Letters

Government Research Grants: Effect of the New Procedures on the Individual Investigator

Recent editorials in *Science* have called attention to the possibility that new administrative policies regarding government research grants may have untoward effects on scientific progress in the United States. The editorials are a timely warning to the scientific community that the effects of these policies must be carefully scrutinized, and if indeed damaging to science, strongly opposed.

In the intervening weeks, the new requirements resulting from changes which affect the policies of the National Institutes of Health and the National Science Foundation, have begun to reach the individual investigator. Having had the benefit of the notice given by your editorials, I have given some attention to the actual impact of the new requirements on my own research program, and wish to take this opportunity to record some of my observations.

The recent changes in administrative policies lead to the following major new requirements which must be met by the investigator and by his institution: (i) The number and detail of required reports on research effort and expenditures have been increased significantly. The investigator must now devote a greater portion of his time to the resultant administrative work, and his institution must make an increased outlay in administrative procedure per research grant dollar. (ii) The granting agencies now require from the investigator a greatly increased *advance* specification of his equipment needs. In general, the need for any item costing more than $1000 must be known before the research program is undertaken, or permission requested from the agency whenever a new need for such equipment arises. (iii) More severe restrictions have now been imposed on peripheral expenditures such as laboratory renovation and purchase and repair of office equipment.

How do these changes affect the investigator's scientific work?

1) *Increased paper work*: Your editorial comments have already reminded us that every additional hour of paper work is taken away from the time that the investigator can devote to the actual purpose of a grant—scientific research. I estimate that the time required by the investigator for paper work will be at the least doubled by the new procedures. In my experience, paper work on moderate-sized grants has in the past accounted for about 10 percent of the total time devoted to a project by the principal investigator. The new rules will probably increase this essentially unproductive work to about 1/5 of his time.

It can be argued that even this increased time is not an undue price to pay for the support given by the grant, and that every citizen has a responsibility toward the proper accounting of the use of the nation's funds. I am not disposed to argue against this position, although as you point out, the relative social good to be derived from a day spent by an investigator on such paper work, or on actual research, should be carefully weighed. Instead, I should like to suggest that the damaging effects on research resulting from the new procedures are far more serious than the loss of an additional 10 percent of research time.

The balance of an investigator's time between administrative duties and actual research can have a profound qualitative effect on his work. With good secretarial assistance, paper work amounting to 1/10 of one's time can be taken care of more-or-less casually, at odd moments in the day. However when administrative work represents 1/5 of one's time, it is usually necessary to provide a stated period for it: otherwise the task becomes too chaotic even with secretarial help. Inevitably this requires more stringent scheduling of *all* of the investigator's time. He will then be faced with the prospect of detailed advance scheduling of his laboratory work, discussions with colleagues and students, library work, writing, quiet contemplation of a problem, and other duties. There are brilliant and effective investigators who can, and even prefer, to work under such conditions. But I believe that there are a considerable number of equally effective scientists who find such arbitrary restraints on their time rather unpleasant and not conducive to a style of work which they find essential to their productivity.

Among the new regulations is an NIH requirement that the actual fraction of an investigator's time devoted to a particular research program be reported at quarterly intervals. To anyone even slightly familiar with scientific work such a requirement is on its face absurd and unworkable. When an investigator visits the library to find a reference for his class and happens to read an article relating to an NIH-supported research project, how shall the time be apportioned? If during the walk home in the evening his mind is occupied with an NIH-supported research problem is he permitted time-spent credit? Shall he subtract a fractional allowance for enjoying the scenery? I believe that the new time-spent rule will do harm to science, if only by introducing a new air of absurdity to what ought to be a serious and responsible form of activity.

Both the time-spent rule and the added burden of paper work impose serious restraints on the investigator's freedom to pursue his task in the most effective manner. To many scientists a great attraction of scientific research is the freedom which it permits in the ordering of one's intellectual activities. There is good reason to believe that this freedom often has an important relationship to the success of a scientific endeavor. There are times when a scientific problem can be solved only if the investigator is free to spend most of his waking hours, sometimes for weeks on end, with his attention fully concentrated on the single task. If, as I believe they will, the new rules force investigators to adopt a more arbitrarily restricted style of work, many present and potential scientists will find a life in science significantly less attractive and productive than it once was. This will damage the future of science in this country by an amount far greater than that involved in the extra paper work imposed by the new administrative requirements.

2) *Requirements for advance specification of equipment*: On the surface, the new requirement that the investigator request authorization, in the original application, for the purchase of all equipment costing in excess of $1000 appears reasonable. After all, an investigator ought to know what equipment will be needed for the experiments that he plans to do. However, it has been widely recognized that basic scientific research gains much of its strength from the pursuit of new leads and new problems as fast as they arise. This has been thoroughly appreciated by federal granting agencies, for the grantee has always been permitted to make rather large alterations in his plan of work without requesting permission. Under previous rules, the investigator was not only free to determine the course of experimentation, but could usually purchase the equipment needed for any unforeseen work, so long as the overall division of the budget between salaries, equipment, and supplies was not altered. Thus, the granting agencies not only permitted the freedom of choice essential for the pursuit of basic research, but adopted an administrative procedure that made it possible to put this freedom into practice.

The new regulations retain, in theory, the investigator's freedom to determine the course of his research, but they place a serious restriction on his ability to make any effective use of this freedom. An investigator who is bound in advance to the purchase of a particular set of equipment loses a good deal of flexibility in research. The new procedures do permit the investigator to alter the approved list of equipment—but this requires a new justification for each new item, and the delays and extra paper work involved in this procedure are certain to vitiate most of the flexibility which this provision is supposed to provide.

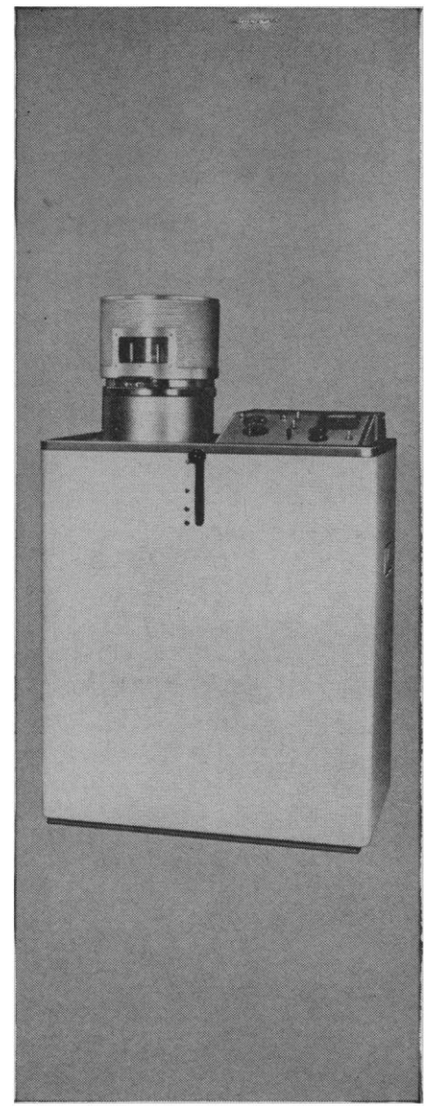
Of course, those investigations which *can* be delineated in detail in a grant application will not suffer from this new requirement. It should surprise no one, then, if in the course of time, investigations of a more predictable course become increasingly prevalent in grant-supported research. When this happens, we will have reaped the fruit of this administrative change—the encouragement of research so predictable in its outcome as to become relatively remote from the free inquiry into nature that is the foundation of basic research. That *all* aspects of science, including the most practical development work, will in the not-so-long run suffer from such an erosion of the strength of basic research hardly needs to be argued here.

3) *Restriction of peripheral expenditures*: The arguments in favor of this provision are well known and are superficially reasonable. An institution's basic facilities, such as power lines, plumbing, and typewriters are essential to its *overall* purpose and ought not, it would seem, be charged against a research grant with a specific purpose. With some justification, Congress might regard the use of research funds for the purchase of office equipment and for laboratory maintenance as a flagrant case of "sponging" on government funds, strongly to be forbidden.

A deeper examination of this problem will show, I believe, that it lies close to the heart of a fundamental unresolved issue concerning government support of science and education, and that the difficulty is as much a reflection on Congress as it is on the academic community.

In many institutions there are simply insufficient general funds to provide for the extra burden in typewriters and power lines resulting from the initiation of research grants. In most universities it will be found that the grantless departments, such as English or Romance languages, are notably less well equipped, let us say, with electric typewriters, than the science departments. Often enough the science department's *regular* budget is simply too skimpy to warrant even the cost of annual maintenance of such equipment. The fact that the science departments *are* so equipped is usually due to the fact that, in the past, such charges have been permitted against research grants, which made partial use of general equipment of this kind.

This situation reflects a basic fact about the support of scientific research in the United States: All but a very few affluent institutions lack the general financial strength to accommodate the extra cost in peripheral expenditures resulting from the establishment of scientific research programs to the full capacity of the institution's laboratory facilities and of the intellectual capabilities of its staff. If government granting agencies had not, in the past, permitted these peripheral expenditures, many institutions would have been unable to accomplish the remarkable ex-



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pansion in scientific research that we have witnessed in the last generation.

This state of affairs has been well known to grant adminstrators and to the academic community. In effect we have until now operated under a tacit agreement that a certain amount of general support for a university is to take place through the support for scientific research. That this is the actual situation is obvious from the relative magnitude of research support in the total budget of many universities. Grant funds often represent one-third to one-half of an institution's total budget. It is a truism in administrative art that no institution can possibly double its burden of activity without a considerable expansion in its *general* financial strength, and only a few institutions have been able to find this general support from independent sources. It should be clear as well that without the general support derived from research grants, the overall status of most of our universities as educational institutions would suffer a disastrous decline.

One often hears the argument that since Congress will not tolerate the idea of providing substantial federal support for higher education as a whole, the "realist" will accept general support for the university through the expedient of support for science. There has always been the danger that sooner or later the hypnotic glow which surrounds science would fade and that Congress would demand an accounting to show that funds for science are in fact rigorously restricted to the narrow purpose of the particular research program for which they were awarded. It would appear that this time has come.

I believe that the givers and receivers must now face the basic fact which has for so long been evaded by both: If this nation wishes to develop a strong program of research and education in science, it will have to understand that such strength cannot successfully be grafted onto our presently impoverished system of education. If Congress is willing to pay for the fruits of scientific research, it will have to pay the full price—which includes support for education in general. If the academic community wishes to be true to its mission of serving the truth, whether this takes the form of a nuclear pile, or a poem, it will have to accept the duty of making a principled demand for equal support for all aspects of education.

My own experience with both the earlier administrative procedures and the new ones convinces me that the foregoing difficulties are fully appreciated by the granting agencies themselves. Indeed, I believe that the new regulations have been put forward by these agencies with a considerable effort to avoid unnecessary demands on the investigator's time. But even with all the understanding and good will in the world, the new regulations—which appear to have been forced on the agencies by their congressional critics—will do serious harm to the progress of scientific research in the United States. For this reason I believe that the new rules should be strongly opposed by scientists and citizens generally.

Many scientists have accepted a responsibility to educate their fellow citizens about the scientific problems which must be understood if citizens are to help our lawmakers and administrators avoid a catastrophic end to the accelerating power which science has placed in their hands. I believe that scientists should also undertake to educate their fellow citizens about the principles which are essential to the growth of science: conditions of work which foster a free inquiry into nature; a search for truth which acknowledges the equal importance of all the forms that the truth can take, from physics to philosophy.

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The correspondence following your editorial "More paper work, less research" brings to mind the old adage of the surprise maternal visit to the larder when the young man just happens to have his hands in the confiture.

It has been my privilege to serve on the research grants committee of both national and state organizations for several years. One of the signatories of the 13-barreled letter starting on page 728 of *Science* is a gentleman more than adept at securing grants and then not using them for the purpose for which they were secured. This of course is often justified on the basis of "research," "education," and "serendipity." The cold fact remains that power corrupts and large amounts of funds spell power. Eternal vigilance remains the price of liberty and, to say the least, honesty.

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