Basic Research and Financial Crisis in the Universities

Lagging federal research support and spiralling costs jeopardize survival of U.S. private universities.

George Pake

Universities are the locale for most of the basic research done in the United States. The universities are, of course, both public and private. Let me turn first to general aspects of the problems that face basic research in the universities.

Squeeze on Research Funds

Most of us are aware that the dominating component of research funds in the universities comes from the federal government, about three-fourths of all research funds. We are also aware that our military involvement in Southeast Asia has placed a severe strain on the federal budget, which of course reflects itself either in cuts or in decreased growth rates for many federal programs. The period of rapid growth of research funds in the universities was the late 1950's. Even in the face of the Vietnamese war, research funding has grown somewhat each year. But during the past 3 or 4 years the growth in federal funds for research has fallen substantially behind the increasing demands from new universities, from expanded numbers of faculty members in the established universities, and from expanded numbers of graduate students. The effective federal funding of research per faculty researcher has in fact begun to decline. The effect of this decline is to transmit pressures to other university funds which, alas, are increasingly overcommitted.

University funds from *all* sources have certainly grown extensively in recent years. But the growth rate, as with federal research funds, is not keeping pace with the growth in student and faculty numbers, with the demands of both students and faculty for higher quality facilities and services, and with inflation in other operating costs.

Let us turn first to the state universities. Although it is certainly true that state legislators are now lavishing more funds upon their various expanding state university systems than was ever dreamed of a decade or so ago, I am told by my friends in the state universities that the state legislature all too often responds to the need for new funds only after the students are already registered at the campus. In addition, there is a serious lag while new buildings are under construction and new faculty members are recruited to occupy those buildings in order to provide the kind of instruction that the students already needed when the appropriation was made in the legislature.

If this picture is even partially valid, it is a forlorn hope to expect that state universities can somehow carve new and expanded research support out of resources that fail to keep pace with the teaching needs for the many undergraduates descending upon the campuses. It is especially forlorn when one recognizes that the states have in the past relied on the federal government to support research, and thus have not adjusted to the notion of bearing this added cost item. An interesting confirmation of the inadequacy of state funds to support the state universities is provided by a booklet put out by the National Association of State Universities and Land Grant Colleges entitled "Margin for Excellence" (*1*). This booklet contends that these public institutions require, in order to be really excellent, an extra margin of financial support provided from *private* sources —a contention about which we shall say more later.

It is clear that the state legislatures can, in at least some instances, be generous in their efforts to support excellence. For example, the Einstein and Schweitzer chairs in the state of New York provide for each professor a "package" of something like $100,000 per year, a very substantial portion of which is usable for salary. The margin for excellence in this example does not seem to be private support, and, indeed, obtaining approval of a state legislature for such out-of-line salaries has apparently proved easier than finding private sources. Not even private universities have found private support for salaries at the level provided by these state-supported chairs.

What about the private universities? These institutions regard as one of their major reasons for being their ability to provide a very high quality education. At their best they can offer a more personalized kind of instruction in an uncrowded setting, because they are not faced with statutory requirements to take all comers. These institutions feel an intense pressure to provide the highest quality of education because they are acutely conscious of burdening the student with tuition charges. The quest for quality means attracting high quality faculty to teach the undergraduates, and that in turn means maintaining strong graduate and research programs to attract and hold the faculty. These are the very programs, whether in public or private universities, that are primarily supported by federal funds. The present squeeze on federal funds thus deals a body blow not only to strong graduate education, but also to quality undergraduate education.

Private University Problem

The decline in federal funds is only the beginning of the problem for the private universities. There are a number of other factors which have seriously curtailed the growth in financial support for private institutions.

The first factor is that inflation in costs has substantially exceeded the rate of growth in endowment income. There are lots of reasons for this. With the investment practices current in universities, and with restrictions which donors sometimes put on dis-

The author is executive vice chancellor and professor of physics, Washington University, St. Louis, Missouri. This article is based on his remarks at a session, "Science and Government: Short-Term and Long-Term Support of Basic Research," held at the National Academy of Sciences in March 1967.

posal of assets, it requires on the average more than $25 million of endowment to provide $1 million of annual operating income. Few universities, facing the kinds of pressures of finance that are now upon them, could afford the luxury of salting away $25 million (if they had the opportunity) in order to obtain only $1 million toward next year's operating expenses. One can suggest, of course, that a significant portion of endowment funds should be put into good growth stocks so that there can be substantial capital gain. In fact this is done to a considerable extent. However, the legalities surrounding the investment of funds which were designated as endowment by the donor normally require the capital gain to be considered as part of the corpus of the endowment and not as income. A number of universities have recently begun legal studies to seek ways to use a portion of this capital gain. Unless such methods are found, the capital gain in endowment during a particular year can be $10 million while an operating deficit of $1 million pushes an institution closer toward the wall.

A second factor in the declining growth rate of income to private universities is the invasion of the area of private philanthropy by the state universities. The magnitude of this encroachment may still be small proportionately, but there is an organized effort behind this invasion, as mentioned earlier. Admittedly I have a private university bias, but I am astounded by some of the assertions in "Margin for Excellence" (*1*). Only an incredible forbearance on the part of private universities can prevent this booklet from becoming a very divisive force in higher education.

A third influence—which may or may not be waning—is the effect of a low stock market on private donors. Wealthy individuals who look favorably upon universities as objects of their philanthropy were hard pressed in 1966 to feel as wealthy as they did a couple of years ago. And gifts based on stock market holdings at low value provide less tax relief for the donor.

A fourth effect that has reduced private giving to universities is very difficult to measure accurately, but it certainly should not be underestimated. It is the effect of alleged student and faculty opposition to the Vietnamese war and of certain highly publicized aspects of student behavior—from long unruly hair to use of drugs in some instances (2). Potential donors often seem to join some members of the general public in making the mistake of viewing specific publicized incidents as typical of the faculty members and students of our universities. Presumably, donors really have to like the university in order to give substantial portions of their hard-earned resources to it. At the present moment in our history, many of them simply find it more and more difficult to like the universities, and previously expected support has not been forthcoming.

We have talked about financial squeezes in more or less numerical terms up to this point. That is, we have referred to the rapidly increasing numbers of undergraduates on our state university campuses, and we have referred to the pressure on private institutions to strengthen their graduate programs, which of course means some increase in the number of graduate students. But, beyond the effects indicated by a mere count of the number of undergraduate students, of graduate students, and of faculty researchers on the campus, there is what the Physics Survey Committee of the National Academy of Sciences called the process of maturation of our educational system. The point here is that the U.S. educational system is still engaged in a transition from the situation of the 1920's and 1930's, when serious scholars of sicence in the U.S. often had to anticipate the necessity for carrying on graduate studies or postdoctoral studies abroad before they would be prepared for careers in this country. Since World War II, we have been steadily engaged in a process of establishing quality research and graduate study on U.S. campuses, so that we might have a fully self-sufficient educational system that leads the world. This effort to establish research and graduate study in the United States is still far from complete. To make it complete, there will have to be further investments in graduate research facilities, in reducing teaching loads in some institutions, and in increasing faculty-to-student ratios. So long as substantial portions of the higher educational system remain immature, we must expect that the growth rate for the funds supporting graduate education and research will need to be far larger than suggested by the simple numerical increases in overall numbers of students at all levels.

"Red Tape" Problem

Our universities are becoming morasses of red tape. Fifteen years ago, when federal support of research was just appearing on the campus, there were prophets of gloom and doom who predicted that federal funds would surely lead to an encroachment upon the academic freedom of the universities. So far, there has fortunately been little evidence indeed of encroachment upon that freedom. But university business offices and accounting have been wholly taken over, in effect, by federal procedures, regulations, and auditors. With effort reports, cost sharing arrangements, progress reports, proposals for renewals of grants and contracts, and of course accounting in detail for the expenditure of every special fund associated with each of our hundreds of contracts and grants, our business and administrative offices wallow in a welter of wasteful work.

It may be argued by some that we can recover the cost of all this kind of activity through the indirect or overhead charges associated with our contracts and grants. It is true that, after years of being limited by federal statutes which expressly prevented full payment of indirect costs, we have for the last year or two had legislation which permitted us to attempt to recover full costs as audited by the Bureau of the Budget rules and regulations. Readers may not be familiar with just how the indirect cost rate is determined. We in the universities audit our indirect costs, and our audit is examined by the federal government's auditors. The rules are the rules of the Bureau of the Budget's famous Circular A-21. That circular, at the outset, does not allow all the costs to which the universities feel they are entitled. But even our audit of the costs allowed by Circular A-21 may be disputed by the Government auditors. Finally, after negotiation, the government approves an indirect cost rate which can be substantially less than that determined by the university. However, new indirect costs during a particular fiscal year—such as those which were required to set up effort-reporting and cost-sharing procedures—cannot be put into the indirect cost rate until the *next* year, based on the audit of this year's cost. In summary, we are not allowed full costs as we would determine them, and there is a lag in collecting allowable new costs as

additional red-tape tasks are loaded upon the university.

But perhaps the most serious effect of all these red-tape problems is a kind of an intangible change in the nature and quality of the university. In its current form, the entire cost accounting syndrome is, it seems to me, intrinsically foreign to the academic atmosphere. As these cost accounting procedures settle over the university like a pall, we all find it more and more difficult to discern the distinction between the university and a business corporation in which the financial statement—not educational accomplishment and scholarly achievement—becomes the determining factor in measuring success or failure. Is this really good for education and scholarship and fundamental research? Is there no way at least to halt the trend of the last few years which, if continued, could ultimately immobilize the creativeness of our universities in the shackles of time clocks and unproductive record-keeping?

Instant Cures for Applied Problems?

For some reason, the country seems suddenly caught up in a demand for instant solutions to all its problems. Although the federal government and protesting student groups may disagree on the specifics of a policy in Vietnam, some of the federal agencies and some of the student groups seem to agree on one general principle: ignore the fundamentals and solve our various problems immediately. In a word, it is the demand for *relevance*. Some of the students don't want to learn the basic laws of science, to do mathematics, or to learn history because they are not yet able to see the relevance to the problems of modern society. The federal agencies, whether for budgetary reasons or for philosophical reasons, sometimes appear to downgrade basic research because they don't see its relevance to putting a man on the moon or to treatment of cancer or to devising a better weapon for the jungles of Vietnam. There is a kind of an irrational demand to do this or that *now*, without taking the time to develop the tools to do the job at hand (*3*).

Out of these attempts to achieve solutions at less than the real cost (a demand for an unreasonable kind of cost effectiveness) come efforts to *use* the university, in the crass sense of the word. Agencies ask the university to develop educational programs, to correct deficiencies in primary and secondary education in the cities, to develop social action programs to deal with poverty or alcoholism or other social problems in the cities, or to turn scientific research into solution of engineering problems for mission-oriented agencies in Washington.

But here, as in every other product the university produces, no one wants to pay the full cost. The university is regarded as a source of infinite wealth just waiting to be lavished on solution of the various problems which run rampant through society. Society seems to have forgotten that the primary functions of the university are teaching and research, both of which are necessarily forerunners to training and equipping those who *will* try to solve the important applied problems of our times. If universities sold their services at a profit and were participating in an expanding economy, then it *would* make sense to ask the universities to reinvest some or all of the growing profits in these new social programs. The difficulty is that all services are sold at a loss and there simply are no uncommitted general funds.

Sources of University Income

We have already alluded to the factors which have curtailed the growth of financial support for private universities. In this section, I want to focus less on what is happening to growth rates and more on the sources of income that are today available to the private university. Consider my own medium-sized private university which, in fiscal year 1966, spent on its educational and research programs some $40 million. This omits cost of dormitories and food service, on which the university loses relatively little (*4*). Let us find out what were the sources of income to meet that $40 million expenditure.

First of all, there is endowment. We are a medium-sized university (even small by public university standards), yet we have one of the larger endowments of private institutions in the U.S. (ranking somewhere between 20th and 25th). Its market value at the end of 1966 was approximately $120 million. Presumably it is the size of that number that leads some of our townspeople mistakenly to regard us as a rich institution. In point of fact, of course, that endowment earned income in the year 1966 amounting to a little less than $4 million or less than 10 percent of the total operating expenditures of the university. If endowment income is that small, how did we operate the university at all?

Well, first of all, we charged the students a substantial tuition. In 1966, it was $1700 for the academic year. Tuition provided in fact about $10 million or one-fourth of our operating costs. Government research grants and contracts provided another substantial portion of our operating funds, $14.5 million or about 36 percent of the expenditures of $40 million. (That percentage is not high for quality institutions of the U.S. If it seems high, consider the major institutes of technology which receive something like 75 percent of their operation funds from the federal government.)

We have now accounted for some $28.5 million of the $40 million spent. Where did the other $11.5 million come from? It turns out that there are some miscellaneous sources of direct income, just one example of which is patient and laboratory fee collections at the medical school, and all of these various sources totaled $3.5 million. Then there are a number of so-called organized activities for which we expended $3 million which was offset by $3 million of income. That leaves finally $5 million of income to account for.

The $5 million remaining came from private sources; half of the sum was restricted, and the other half was unrestricted. It is, in fact, the $2.5 million of unrestricted private annual giving upon which we have had to depend to try to keep the university solvent. It is a struggle each year to raise these funds and in 2 out of the last 6 years we have fallen behind, with the result that we have a substantial accumulated deficit.

One point of this discussion is to dispel the myth that a university's endowment of over $100 million represents great institution wealth. Another myth is that somehow the university sits on top of a large pile of "general funds" which can be used to meet various purposes such as increasing faculty salaries, cost-sharing on federal grants, or underwriting the solution of applied problems within the community. *The simple facts are that we sell*

our research, we sell our educational functions, we sell our social service to the community—everything—at a loss. Before the tuition is ever collected, it is more than obligated to pay the salaries of the faculty. Endowment income is, for all except the half dozen or so wealthiest universities in the U.S., becoming an almost negligible component of the annual operating income of the institution. It may not be enough even to maintain the physical plant.

Our universities have on their faculties talented and highly trained people, they have in their libraries valuable books, they have in their laboratories unique and valuable equipment, and they have among their students eager and gifted minds hungry to learn.

All these resources can be and should be made available to help the nation meet its important educational and scientific problems, and even some of its social action goals. But if society wishes to call upon these resources in efforts to meet the nation's problems, *it must pay the cost.*

Finally, I cannot resist remarks on the tactics of both private foundations and government agencies which engage in the support of various educational, research, and social programs in the universities. My first complaint is that these public and private agencies have a disease that I will call "gimmickitus." Even if a university has a good, solid program of distinction and quality under way, one cannot sell it to these agencies unless it is dressed up to indicate a new angle or some alleged new approach. I suppose it is easier to recognize that a program is new than to select the best programs from existing ones. Or perhaps it is easier because there are fewer new programs than existing good ones. In any case, the tendency is to regard good, solid, substantial work as simply not exciting or "innovative" enough to merit support. (This comment does not apply so much to project support grants as it does to institutional programs and grants.)

A second tactic is what I call the "hit and run" approach of the foundations and government agencies. The thought here is that the foundation or agency money is to be used for a period of time as "seed money." The agency wants to get something started and then pull out, leaving it for the university to sustain, from its "general funds." This of course has to mean previously uncommitted general funds —but we have seen earlier that there are no such funds, at least in most private universities.

American private universities and their independent boards of trustees certainly are grateful for the substantial institutional support they have received from agencies such as the National Science Foundation in its Science Development Program, and from private foundations such as the Ford Foundation in its program of challenge grants. But, given the other fiscal developments that have been described earlier in this article, given the Ford Foundation's apparent decision to abandon its program of challenge grants, and given the fact that none of the customers of the university seem to expect to pay full costs, it is tragically clear that the invaluable quality national resource represented by the private universities of the U.S. faces a crisis of survival.

References and Notes

1. "Margin for Excellence. The Role of Voluntary Support in Public Higher Education," National Association of State Universities and Land Grant Colleges, 1785 Massachusetts Avenue, NW, Washington, D.C. (1966).
2. The influence of mass media through disproportionate emphasis on what they or their readers consider unorthodox behavior—whether in universities or elsewhere in our society—must torture the consciences of news reporters, editors, and publishers. This influence seems to me to be a subject that merits extensive social science research.
3. These tendencies on the part of some program officers within the federal agencies appear to the writer to be either over-reaction or mistaken reaction to statements of the President. Careful reading of the President's pronouncements on science will show his interest in applications *and* his appreciation that a strong foundation of basic science is essential. See, for example, President Johnson's letter of 6 April 1967, transmitting the annual report of the National Science Foundation to Congress.
4. The entire residential campus was built during the past 10 years, and there are larger capital costs to be amortized than for most universities.

NEWS AND COMMENT

Columbia and Its New Filter: Smoke Over Morningside Heights

New York. When Columbia University called a press conference to announce that it had been given the patent rights to a new cigarette filter, there were few signs of the hostile clamor that would follow. After all, cigarette smoking is hazardous and scientists have long been searching for ways to make it safer. To Columbia officials, the filter, which drastically reduces tar and nicotine content in smoke, obviously seemed to be in the public interest.

The press conference ended this simple view of things. What was expected to be a reasonably small and quiet briefing turned into a two-hour free-for-all as more than 100 reporters fired angry questions at Grayson Kirk, Columbia's president, H. Houston Merritt, the Dean of the Medical School, and Robert Strickman, the inventor. In the ensuing weeks, the University was the butt of both jibe (see, for example, Herblock's cartoon, page 521 and serious criticism. The announcement of the filter had—as far as the University's public image was concerned—backfired.

The attacks followed several well-defined patterns, and in each case, the critics accused the University of acting improperly. They saw Columbia encouraging cigarette smoking by its endorsement of a filter. They were appalled by the "hoopla" of the press conference and envisioned the University making an unwise venture into commercialism—in this case, the product was a cigarette filter, but what next? And finally, they were disappointed by the University's decision to make the announcement through the public press rather than through the normal channel of scientific communication, publication in a professional journal with the findings for all to see.

Had University officials handled the press conference astutely, they might have cushioned the shock. But the press conference was a disaster. Reporters, in general, do not like people who either hide information or appear ignorant of things they "ought" to