such as environment, energy, or cities, renew demands for new or different programs. It is clear that the minimum requisites for the productivity of such programs are funding for graduate students, and at least an expected 5 years of continuity of funding for key faculty participants. This need not mean funding for all key faculty, but rather funding to ensure needed minimal coverage. The appropriate administrative home will depend on the institution. While one can generalize about the prospective problems of a multidisciplinary effort, comparable generalizations cannot be made about the optimal design for such a program beyond the statement of some minimum requisites.

While the view that the best generalist is a broken-down specialist has been put forward, society's needs appear to warrant continued multidisciplinary efforts despite the educational problems. The appropriate level for such programs may be the masters, the doctorate, or successive two-degree programs. Each has costs and merits, superficiality or time countered by depth and breadth. The job market, the subject, the institution, and the program itself, in some combination rather than alone, probably determine the level of education at which an interdisciplinary program is likely to be successful.

References and Notes

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5. Initiation of the program described in this article was made possible by a grant from the Ford Foundation.

NEWS AND COMMENT

Research Management Scandals Provoke Queries in Washington

The world of federal grants and contracts to universities, hospitals, and other research institutions, long thought to be self-regulating, is coming under intense scrutiny in Washington these days. An increasing number of government agencies, from Congress' General Accounting Office (GAO) to various elements of the Department of Health, Education, and Welfare, including the National Institutes of Health (NIH), are looking at how government research funds are actually spent at recipient institutions. The activities under examination range from out-and-out fraud to routine fudging of accounts, a practice that violates federal rules but that seems, nonetheless, to be common.

So, more and more congressional staffers and Executive Branch officials are learning the not-too-thrilling details of "time and effort reporting" and "monthly certification" and other features of the current system of managing federal funds for science. Rules and practice, however, diverge often enough that one official likens such study to "playing with Jello." But he and other officials, such as Representative L. H. Fountain (D-N.C.), are deeply concerned that this morass may conceal violations of peer review, not to mention strict accounting procedures.

Fountain's alarm is an important bellwether, because, as chairman of a Government Operations Committee subcommittee, he launched in the 1960's one of the most thorough and probing investigations Congress has ever made of how research moneys, particularly those of the NIH, are spent. His committee found considerable waste and mismanagement at that time and developed revised procedures aimed at cleaning things up. But recently Fountain told *Science*, "I am concerned that the reforms we accomplished in the 1960's may not have endured." The subcommittee's belief that granting institutions, together with government audits, have been adequately policing the system "may be illusory." Fountain says his staff is undertaking a major follow-up of its earlier work.

The issue has surfaced in the last year in Washington largely because of two incidents. One occurred at Harvard (*Science*, 23 September) and involved Phin Cohen, an assistant professor of nutrition who alleged that he had been made to sign blank forms vouching for how his NIH grant moneys had been spent, while the Department of Nutrition at the School of Public Health filled them in with unrelated items and forwarded them to the government. Not only did NIH investigators find the Cohen allegations true, but they found serious accounting problems in two other Harvard grants that they examined. NIH asked Harvard to pay back $132,349 to compensate for misspending on all the grants. HEW auditors are now beginning an audit of all federal funds—which total some $400 million—Harvard receives.

The second incident, which may have aroused the Secretary of HEW, involved the Eppley Institute in Omaha, Nebraska, which has received more than $18 million in funds from the National Cancer Institute to test chemicals for carcinogenicity. According to GAO investigators, whose report is about to be published, between 1973 and 1976 Eppley's contracts with NCI have been extended without using normal procedures. For example, some 11 projects, some of which had already begun, were approved with only a verbal say-so from NCI. Moreover, some 50,000 laboratory animals, bred at a cost of $1.75 apiece, turned out not to be employed in Eppley's research and apparently were destroyed. Finally, some of the equipment, materials, and animals the government paid for were used for Eppley's industrial research contracts according to GAO. The Eppley situation has suggested to several observers that some bending of the rules has been overlooked by NCI officials, because Eppley's director is Philippe Shubick, a member of the President's National Cancer Advisory Board, which has oversight responsibilities for the NCI.

[Eppley's Associate Director, Phillip Issenberg, told *Science* that Eppley had always "done what we were told to do by NCI" in renewing its contract. As for the 11 projects, "We did not have the good sense to put their response in writing." The misuse of equipment was minimal, he said, and the animals destroyed for good reasons. But he admitted that Eppley could have been more careful in having bred 78,000 animals of which only 27,000 were used in experiments. Eppley's NCI contract is currently up for renewal.]

It should be noted that no one is alleging—even in the most serious cases discovered so far—that scientists are using

federal grant and contract moneys to buy mink coats, yachts, or private jets. But a number of important officials and groups are asking whether research funds are actually used the way that Congress and the Executive Branch think they are. Among the current inquiries are the following.

▶ Representative Fountain's Subcommittee on Intergovernmental Relations and Human Resources plans to follow up its earlier investigation by looking at, in Fountain's words, "the quality and effectiveness of research grant administration, including peer review," for the research supported by NIH, HEW, the Department of Agriculture, and the National Science Foundation. Fountain says he will hold hearings "in the first half" of 1978, but he has already asked the GAO to gather information on grant and contract management practices in the course of its other investigations of university and research institution matters. GAO, also at Fountain's request, is beginning an examination of how research funds have been spent at a single school, in this case the University of Rochester Medical Center. Fountain happened to pick Rochester because it receives support from several federal agencies and because recent federal audits of the school appeared inadequate.

▶ In an unusual move, HEW Secretary Joseph Califano has ordered the HEW Audit Agency to review all NCI contract awards, a review which is now under way and which is also of interest to the Fountain subcommittee, because it has been reviewing NCI's programs.

▶ Califano also issued a directive on 18 May "aimed at eliminating waste, abuse, and mismanagement" from HEW's vast grant and contracts budget which totals $7 billion. The directive followed some ad hoc investigations by the office of the assistant secretary for management. It includes NIH which has only $2 billion of HEW's total grants and contracts budget.

The directive requires even, quarterly distribution of funds to end the "bunching" of funds distribution in the last month of the fiscal year, stricter accounting on sole source contracts, more training for contract officers, and other changes in departmental procedures.

▶ The GAO has just published a self-initiated review of the adequacy of HEW's audits, including its auditing of research money. High-level HEW and NIH officials all rely on HEW's auditors to inform them of what is really going on out in the research institutions where the money is spent. But it is obvious, as GAO has concluded, that HEW's group of auditors is inadequate to the task. According to previously published GAO figures, HEW in fiscal 1976, had only 937 auditors to ferret out problems in the spending of a departmental budget of $128 billion.* (The Department of Defense, by comparison, has more than 6200 auditors looking after expenditures of $93 billion.) One question the new GAO study has asked is whether the types of audits performed in the past by HEW have been likely to turn up the sort of problems that have come to light at Harvard and Eppley. The answer seems to be that the auditors have been so busy looking at systemwide aspects of an institution's accounting that they rarely learn the fate of moneys awarded to a single investigator, such as Phin Cohen.

▶ The Office of Management and Budget (OMB) of the White House has been reviewing the inconsistencies in the rules which different federal agencies promulgate in requiring accounting for their money from colleges, universities, and other research institutions. OMB is reviewing suggestions from HEW as well as the universities, represented by a committee of the National Association of College and University Business Officers (NACUBO).

▶ Finally, NIH's 13-member internal investigative unit, bearing the innocuous title of Division of Management Survey and Review (DMSR) continues to look into allegations (received from higher-ups, program officers, and even anonymous letters) of wrongdoing and fraud in the spending of NIH money. The DMSR was the group that investigated the Harvard scandal. It also made a major investigation of another scandal in which a scientist, Leonard Hayflick, allegedly sold human cell cultures developed with federal support to other groups and institutions at a profit of $67,000, and he also held sales contracts potentially worth $1 million (*Science*, 9 April 1976).

Like any police file, many DMSR reports (which are available under the Freedom of Information Act) make for chilling reading. Others obviously exonerate researchers or their institutions from charges. But the range of problems which the DMSR turns up is probably significant.

One case involved the American Institutes for Research (AIR), in Washington, D.C., a nonprofit organization that does behavioral and social science research. An AIR single investigator was responsible for a 5-year grant totaling some $200,000 from the National Institute of Mental Health for work on abortion and unwanted children. He also received support from the National Institute of Child Health and Human Development and the Ford Foundation. According to the DMSR report, the investigator falsified invoices to the government to payments for consultants for the project who were in Czechoslovakia and who allegedly would be persecuted by their government if they were paid directly.

But instead of forwarding the payments to the consultants, the investigator deposited them in bank accounts in Prague, Geneva, Bethesda, Maryland, and Washington, D.C., until they totaled more than $100,000 and had earned approximately $12,000 in interest. DMSR, as it does in such cases, referred the matter to law enforcement authorities and the Internal Revenue Service.

Now, 2 years after the first DMSR report on the matter, the investigator has convinced the authorities that the consultants really existed and did work on the study. The U.S. District Court of the District of Columbia has approved a trust agreement for the disposal of the money to any Czechs who can be proved to have earned it. AIR, which discovered the problem in the first place and brought it to the government's attention, also fired the investigator.

Another case involved two researchers at Brandeis University who got a grant from the National Institute of General Medical Sciences. Afterwards, the DMSR alleged, the researchers departed for Israel, and apparently took with them some $6000 worth of equipment bought with NIGMS funds. The DMSR recommended that the cost of the equipment and part of their salaries be repaid to the government.

Other DMSR reports discuss situations in which institutions submitted identical applications to different parts of NIH, or investigators charged their salaries to the wrong accounts, and other cases caused as much by snarled red tape as by deliberate intent to monkey with the system.

Records Routinely Falsified

One question which officials in the GAO, HEW Audit Agency, and DMSR are asking themselves these days is how typical are cases of outright fraud. Admits the Deputy Director of NIH, Thomas E. Malone, "I personally don't know what's going on out there. I have to rely

*HEW supplements its own audit staff by contracting out for an additional 2000 man-years of work every year. This brings its total audit staff capability to approximately 3000, which is still half of the number of auditors available to the Defense Department.

on the reports we get from our auditors. I don't have personal knowledge of widespread abuse," Malone told *Science*. "But if there is a belief that there is widespread abuse then the burden is on us to get to the truth of the matter."

But while searching for the truth about fraud, officials may stumble on a less glamorous, but probably very common practice, namely, the "pooling" of funds from different grant and contract accounts, and charging of salaries, equipment, and materials to whatever account has plenty of money at any given time. In audits and other federal reports, the practice shows up in a variety of guises: as "late fund transfers," poor "time and effort reporting," or "inaccurate monthly certification." There seems to be some consensus among government auditors and investigators that this practice is widespread, violates federal guidelines, and involves, ultimately, the spending of taxpayers' money for other than the originally intended purposes. As such, the problem of pooling may become as big an issue as the Harvard or Eppley incidents in the forthcoming Washington investigations.

What happens is this. A researcher applies for a grant—often for several grants—and accompanies each proposal with specific statements about the staff time, equipment, and percentage of his or her own time that will be allocated to the project. The grant application is reviewed by the researcher's peers on the same assumption, namely, that the project is a discrete entity and will be performed as stated in the project plan. An OMB regulation—known to the cognoscenti as FMC 73-8J-7(d)—requires that the investigator certify after the fact, on a monthly basis, how the money was actually spent. There is also a requirement that the institution which employs the researcher file annual reports of expenditures containing similar information. And in the vast majority of cases, the investigator, and his institution, certify that the money was spent in accord with the original research plan. So the system runs along, ostensibly smoothly, with everything properly accounted for.

But what sometimes really happens is that the scientist is juggling his time among several different grants and contracts, not to mention teaching, administration, travel, and in some cases, patient care. So are his colleagues, technicians, and students. The result is that his own operation, as well as the larger entity in which he works—be it his laboratory, department, school, or hospital—resembles a many-ringed circus, with myriad activities going on simultaneously.

The financing of and accounting for these activities is equally complex, and even obscure. Money starts and stops coming in to the department, or laboratory, at irregular intervals. Some accounts are fat with extra funds; others are lean considering the work they are supposed to support. Sometimes a project's funds arrive at the university right when the work begins; often, however, the funds arrive months after work has started.

So the scientist, if he also acts as the administrator of several such grants and contracts, or his department head, or his departmental business officer, resorts to the practice of charging salaries, supplies, equipment, and other things to whichever accounts seem most convenient at the time. This is done, people say, regardless of whether the costs were incurred for the account charged.

Finally, to make life simple again, the scientist, or the business officer, or whoever handles the accounts, certifies to the government in the monthly statements (which are meant to be signed by someone with direct knowledge of the project's progress but often are not) that the money is being spent in accordance with the original project plan. This then, is the practice called pooling by which institutions gain some freedom from government accounting rules but still keep relations with their federal sponsors running swimmingly.

Following up on descriptions of this practice by government auditors and investigators—who generally referred to it as their biggest problem and even claimed it might occur in 50 to 70 percent of *all* government research grants and contracts—*Science* contacted three senior principal investigators. One was the director of a major university laboratory; another had participated in biomedical work at two prominent university teaching hospitals. A third was a history professor at a leading East Coast institution. All of them admitted that such pooling and shuffling of funds among accounts was common practice. One even ventured that sometimes as a result, a project can be so deprived of money that the work it was to support never gets done!

Lawbreaking or Needed Leeway?

Opinions on the significance of this practice vary depending on whom one talks to. A high OMB official was angry on learning that both auditors and scientists say the practice is widespread. "Any false certification to the federal government about the expenditure of federal funds is inexcusable," he said. "That amounts to making false claims to the government for funds, and there are statutes that punish it." But he admitted that the certification rule, FMC 73-8J-7(d), leaves enforcement up to the agency that sponsors the research.

By contrast, a veteran program officer at NIH defended aspects of the practice as it applies to grants. He noted the long belief on the part of researchers, and of some people in government, that a grant is a gift, and that the strings attached to how grant money should be spent should be loose.

This official warned that "business-oriented officers" in NIH, however, might not be sympathetic to such practices.

Fountain, while not commenting on pooling as such, stated that any application of funds for purposes other than the approved project undermines peer review. He told *Science*:

> There is an important basic connection between the peer review process for selecting research projects and the proper use of research funds within grantee institutions. If grant money is spent for purposes that are outside the approved project, the integrity of the peer review process is undermined and further, unsuccessful grant applicants may not have received equitable treatment.

A third, and highly significant reaction was that of the principal investigators themselves, who complained bitterly that they were teachers and thinkers, not CPA's. "There is an enormous mismatch between federal policy and university habits here," explained one. "We in universities can't say whether we have spent twenty-two and one-half percent of our time on this or that. Yet the government is trying to buy research the way it buys missiles, or the way you buy safety pins or diapers."

Federal auditors are well aware of this attitude, and say they have been hearing such protests for 10 years and more. Says one experienced audit official: "There has never really been a meeting of minds between the federal government and the academic community, the professional staff who manage the funds, as to what . . . they commit themselves to provide in return for research support. The academic community looks upon the effort to identify the amounts of effort spent on each contract and grant as so much unwanted interference."

It is doubtless true that there are some time-honored questions here concerning proper accountability relationships between the federal government and academic science. But in coming months, it looks as though Congress and some "business-oriented" executives of the federal government will be looking at the question of accountability in its most literal sense.—DEBORAH SHAPLEY