Federal Funding of Basic Research: The Red Tape Mill

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There is a story, perhaps apocryphal, about a physics manuscript sent to Wolfgang Pauli for review. His response indicated that there was little to recommend publication. "It's not even wrong," he wrote. The same can be said about a large part of the administrative burden placed on scientists and universities by federal support of basic research. With good intentions and for plausible reasons, aided and abetted by the quick-copy machine, attitudes and procedures have evolved for the granting and expenditure of federal funds for basic research that are "not even wrong" but have little else to recommend them. Why do we have such problems? What are they? How much do they cost us? What can be done about them? In this article I describe my personal response to these questions.

Summary. Federal regulations and concerns about accountability for public funds have added greatly to the administrative burden associated with federal support of research at universities. Much of the added burden is viewed as unnecessary and counterproductive by the scientists and administrators who must bear the load. They feel that funds and effort intended for research are being diverted and wasted. The various types of costs are reviewed, including some thoughts as to their origin and estimates of their magnitude. Topics covered include project versus programmatic support, the indirect cost game, accountability, federal regulations, and the bureaucratic syndrome. There are no simple solutions, but several promising initiatives have been taken and more should be forthcoming.

Consider for example, the support of basic research in the universities by industry and private foundations. For decades, our Department of Chemistry has received annual grants from E. I. du Pont de Nemours & Co. At present the grants amount to about $50,000 per year, and usually consist of a Young Faculty Grant (YFG) and an unrestricted Science Grant. DuPont requires neither applications nor financial reports. The department head determines who will receive the YFG and sends curriculum vitae and a short description of the research interests of the awardee (or awardees) to DuPont. The only limitation by DuPont on expenditures is that the department head consider them relevant to the general purposes of the grants. At the end of the year, a brief report is submitted "giving a general description of how the funds were used" and commenting perhaps on future needs. The red tape is minimal because DuPont has a continuing basis for evaluating the department's performance—the abilities, qualifications, and numbers of our graduates whom they employ.

A different approach is taken by the Sloan and Dreyfus foundations. Both seek to encourage promising young scientists in developing first-rate academic careers, Sloan with fellowships for basic research ($20,000) and Dreyfus with teacher-scholar grants ($35,000) and grants for newly appointed young faculty ($25,000). Nominations are required, usually by a department head, as are curriculum vitae, a list of publications, and supporting letters. The Dreyfus programs also call for a brief statement of plans from the nominee. Selection is made by panels of distinguished scientists. Brief annual reports are required from the recipients, who are encouraged to make them in the form of preprints or reprints. Dreyfus also requires an annual report on expenditures. The only limitation on use of funds is that charges should be relevant to the general (very broad) purposes of the grant.

In contrast, federal grants and contracts for research at universities have an elaborate protocol. Lengthy applications, as well as peer or staff review, or both, are required, and after budget negotiations, an award is forthcoming in a modest fraction of the cases. Success is rewarded by extensive regulations governing the conduct of the research itself, limitations on and approvals for particular expenditures, requirements for scientific reports and fiscal reports, and by highly detailed auditing of the funds used. The justification usually offered for this difference is that the public must be assured that public funds are used responsibly. There is enough truth in this assertion that it is often accepted uncritically. However, state universities derive most of their support from public funds appropriated by the state, and these funds are utilized with greater latitude and fewer restrictions and reporting requirements than are imposed by the federal government. For example, annual reports are prepared by our School of Chemical Sciences (SCS) and by each of its three departments. But the reports are requested by the university administration, not by the state. Moreover, in 1980 each report was limited to two pages.

There are state regulations that govern the use of state funds and also the use of any private or federal funds entrusted to the university. They deal largely with purchasing and personnel procedures and with the care and disposition of fees and state property. Also, state-sponsored compliance audits periodically review the university's internal management. However, within the SCS and in each of its departments, expenditures are left to the judgment of the unit's executive officer. The validity of those judgments is not sought in budgetary rigidity or in audit reports but is tested by the outcome—the numbers of students taught and how well and at what cost; the degrees completed and the performance of the graduates; and the scholarly accomplishments of faculty.

Some of the state requirements are poorly conceived, costly, or ineffective. But they are less burdensome by far than the federal regulations. Moreover, the federal burden is over and beyond the costs of meeting the state or institutional requirements for expenditures of all funds. Why then should there be such a great difference in the handling of federal as opposed to state tax funds?

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Project versus Programmatic Support

There are at least two major differences between institutional and federal support of research at the universities. Generally, institutional funding is programmatic, whereas most federal grants and contracts are awarded on a project basis for individual principal investigators. Furthermore, institutional objectives and support are multipurpose in nature, whereas federal support has been viewed increasingly as limited to the procurement of results on specific research problems. Both these differences have a profound effect on the joint enterprise and contribute much of the administrative complexity to federal support.

State and federal funding of the activities of SCS are comparable in amount. However, there is only one budget for state funds for each of the three departments and one for the SCS, with the last serving in part as a buffer for fluctuations in departmental needs. In contrast, the SCS has over 150 active federal projects (2.3 per faculty member) from five different agencies. The cost of administering such a fragmented program with its large number of grants is undoubtedly several-fold greater than, for example, accomplishing the same research with an enlarged state budget.

The burden of the project system is well recognized (*1*), and from time to time its viability has been questioned (*2–4*). Each project funded demands the protocol already outlined. Preparation of the application alone is a major task for the faculty member; the progress and special reports can be equally time-consuming. The length and detail of a proposal increase with the lack of assurance of the proposer, and when funding is known to be difficult the proposals become even longer. Application and report preparation provide some benefits to the researcher in planning the work, but such benefits are limited.

Although only 5 percent of the researcher's total work time may be used in writing applications and reports (*3, 5*), it is a much larger fraction of the time spent on research. Also, it is usually time that would otherwise have been spent preparing manuscripts for publication. From dealing with my own grants, from helping young colleagues develop their first proposals, and from providing service as a referee, I estimate that proposal and report writing reduce a faculty member's research output by at least one paper per year (*6*), a loss in published research of as much as 10 to 20 percent. Furthermore, the refereeing of proposals falls heaviest on the leaders in a field.

The marriage of the federal project system to the universities is an uneasy match. University research is primarily programmatic, most of it being accomplished in graduate programs by students working on their Ph.D. theses. On the microscale, one sees typically a faculty member directing the thesis research of a few graduate students supported with part-time stipends from two or three federal grants. The output of this program is professional manpower as well as research results, with a response time of about 5 years.

In contrast, the typical length of a federal grant is about 3 years, and decreasing their length has been suggested as a means of ensuring greater accountability for biomedical research grants (*7*). The heavy dependence on graduate student help requires longer grants, not shorter. And greater flexibility of funding is needed to accommodate the fluctuations in the supply of students and the institutional support of them, since neither of these can be predicted with much accuracy for a given project. Greater flexibility in the carry-over of funds from year to year would help. These suggestions are not new (*1, 8*), but they bear repetition.

Another difficulty of the project system is that truly new areas fall between the cracks of federal funding, which follows traditional lines. Muller (*9*), for example, described how his prize-winning research was "bootlegged" because it fell beyond the conventional interests of the federal granting agencies. In his view "the strict compartmentalization of the funding organizations [make] it very difficult for a scientist to follow the directions that research takes. . . . The goal of the funding agencies should be to facilitate research, not to direct it."

Although the project system of federal support has major weaknesses and has added costs, most scientists agree that its price is more than repaid by the benefits of the system (*10*). There is strong evidence that a large fraction of the major advances come from a small fraction of the scientists (*11*). Therefore, it is essential that the best ideas command adequate support. So far, the best way found for accomplishing this is by peer review of projects proposed by individual scientists.

With care, the costs of this approach can be kept down. The National Science Foundation (NSF) has recently sought to limit the length of research proposals, and some funding agencies now accept reprints as technical reports. But more could be done throughout the federal government to keep applications for grants to the essentials; to have fewer and larger grants per investigator; to limit reports to publications; to use fewer referees; and to have longer, broader, and more flexible grants.

The Indirect Cost Game

Federal support of basic research in the universities has led to a great deal of effort and friction in what I call the indirect cost game. It is largely a zero-sum game, and much of the effort seems misguided or at least unnecessary. This perspective stems from the evolution of the present indirect cost system which therefore merits a brief review.

The federal support of research is a post-World War II phenomenon that became truly large-scale in the post-Sputnik decade. At first, except for a few classified laboratories and projects, the universities viewed such support as help in accomplishing better what they would have been doing anyway. Federal funds were designated largely for the direct costs of the research or the graduate education they supported and there was little interest in determining the additional, indirect costs borne by the institution. Today, the institutions go to great pains to justify an indirect cost rate that is as high as possible, while the federal government works to keep the allowed rate as low as will be tolerated.

There are at least three proximate causes for the change—the rapid post-World War II expansion of higher education, spurred by rising expectations and the baby-boom; the post-Sputnik expansion of graduate research and education by the federal government; and in recent years the inflationary economy. All three have widened the gap between funds available and funds desired, but federal intervention is particularly relevant here.

The university programs are characteristically inflexible and slow to move in new directions. Furthermore, the tenure system and human nature make it more difficult to cut back a program than to expand one. Thus the universities are not equipped to respond to changes in federal objectives, priorities, and funding which, relatively speaking, can occur overnight. To illustrate the point I show in Fig. 1 a semilogarithmic plot of the number of Ph.D.'s granted per year in chemistry by U.S. universities back to 1912.

Except for sharp drops during

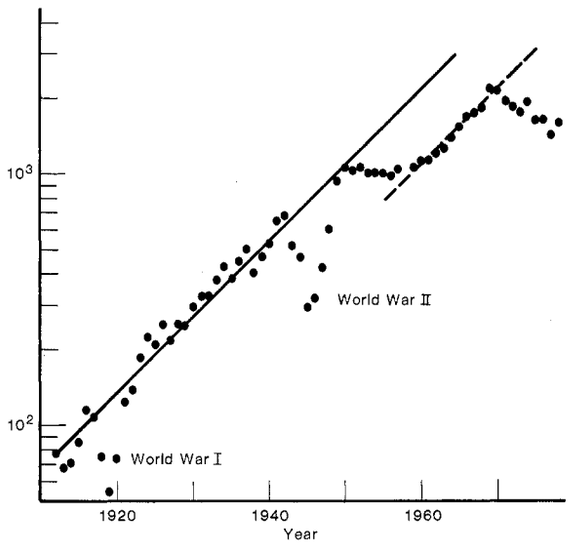

Fig. 1. A semilogarithmic plot of the number of Ph.D.'s granted in chemistry by U.S. universities since 1912. Data prior to 1962 are from the American Chemical Society Office of Manpower Studies and for the years since then, from the ACS *Directory of Graduate Research*.

World Wars I and II, the production rate increased exponentially from 1912 to 1950, with a doubling time of 10 years. In about 1950 the rate leveled off at 1000 Ph.D.'s per year, but starting in 1960 the rate again doubled in a decade. Since 1969, the rate has dropped off from 2200 per year to what may again be a constant value of about 1600 per year. These data imply an overbuilding of capacity, laboratories, and faculty of at least 25 percent. The doubling during the 1960's was due largely to federal encouragement and support, but it required institutional commitments that would otherwise have not been made to that degree and that overextended the universities.

The result was an increasingly insistent demand from the institutions for relief. The problem was exacerbated by the elimination of most federal graduate traineeship programs in the early 1970's and sharp cutbacks in fellowships (*12*). As is, faculty believe overhead rates are too high, institutions think them too low, and the Congress and federal agencies claim the institutions are greedy and that any problems they have are of their own devising or imagining.

The problems are not new. As early as 1956, Blauch, Assistant Commissioner for Higher Education, Office of Education, said (*13*):

> This Federal research relationship has, of course, had a large impact on the higher educational institutions. While it has no doubt benefited them, it has also created some serious problems. The contracts have thereby strengthened the institutions. In many cases, however, they have not covered the full costs of the research and have therefore been something of a drain on institutional resources.

It is hard to estimate how much time and resources are devoted to the indirect cost issue, but the amounts are substantial. Much of the federal concern with accountability for grant funds arises with indirect costs. For example, one attempt toward keeping indirect costs down is the federal requirement for cost sharing. The institutions must explicitly identify for each grant some contribution to the project that is not, of course, recovered as an indirect cost. This in turn leads to the requirement that time and effort reports be submitted so that each specific contribution can be verified. It's a lot of busy work (*14*).

For many in the granting agencies as well as the universities the final straw is the new (1979) Office of Management and Budget circular A-21, entitled "Cost Principles for Educational Institutions." This requires a complete report of all salaried activities for those who spend any time on work related to a federal grant or contract (*15, 16*). Among the kindest words about it are those of Saunders Mac Lane (*15*): "the part requiring 100 percent reporting . . . is meaningless, invasive, inappropriate, counterproductive, and ineffective."

Institutions differ widely in what they include as direct costs, and if one returned to a simple formula based on total direct costs, as NSF started out doing, some institutions would soon have higher direct costs for a given research project than would others. Also, there would be differences among departments at the same institutions. However, the present system has its own anomalies and requires substantial management effort. Certainly the procedures could be simplified and the funds now used for administrative purposes could be used instead for research.

In the case of cost sharing, most institutions make major contributions that could be accepted by all federal granting agencies on a department, college, or, preferably, an institutional basis. At SCS, all of the faculty salaries for the academic year are ordinarily charged to state funds. Graduate students with a half-time minimal stipend from a research grant usually give full-time creative and dedicated effort to the research. Many graduate students supported with teaching assistantships and industrial fellowships work half-time or more on federally funded project research. Postdoctorates in universities have stipends less than half of what they would command in industry or government. Faculty work 55-hour weeks. Thus it would be best to eliminate, or at least simplify, the cost-sharing requirement.

On the other side, the institutions should recognize that they would be better off with a simpler indirect cost system that does not recover the last ounce of blood. They too have a vital stake in research and graduate education and could probably benefit from trying to do less but do it better. After all, a university can be more than a collection of entrepreneurs held together by a common interest in parking problems.

Accountability

The stresses that have developed around the issue of indirect costs are part of a larger concern with accountability. In the past decade (*1, 17*), this concern has become troublesome indeed to the partnership that enabled science to flourish as a national endeavor. Elmer B. Staats, Comptroller General of the United States, recently presented the federal point of view (*18*):

> Finding an appropriate working definition of accountability for public funds used to support basic research at universities is a matter of great importance. . . . Public pressure for fiscal accountability for university research is especially called for since the public understands little of what the research actually entails. . . . We in the federal government, in regard to basic research, must understand that fiscal accountability is only a means of insuring that research is carried out.

A perhaps unkind paraphrase of these remarks is that "We don't understand the substance of research so we'll audit the hell out of its costs." As support of the paraphrase I offer the headline of a typical article about the conflict, "Universities scored for 'sloppy' accounting" (*19*). The article quotes Harold Stugar, deputy director of the GAO General Management Studies Division, as saying that "the five problem areas are: inadequate salary and wage documentation;

improper or inadequately documented cost transfers; undocumented consultant costs; weak cash-management systems, and inadequate procedures for acquiring and accounting for equipment and supplies."

By 1978 the severity of the problems led to the formation of the National Commission on Research, an independent body that has already issued several reports (*8, 10, 17*) about various aspects of university-federal relations. The title of the commission's report (*17*), "Accountability: Restoring the Quality of the Partnership," is indicative of how the situation is perceived. Sessions and Collins (*20*), on the basis of their cost-benefit analysis, refer to the federal view of accountability as a "costly 'bill of good.' " The federal audits of federal research grants and contracts at universities have recommended that perhaps 1 percent of the charges be disallowed. But, noted by Sessions and Collins (*20*), " 'mismanagement' of the Federal funds at universities is not fraud—the diversion of monies for personal gain. . . . The issue here consists of spending Federal money on normally worthy research and educational items that the auditors decide were not eligible as an expense under the *particular* grant or contract; or, spending more money than the agency allows on an otherwise eligible item."

As pointed out in the introduction, institutions have their own regulations and auditors. The federal burden is a costly add-on with few if any real benefits. Estimates of its costs are difficult to make. However, for the University of California, Los Angeles, Sessions and Collins (*20*) estimate a departmental cost of at least 1 percent, which is also a minimal figure for SCS; and then there are the university-level and federal costs, which are of at least comparable size.

Some of the misplaced emphasis upon fiscal accountability seems to arise from misconceptions about the peer-review system for selecting proposals to be funded. Staats (*18*), for example, states that "peer review still appears to be the best method of accounting for the substance of scientific research, as opposed to other aspects, such as the finances." This view overlooks the fact that peer review is prospective. It evaluates the intrinsic merits of a particular proposal from a particular scientist. Past performance of the scientist enters, but usually in a general way rather than as a "scientific audit" of accomplishments from a grant. When graduate education was recognized by the federal government at least as a desirable by-product of university research, one could point to the numbers of advanced degrees awarded. With the present federal emphasis on research results it is ironical that so much attention has been given to reviewing expenditures and so little to the research actually accomplished.

Gibson (*21*), however, offers performance evaluation of academic research as a more relevant and less costly form of accountability. This might be accomplished by indirect measures such as the citation index or by direct evaluation of the research output. After all, the progress reports, final reports, and publications are the visible product that is called for and they are "a means of insuring that research is carried out" (*18*).

The present emphasis on fiscal accountability has hidden as well as visible costs. In combination with the project system of support, it does what Staats recognizes should not be done (*18*); it inhibits the freedom essential to creative research. Only a short time is required for an exciting serendipitous discovery or for the emergence of a bright new idea. Both are highly unpredictable yet either can be much more significant than the original plans. The project system as such need not inhibit the response of scientists to these new opportunities. Unfortunately, the redirections often do not fall within a narrow accounting view of what is covered by a proposal submitted at least a year or two earlier. As a result the new opportunities are delayed or even lost. Raymond Orbach has described the situation in basic research as "the need for lateral movement" (*22*). Instead, the inflexible auditing practices treat research support as if it were the procurement of hard goods.

The commission report on accountability (*17*) drew a number of perceptive conclusions and made a set of recommendations, some of which, in my view, are not specific enough and tend to accept what I consider to be misconceptions. Nevertheless they could lead to less burdensome, more relevant demonstrations of accountability. Moreover, some of the federal agencies are exploring management options better suited to the nature of research in the universities.

An important step in this direction is the grant-administration experiment being conducted by NSF with a small group of chemistry departments, including ours (*19*). The peer review and granting processes are unchanged, but various new post-grant procedures are being explored. In the initial phase, all of the grants from the chemistry division of NSF to faculty of a department were combined in a "master grant" administered by the university on pretty much of a programmatic basis. Those procedures found to be most useful are being continued in a second, larger-scale phase just getting under way. They include: (i) allowance of charges incurred up to 90 days before the starting date of a grant; (ii) approval by a university mechanism of most budgetary transfers previously requiring NSF action; and (iii) some use of project funds for very "closely related" work.

Federal Regulations

Some of the increasing burden of federal regulations has to do with tensions arising from indirect cost issues and misguided concepts of accountability. But most comes from federal regulation not only of research expenditures and research itself but also of how the universities manage their affairs. Philip Handler had this to say in his testimony at congressional hearings on authorization of the NSF appropriation for fiscal year 1980 (*5*):

> I suppose that university presidents have always known that he who pays the piper will, one day, call the tune. . . . Universities are now expected to be models of equal employment opportunity, models of how to manage an animal colony, models of how to provide seemingly endless statistics concerning themselves. . . . They are to respect privacy but provide information that the Privacy Act, in spirit, was certainly intended to protect.
>
> A substantial fraction of the indirect costs component of research grants arises from the burdens imposed in meeting federal regulations. . . . What is important is that those costs are being defrayed from funds appropriated in the name of research.

Handler refers to three types of federal regulations: (i) those having broad social objectives; (ii) those regulating the conduct of research itself, for example, animal care and limitations on the use of human subjects; and (iii) those governing the federal support of basic research including the granting process, expenditures, and accounting for the costs. Each type of regulation has major "hidden costs" in addition to the direct costs (*23, 24*). Although this article is concerned primarily with the regulations governing federal support of research (type iii), the other two types of regulations cannot be ignored.

The regulations for social objectives are the most costly of the lot. A 1976 American Council of Education study concluded that between 1 and 4 percent of all institutional costs are attributable to 12 such major federal programs (*25*). Their pervasiveness has added a new dimension to our universities that is frightening to some and frustrating to

others (*23*), but it should not be forgotten that the universities were "once securely counted in the constituency for intervention" by the federal government for social ends (*26*).

The regulation of research itself is troublesome because of the usual insensitivity of regulations to cost-benefit trade-offs. Too often the answer is to avoid all risks by doing nothing. For example, restrictions on the use of human subjects for biomedical research have forced some types of clinical trials to other countries (*27*). An important current issue is the extent to which the health and safety standards for industrial workers are appropriate for student laboratories and university research. Is the record of university laboratories so poor in this regard that enormous investments are essential for improvement?

In other instances, regulations may inhibit whole areas of research. A case in point is the experience of a campus colleague who does research on animal genetics. In about 1964, Dzuik (*28*) devised an implanted, time-release capsule that gives a constant, controllable release of steroids over long periods, enabling ovulation to be controlled in several livestock species. The approach was especially effective in improving the efficiency of sheep production. However, the Delaney Amendment places severe and often unreasonable limits on the amounts of chemical residues in food products, in this case natural steroids. Approval is therefore needed to market food products from animals treated by the Dzuik method. The costs and difficulties of obtaining such approval have prevented utilization and further development of the method in this country, although it is being used in Europe and parts of Asia. Also, it is discouraging further research on the reproductive biology of domestic animals.

The Bureaucratic Syndrome

The many regulatory burdens catalogued above are compounded by what I call the bureaucratic syndrome in their application. In Scott's words (*23*), "it is not the people in government that cause higher education's problems; it is the nature of bureaucracy itself . . . well-intentioned people will pursue their own bureau's objectives most earnestly, ignoring the consequences of their actions even when those actions conflict with other values protected by government or harm the institutions they are designed to assist."

Several general classes of overzealousness can be identified. A common one is to require special certification on a general basis in order to address a recently identified problem. A good example is NSF's response to current interest of congressional committees and federal regulating agencies in avoiding unnecessary equipment purchases, properly maintaining and accounting for existing equipment, and encouraging multiple and shared use of expensive special purpose equipment. The NSF (but not National Institutes of Health) now requires that proposals budgeting equipment items over $10,000 include certifications that "no similar item(s) exist within the unit nor is/are conveniently available" or that "apparently similar items exist but are not available for shared use (see attached explanation)."

Although the objective of the certification is clearly desirable, there is no evidence that the requirement of a certification is based on a cost-benefit study (*20*). For one thing, it overlooks the great skill of many faculty at beating the bushes for and scrounging needed equipment from nearby laboratories. For another, our experience with it so far has been one of added cost and no benefit. The cost-sharing certification for individual grants is a similar case where, as mentioned earlier, an annual departmental or institutional statement could suffice.

The overzealousness of the federal bureaucracy is compounded by overreaction on the part of the universities. When federal regulations come out, the university bureaucracy usually prefers not to risk compliance standards that might lead a federal auditor to disallow expenditures from grants. So, to be safe, a university's internal requirements will often go beyond the federal requirement. In the research equipment case, certifications might be required for less costly items, say from $1,000 to $10,000 as well as for the more expensive.

A somewhat different class of bureaucratic problem arises because the federal granting agencies are not service oriented; in fact, their clientele consists mainly of supplicants for funds who find it hard to be critical of an agency. Why bite the hand that feeds you? Moreover, the views of applicants and grantees are seldom sought. No one has ever asked me my opinion of the efficiency of the NSF mail room or about the length of time required for issuing a formal award notice. The lack of such communication promotes ill-feelings on both sides.

As an administrator reviewing and signing a great number of documents, I soon became aware that there must be original signatures on three copies of each research proposal—two required by federal agencies and one for the campus contracts office as "insurance" in case the agency loses theirs! Could the signature requirements not be simplified in the present age of the photocopier?

Another example of this nature is the matter of changes (or differences) in procedures or in format (*24*). The administrative effort required to change a procedure is greater by far than that for continuing the effort spent on meeting current operations. How much effort has already been spent by the universities over the past year or two to meet the new requirements of the revised Office of Management and Budget circular A-21 governing the federal use of funds by universities? Some major changes become necessary, but the effort required for even small changes is too high unless major benefits are clearly discernible.

Concluding Comments

Federal support of basic research in the universities is a mixed blessing. The partners in the enterprise are disparate at best, and good will and understanding are essential on all sides for a smooth and effective joint effort. There is now sand in the machinery, causing unnecessary wear and tear and loss of output. Some of the loss is immediate, visible, and quantifiable. Much is long term, hidden, and qualitative. One can argue whether it totals 10 or 20 percent, but it is in that ballpark. Few, if any, will claim the loss is insignificant.

All will agree that the administrative burden on scientists and engineers, on universities, and on the federal government for the conduct of federally supported research should be reduced. I believe it is more important to get on with the task of reducing the unnecessary burden than to establish just how costly it is. The nature and magnitude of the problems are becoming widely understood, which is essential to their alleviation. Important initiatives have been taken, and management experiments are under way. Establishment of the independent National Commission on Research was a major step in the right direction and the studies it has issued so far (*8, 10, 17*) provide some excellent guidelines for improvement.

Most grants and contracts treat research as if it were a commodity being manufactured exclusively for the federal government. Instead, research is a highly individualistic creative enterprise commanding strong institutional commitment as well as the dedication of

faculty and students. The nature of research cannot be changed, but we can improve the management of its support in the universities.

Why not treat federal support of university research as the assistance it is rather than as procurement funds (*29*)? Most of the post-award administration could be left to the grantee institution and principal investigator. Accountability could be converted from allowability of costs and detailed documentation to reasonableness of technical progress. One could allow at least some funds from a grant for a particular project to be used by the principal investigator for other research.

The NSF grant administration experiment started 2 years ago (*19*) could evolve into an operating philosophy for federal support that provides a better match of the project support system to the programmatic structure of university research. Also, it could encourage the universities to reduce some of their own counterproductive red tape; at least that is happening here at Illinois. In another experiment starting last fall (*30*), the NSF Chemistry Division is trying to reduce costs by giving principal investigators the option of submitting either a traditional proposal or a set of publications on work under the present grant together with a short statement on future research directions. It would benefit everyone if this last option could substitute also for fiscal accountability!

Most federal agencies funding research in universities have advisory committees of university scientists who assist in the peer review of proposals. I suggest that each have an advisory committee charged with streamlining procedures, shortening forms, soliciting complaints, eliminating red tape, and enabling scientists to spend some time in their laboratories. Finally, it would help if the Congress as well as the agencies listened to such advice.

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