant proportion of public resources. The full support of proposed scientific endeavors exceeds the capabilities of private or incidental funding. In our society, the allocation of public resources among competing demands is subject to scrutiny and decision by the citizens and their representatives in government.

The key point is that science has shifted from its traditional state, in which its external interactions were small and its needs for support could be met in full with hardly a dent on the national economy, to its present state in which its interaction with society is complex and multiple and its needs for support are comparable with those of other major national activities. Now the public wants to be assured that its investment in science is sound and is in proper proportion to other uses of its funds. The public also wants to be assured that it receives and will continue to receive all possible benefits from its investment in science. Scientists, likewise, want certain assurances. They want to conduct research in their accustomed way, without externally imposed constraints, without diversion from the time-tested procedures by which they select problems, decide how to study the problems, and report their findings to colleagues in order to obtain independent verification and acceptance.

I am referring specifically to basic research, to the pursuit of general scientific knowledge without regard to its possible applications. We must also view basic research within the total context of science and technology and related industrial and commercial activity. Achieving appropriate balance in this totality requires solutions to paramount questions of national goals and policies and of present and future allocation of national resources. Here are many challenges to statesmanship. Their wise solution will require the increasing attention of leaders in science as well as leaders in all other sectors of national life.

But here I want to emphasize that basic science by itself, excluding technological development, interacts with the public in two major ways. First, even a single instrument that is desired by scientists solely for basic research, as in high-energy physics or radio astronomy, can cost hundreds of millions of dollars; such numbers are not insignificant in the national budget process. Second, the public demands for progress in combating disease, in securing the national defense, and in advancing the general welfare place great pressures on scientists to do even more basic research, in some fields, than they have freely chosen to do.

These interactions are not simple. Let me give just one example. It is quite possible to expand basic research beyond its "free-choice" level at any given

The first award of the Compton Medal was made in 1957 to the late George B. Pegram (above). It was presented for the second time last fall to Karl K. Darrow (below).

time. One way is to divert suitably qualified research talent from other fields, and another way is to attract more students into the particular field. A scientist who has been thus diverted or a student who has been thus attracted may find himself working happily and productively in his new field. Now, has science been distorted? And what happens to the other fields, whether of science or of humanities, from which the intellectual talent has been drawn? These are grave questions, questions that call for a high order of statesmanship in science. Many such questions must be asked. Their resolution may affect profoundly the future pursuit of science and perhaps the course of civilization.

HOW will scientists respond to such challenges of this new era? They can avoid public action and leave to nonscientists many major decisions that surely will be made, for better or worse. Or, scientists can step forward, at this time of action, and bring to bear not only the authoritative knowledge of their scientific specialties, but also certain qualities and understandings that characterize scientific discipline.

Does the scientist indeed, by virtue of his particular traits and disciplining, possess any techniques, any modes of thought that are especially relevant to statesmanship? I believe that he does. By no means do I imply that the scientist has a corner on intellectual capacity or ingenuity or creativity, but rather that science has sharpened his capabilities in certain relevant ways. To say simply that he is objective, rigorous, and quantitative is to pass too lightly over an essential point; so let me develop this point in more detail.

The scientist is acutely aware of the importance of precise definitions and distinctions. Mass and weight are two different things, as are speed and velocity, theory and hypothesis, and so forth. Also he is used to dealing with probabilities and he knows the difference between "impossible" and "highly improbable". He knows that a "sure bet" is not necessarily a "certainty" in the probabilistic sense.

The mature scientist has also thought carefully about value judgments and their appropriateness in different situations. He knows that an observed datum is neither good nor bad in the ethical sense, that likes and dislikes have no place in determining which measurements to report. At the same time, he realizes that there are many ways to attack a problem and that he may prefer one approach while his colleague's taste may lead to a different but equally valid approach. Even more significantly, he recognizes that value judgments can and must be made in connection with the application of scientific knowledge to practical ends. But in dealing with questions of morality, although he may recognize more clearly than other citizens the possible consequences of a new technology, the scientist knows that an ethic is not derivable from a scientific fact.

Thus, in matters of precision, probability, and preference the scientist is peculiarly sensitive, because to be insensitive is to invite catastrophe in his scientific career.

Finally we ask: Will the addition of a scientific component in the arena of statesmanship *insure* a satisfactory resolution of the great issues of today? No. This is not a matter of certainty. This is a matter of faith. However, each research adventure in a new scientific problem is an act of faith—a faith that rigorous, scientific investigation will displace at least a small piece of ignorance. It is my deep conviction that the probability of achieving sound and desirable resolutions can and will be increased by the public service of competent scientists, who also possess and will develop the relevant qualities of leadership and judgment, and who will devote themselves, in the selfless tradition of K. T., to these issues of which we speak.