

THE GOVERNMENTAL SCIENCE ADMINISTRATOR

By Frederick Seitz

The Start

LIKE so many other physicists, I emerged into the postwar climate of our country in the fall of 1945, having spent nearly six years on work that bordered more nearly on applied than pure science. The first part of the war had been devoted to ordnance and ballistics, the intermediate part to the development of radar components, such as diodes and oscilloscope screens, and the last part to the Plutonium Project at Chicago—all climaxed by a number of months as one of the scientific intelligence officers in SHAEF. With my colleagues at the Carnegie Institute of Technology, plans were laid for research in the coming period. We hoped that we could find the funds to match our dreams even modestly.

During the winter of 1945-46, I received a remarkable letter from Dr. Bruce Old, now at Arthur D. Little, then a Commander in the Navy. He stated that the Navy hoped to establish an agency which would support fundamental research in much the same way that NDRC had supported applied research during the war. Old had spent much of the war in naval programs related to ordnance and metallurgy and realized that our group at Carnegie Tech had considerable interest in the field of metal physics. Even when we granted its tentativeness, Bruce Old's proposal seemed somewhat preposterous to us, for it was hard to believe, after the lean years of the depression, that society would support basic science in peace time with anything like the spirit that it had supported military research during the war. It is true that there was much talk of establishing a national science foundation, but the controversy that broke out over patents and the like whenever the subject arose, made such a foundation seem a very long way off. Nevertheless, Old's letter turned out to provide a true augury of the future, for the new naval office was formed and the Navy did establish a contract along the lines proposed; in fact, I would not be sur-

prised if a descendant of that contract is still in effect at Carnegie Tech.

Other agencies soon followed the very fine pattern established by the Office of Naval Research. A simple estimate indicates that in the intervening fifteen years the United States Government has expended a sum in the billion-dollar range to support the most basic sciences. The precise amount depends somewhat upon the definitions of basic research used, since it is essentially impossible to draw a sharp line between basic and applied research.

The Matching of Money and Science

THE underlying principles involved in the assignment of government funds to basic research seem very simple. We have, on the one hand, money derived by our government from the great productive capacity of the nation; on the other, we have the well-established areas of science which are in a position to make an almost limitless contribution to the well-being of our society. It is only necessary to bring the two together in order to enrich our nation immeasurably. If done properly, the process represents a highly profitable investment of governmental funds. Actually, the problem of matching public money to science is not a trivial one. Much depends upon the intelligence and perceptiveness of those involved in the intermediate link. In brief, the effectiveness of the process of matching public funds to productive science depends in a critical way upon the abilities of a very small group of administrators whose importance is not discussed in an explicit way sufficiently often. The slender bridge between governmental funds and science which they represent is fully as important as either of the two units it connects. There is a great opportunity for catastrophe if the intermediate link proves faulty.

When Cyril Stanley Smith became a member of the General Advisory Committee of the Atomic Energy Commission at the end of the war and was asked what the AEC should do to stimulate the field now designated by the term "materials research" most effectively, he proposed the simple policy, "Make sure the good people in the field have whatever they need to do their work." This rule seems trivially simple to apply, but actually it is not. First, there is the problem of determining who the good people are and estimating their relative quality. Such decisions require very great judgment. It is not enough to ask each individual scientist or engineer to give his own opinion of his merit. Some scientists are far better than they think, whereas others are not quite as good. The scientific administrator in an agency must be capable of forming his own judgment by drawing on a variety of sources. Then there is the question of the supposed needs and whether they are genuine or not. The concept of need is highly subjective since it depends upon a proper evaluation of what the individual wants, and his area of study deserves, and what is generally good for the agency and the nation. Many good scientists need more in the way of money and facilities than they think they do. Others would definitely be harmed, or their field would be harmed, if they obtained as much as they think they should. In brief, the scientific administrator must try to direct the potential funds at his disposal in order to achieve a maximum benefit of a rather complex type.

An Elite Corps

WHEN viewed appropriately, the corps of scientific administrators, most of whom are centered in agencies in Washington, represent a highly elite and influential group. In many ways I believe that individually they are more important than all but the very best scientists whose work they support, both because their total number is very small and because individually they can have an enormous influence on the course of development of the entire country.

Thus far, over the past fifteen years, they have been far more successful than one might have hoped if one had attempted to judge the situation in 1946. Perhaps the traditions got off to a good start because many of those who were most prominent at the end of the war had done similar administrative work for military research during the war and, hence, had developed both profoundness and breadth of vision. It is highly important for the welfare of science, and, hence, of our nation that these traditions be maintained.

It is not at all obvious that the scientific administrators will always follow the right path. As the support for science derived from the government grows, the life or death influence which the administrators have over a given institution or geographical area becomes correspondingly large. It is my personal opinion at the present time that the question of maintaining the quality of scientific administration in the governmental agencies is fully as important for the future welfare of science



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as training in science in secondary schools and higher academic institutions. The judgment of the administrators will be reflected in our strength or weakness in a major way in the future.

Perhaps one might dramatize the situation by means of the following analysis. While riding in a plane recently, I attempted to list from memory all of the scientific administrators in the agencies with whom I have had association since 1945. Naturally, this association has mainly been with those concerned with the physical sciences, which, in fact, obtain a large fraction of the government money at the present time. My list contained about fifty names, most of which are very well known. Naturally, it started with Captain Conrad, Alan Waterman, Emanuel Piore, Randal Robertson, Tom Killian, and went on through individuals in the Atomic Energy Commission, the National Science Foundation, the Air Force Office of Scientific Research, and the Office of Ordnance Research (now the Army Office of Research). Since my memory is not the best and my own circle of acquaintance is naturally limited, I would estimate that the total number of influential scientific administrators has been in the neighborhood of several hundred in the last fifteen years, but is substantially less than five hundred. This relatively small family of individuals has directed the flow of several billion dollars. That is, on the average, each administrator has determined the fate of tens of millions of dollars. Moreover, the group has had a profound influence upon the ebb and flow of scientists throughout the various scientific laboratories in the country and upon the rise or decline of geographical areas in the various fields of science.

Last year, the American Physical Society added about 2000 members, to give it a total membership

near 17 000. About five hundred of the new members were at the PhD level. In other words, the total number of PhD physicists produced last year is substantially larger than the total number of administrators in governmental agencies who have been effective since 1945. Still further, I believe that if one were to examine the qualifications of the 2000 physicists who joined our society last year, it would turn out that no more than one percent—that is, no more than about twenty would make outstanding science administrators in government offices. Yet, the cold truth of the situation is that the success of the current system for supporting science in the United States (I do not believe a better one exists), depends critically upon finding this small number of appropriately gifted individuals and matching them to the jobs. It is vitally important to our own welfare that we develop ways of inducing these young individuals to join the corps with the understanding that it can provide an appropriate means for self-expression. They should be helped to realize that the role they can play is by no means passive but will inevitably have a far-reaching effect on our national well-being. It should be pointed out, for example, that individuals such as Uner Liddell played a decisive role in getting the present program in nuclear physics in the United States started after the war. Similarly, Lawson McKenzie, also of ONR, was exceedingly effective in making certain that an excellent nation-wide program in cryogenics became established. Numerous other cases could be cited.

Perhaps above all, it is important to persuade young scientists who are attracted to the posts of science administrator to accept these challenging positions even if only for a trial period of two or three years. Most of those who have been successful as administrators have had little difficulty in obtaining attractive positions elsewhere when they desired.

Qualifications of Science Administrators

CAN one prescribe the qualifications of the ideal agency administrator in detail? It probably is possible to do so only in the most general terms. The problems involved in modern science are so very broad and diverse that one has need for a great diversity of talents and attitudes within the various agencies. As in the case of the typical scientist, the only two qualifications that one can insist upon for the typical administrator are dedication to the occupation and a high level of competence in the technical phases of the work.

Obviously, the level of competence in comprehending the details of research usually need not be as high for the administrator as for the working scientist. On the other hand, the ability of the administrator to comprehend people, often with complex personalities, and to work with them must be much higher than is necessary for the typical working scientist. The administrator must not only be able to judge the relative merits of the scientists and their contributions but must be able to work both with them and his own counterparts in

the other agencies. He should associate closely with the scientists in order to build up his own store of critical information and opinions on the many matters which will influence the effectiveness of his own work. This process of absorption and integration is quite complex and is difficult to discuss in any other than a subjective and general way. A large part of the work of the administrator is carried out on the basis of a highly developed intuition.

Dangers of Czarism

THERE are a few characteristics which the administrator must learn to rise above, if he possesses them. Perhaps the principal one is that he must avoid any tendency to use his position as a basis for attempting to become the czar of any field of science; that is, he must avoid seeking to control it technically by the direction of funds. Technical judgment must ultimately rest with the working scientist. Although the situation occurs rarely, circumstances have occasionally made it possible for individual administrators to become virtual dictators of a field for periods of time. Whenever this opportunity has been abused, it has inevitably been followed by disaster to a segment of the scientific community, either to a field or to a geographical area, and the country has thereby suffered.

The Case Against a Single Agency

OCCASIONALLY, one hears the opinion expressed that there would be a net over-all gain if basic science were supported only by one agency, perhaps the National Science Foundation. I believe this view is completely false.

First, the aspects of both pure and applied sciences are now highly diverse, threading through many important aspects of our society, which range from the cultural to health and national defense. It becomes more and more important that each organization possessing a broad interest have its own access to the scientific community.

Second, the number of administrators in any one agency will always remain small enough (as a result of the tendency toward line organization) so that the inevitable fluctuations in opinions and funds could from time to time have an adverse effect on given fields. It is highly desirable that the scientific community, as a whole, have the benefit of funds from several agencies. I doubt if there is a research group which has not found cause to be grateful for the present pattern of multiple support on at least one occasion in the last fifteen years. It should be emphasized that there is negligible likelihood that those receiving funds can abuse the pattern of multiple support by obtaining duplicate funds for the same piece of work. The administrators of the agencies form too closely coupled a fraternity. It is relatively easy for them to check on one another's contracts.