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## The Role of Scientific Instrumentation

To a large extent, American leadership in science has been based on the widespread availability of excellent instrumentation. In an earlier era, scientists could make fundamental discoveries with the equivalent of sealing wax and string. Today an occasional worthwhile observation is made with simple tools, but most significant advances depend on the application of complex instrumentation. In many instances appropriate devices make possible a tenfold or greater speed in data collection. In other instances sophisticated equipment permits measurements and experiments heretofore inaccessible. Current trends indicate that, in the future, leadership in science will be even more contingent on pioneering the use of new and increasingly powerful equipment. American scientists are fortunate in having the support of an innovative instrumentation industry that has been a by-product of federal support of research.

The grants system placed considerable sums of money at the disposal of a large number of investigators who were a good market for effective apparatus. Many small companies were organized to invent, develop, and manufacture new products. Some companies produced unneeded or shoddy goods, and they failed. Others built needed and excellent equipment that was crucial to the advancement of science. Academic and industrial research benefited alike, and a thriving export trade was established.

One can learn something about economic systems and about the role of instrumentation in science by considering the contrasting situation in Russia. Those who have visited Russian laboratories generally come away with a favorable impression of individual scientists, their interest in science, their willingness to work, their familiarity with the literature, and their eagerness to learn. Yet much of the Russian work seems pedestrian. In many areas the Russians are followers, not leaders, despite the fact that large staffs are active. The consensus of visitors is that a major Russian deficiency is in their equipment. The creative potential of many fine young people is lost, for they must devote their time to making routine observations that could be made much faster and more accurately with modern equipment. At some institutes one may observe individual pieces of apparatus that have been invented and built there. However, scientists at other institutes seem unable to benefit from the inventiveness of their countrymen, for in the U.S.S.R. there is no adequate scientific instrumentation industry. In Western Europe the situation is quite different. Many laboratories are well equipped, and they have available the back-up of inventive companies.

In view of the key role of instrumentation in the progress of science, policies with respect to allocation of federal funds have been shortsighted. Several years ago when the budgetary squeeze became severe, the National Science Foundation implemented a policy of favoring support for personnel over support for instrumentation. At the universities individual grantees followed the same practice. The fraction of funds devoted to instrumentation was not very large, so that their diversion did not help the employment situation very much. However, in the absence of adequate replacements and the purchase of new kinds of instruments, the quality of equipment at many universities has declined, and research is being hampered. The deficit in scientific equipment should be met, and federal authorities should establish a long-term policy of steady support for the procurement of instrumentation on a level that will guarantee continued American leadership in science.

—PHILIP H. ABELSON