

the National Bureau of Standards

An invited address before the American Physical Society,
at the Shoreham Hotel, Washington, D. C., May 1, 1953

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SINCE THE TIME I was first asked to speak at this meeting of the American Physical Society, events have occurred that are of appreciable importance to the National Bureau of Standards. These events have been sufficiently well publicized that there is no need for me to specify them. Furthermore, committees of specialists have been or are being set up to resolve the basic issues of the controversy involving the Bureau and its directorship. Hence, I believe it to be inappropriate for me on this occasion to discuss the case except to convey appreciation to the members of the American Physical Society, and others, for their expressions of confidence and support. For these we are sincerely grateful.

Tonight I plan to speak as the Director of the National Bureau of Standards and attempt to explain why I and the other members of the organization believe in the Bureau and the importance of its operation to the national welfare and security.

The Bureau staff believes first of all in the importance of scientific research as a means of intellectual and spiritual advancement, as the foundation of our technological economy and high standard of living, and as the bulwark of our national security.

We believe in the teachings of Galileo that theory and hypothesis must conform to the results of experimentation and observation. We believe in the philosophy of Lord Kelvin that basic understanding in science depends on measurement—the reduction of observation to numbers. We believe further that the reduction of observation to meaningful numbers requires the development and maintenance of uniform standards for physical measurement, and that this need provides the first and primary reason for the Bureau's existence.

The development and maintenance of the standards for physical measurement, with the associated calibration procedures, are to us a challenging and dynamic activity. This standards work must not only keep abreast of the expansion of the frontiers of science, but in the older regions there is a continuing demand to increase the precision and reliability of measurement.

We believe that there is romance in precision measurement, and that ability to extend the absolute ac-

curacy of measurement by one decimal place frequently demands as much in ingenuity, perseverance, and analytical competence as does the discovery of a new principle or effect in science. We believe further that many of the important advances in science are possible only through the availability of instruments of high precision which enable the measurement of small differences or minute effects.

We stress reliability and accuracy in our operations and in checking and rechecking our results. In fact, an inadvertent error of 10 parts in a million (representing a whole wave length of light) in a length calibration made some months ago was a cause of grave concern to the Bureau's management, and there was no rest until the cause of the error was located and remedial action was taken to prevent a recurrence.

We stress objectivity and fairness in our operations and attempt to insure them by a willingness to accept the results of well-planned reproducible experiments and the logical conclusions therefrom. We follow as far as possible the established or clearly defined observational techniques and analytical procedures of science but welcome the opportunity to evaluate and accept new ideas and techniques. We believe that scientific conclusions should be made only by following such procedures. We believe further that complete freedom of inquiry in scientific investigation is essential to insure not only the soundness of a particular set of results or conclusions but also the development and healthy progress of science itself.

Related closely to this is our conviction that a substantial portion of the program of any sound scientific or technical laboratory should be devoted to fundamental or nonprogrammatic research. Such provisions afford an opportunity for the more imaginative scientists to explore freely ideas of their own choosing and help to provide vigor and strength to the entire laboratory.

We believe that communication between scientists, through discussions, meetings, and visits between laboratories, is essential to the development and evaluation of new ideas. For there is no ultimate authority or supreme court in science except that resulting from general acceptance through free interchange. The results of a particular experiment are not considered established unless they can be reproduced by other observers, in other laboratories, and with different equipment. The

Allen V. Astin was asked to give this address some months before his emergence as a controversial figure in the national scene. He spoke before an overflow audience at the banquet of the American Physical Society during its Spring Meeting in Washington, and upon the completion of his talk he was given a standing ovation. For the views of the APS, see p. 20.

conclusions of a theory or hypothesis are not considered valid until they survive the scrutiny and criticism of other analysts and/or conform to the results of experience.

Therefore, we believe that the broad dissemination and publication of the results of research investigations are essential to the healthy progress of science to be limited only by strict considerations of national security.

Because of the potential importance of the results of scientific work to the general public, we believe that scientists have a serious responsibility to interpret or to translate their major findings into terms that can be generally understood. In this connection, however, it is imperative that there be no compromise with accuracy since altering or blurring the facts in the interest of popularization would probably be worse than no popularization at all.

Hence, the Bureau, in rendering scientific and technical advisory services to other agencies of the government, particularly when the contacts in the other agencies are nontechnical people, has recognized its responsibility for evaluating the results of its findings in objective and nonambiguous terms.

In our advanced technological economy we believe that there are many ways in which a laboratory like the National Bureau of Standards can render valuable services to other agencies of the government. For example, we believe that appreciable savings in government procurement operations are possible through the intelligent use of technical purchase specifications and acceptance testing based on carefully planned laboratory investigations.

We believe that there are many areas in government operations where the application of modern technology can bring about substantial increases in operating efficiency. Electronic information processing machines afford a notable example.

We believe that the development of standard practices such as safety codes has resulted and will continue to result in substantial savings in human life, time, and money both within and out of the government. The development of such codes generally involves, however, extensive knowledge of the properties of materials, devices, and structures under a variety of environmental conditions.

We believe that in times of national emergency the facilities and resources of the National Bureau of Standards should be as far as possible placed at the disposal of those charged with the country's defense. This was in fact done during the two world wars. Even during peace time or periods of limited emergency there is an appreciable utilization of the Bureau's facilities by the defense agencies. Since World War II, and particularly since the Korean episode, these activities have grown substantially until now more than three-quarters of the Bureau's staff are working on problems for the Department of Defense. This means that the general character of the Bureau's work and the nature of its fiscal support are markedly different than they were 15 or 20 years ago. Whether or not this is a desirable

utilization of the National Bureau of Standards under the present conditions is undoubtedly a question which will be considered by one of the special study committees. We will welcome their recommendations and advice on this matter.

We believe that in order for the National Bureau of Standards to carry out its various functions and activities we must have an alert and competent staff, suitable equipment and facilities, and an environment favorable to scientific investigation and methodology. This environment or climate essentially means the provision of the opportunity to practice the beliefs I have been stating.

We believe that there should be suitable recognition and promotion of the more productive and creative scientists together with a careful weeding out of the non-productive. We believe that the highest positions in the civil service should be available to the most outstanding scientists and engineers, and that it should not be necessary to encumber them with administrative responsibilities in order to attain such positions. This principle is fortunately recognized by the Civil Service Commission.

We believe that we should bring in new blood by the recruitment and training of young scientists and by promoting them to more senior positions as rapidly as they develop and opportunities open. We further believe that education should not cease when an individual joins our staff, and we take pride in the graduate school that has been conducted by and for our employees for more than forty years.

We take pride in our many illustrious alumni now serving in responsible positions in industry and elsewhere in government, and we have reason to believe that they value the experience gained as members of the Bureau's staff.

We take pride in the concept of service, in providing assistance to science, to industry, and to government.

We believe in the dignity of the government service and further believe that the primary incentives and rewards of a civil service scientist are not financial but rather stem from the pride in organization and its functions and from the sense of satisfaction which comes from participating, even in small ways, in the solution of problems of national importance.

We believe also that for federal employees loyalty to our country includes, in addition to the more commonly accepted values, loyalty to the institution for which we work and for its traditions, and loyalty to the administration which shapes its policy.

These represent some of the tradition and creeds of the staff of the National Bureau of Standards. I hope thereby to have given you some impression of why the staff is so intensely loyal to the organization and our Country, and why the staff is so interested in the Bureau's future. We know that the Bureau's work is critical in the Nation's scientific and technological progress. Furthermore, we know that the opportunity to assist in attaining these goals affords a high degree of intellectual, moral, and spiritual satisfaction.