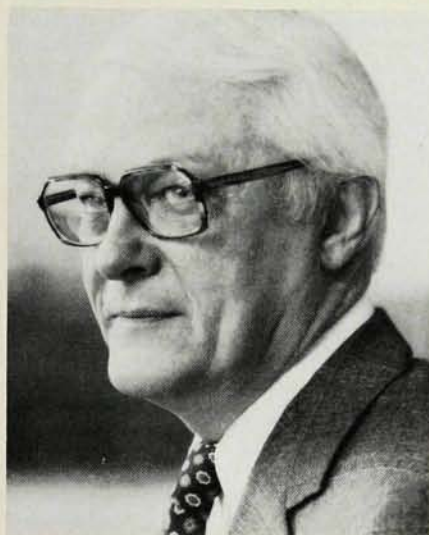


Funding academic research facilities: A duel over tactics

What is the most pressing problem for university science? The answer, at least for some 150 people in the National Academy of Sciences's vaulted auditorium on 22-23 July, is the need for up-to-date facilities and state-of-the-art instrumentation. They had come to steamy Washington—these academic mandarins, industrial executives and government bigwigs—for a highly heralded conference sponsored by the White House Office of Science and Technology Policy, the National Science Board and the Academies of Sciences and Engineering. Here was a chance to come up with new ways of paying for building and modernizing academic laboratories. It also was an opportunity to try once again to put an end to one of Washington's most venerable ways of obtaining capital gifts for the folks back home—by engaging in pork barrel politics. In the end, the meeting, titled "Academic Research Facilities Financing Strategies," revealed that academics and scientists can be just as combative in real life as they are portrayed in C. P. Snow's novels.

That higher education's research facilities and instruments are in a sorry state has been amply documented in a series of studies going back to a 1971 report by the NAS. It has become worse since, because government programs were either cut back or cut out at a time when Washington was outraged by campus demonstrations against the Vietnam War. At the same time the Mansfield Amendment, which Congress appended to the 1970 Military Procurement Act, prohibited DOD from sponsoring research not directly related to specific missions or functions. Since then, the cost of replacing or remodeling buildings and purchasing new equipment has risen even faster than the nation's inflation rate.

The result is that the years of neglect have left the situation grimmer than ever, particularly now, when Washington is preoccupied with holding down nonmilitary outlays as its way of dealing with depressing budget deficits. Today's estimates of how much money it would take to replace or renovate



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outdated instruments, unsafe labs and crumbling facilities run from \$5 billion to \$40 billion over the next decade. Not surprisingly, the Science Board documented in a recent report (PHYSICS TODAY, July, page 59), that 15 universities have managed to grab more than \$130 million in special appropriations during the past three years to build new research facilities, with the help of influential friends in Congress and hired hands in lobbying firms. In every case they have done so without conventional peer review and without hearings or debate.

A threat. "The direct appeal to Congress by educational institutions for funding scientific facilities undermines the peer review process," said the Science Board last March in its uncharacteristically tough report. "This could well threaten the integrity of the US scientific enterprise that is the basis of the scientific, technical and economic competitive position of the US in the world."

In his introductory remarks at the July conference, Science Board Chairman Roland W. Schmitt, who is vice-president for research at General Electric, admitted that the report "generated some concern—in my view, quite understandable—as to whether the science establishment was just trying

to circumvent legitimate interests and actions by Congress, to preserve the status quo of inequitable distribution of NSF funds for science, or to use merit review as a smoke screen to cover what is really a power struggle between the 'ins' and the 'outs.'" (See Schmitt's editorial, PHYSICS TODAY, September, page 144.)

Critics argue that the 30 leading research universities, which received half of the government's \$5.1 billion for basic science in 1983, want to keep the peer review system in place to perpetuate the pecking order. They claim that peer reviews are appropriate for deciding which researchers would do the best science, but inappropriate for selecting what buildings or major facilities to fund at which campus.

"This view might be correct if we could separate bricks and mortar from research," said Schmitt. "But increasingly we cannot. We cannot do microelectronics without clean rooms with air 100 000 times as pure as normal rooms and with floors virtually free from vibration. . . . We cannot do large-scale computation without computer rooms with carefully controlled environments."

The have-nots also grumble that merit-based review perpetuates inequality. "That's true," Schmitt admits, but "Excellence in science is not an egalitarian objective. . . . Once we deviate from merit-based criteria, we quickly get lost in a sea of other possible criteria, none of which will build excellence as well as merit, and all of which will create their own forms of inequality. Certainly we do not wish to substitute the skill of lobbyists for the merit of scientists."

"Finally, merit-based review has been challenged as inappropriate for creating new centers of excellence and talent. . . . Clearly, different criteria need to be applied to the creation of excellence than to sustaining and strengthening it. They might include judgments about the commitment and potential of the sponsoring institution, the creativity of its plan and the realism and adequacy of its proposals for carrying out that plan. But are not

these, too, merit-based criteria? And how do we assure that excellence is the hallmark of new centers of research?"

A distraction. Peer review and political pork threatened to become the focus of the conference, distracting from its central purpose: to seek innovative solutions for financing the academic research infrastructure. Before the participants left the auditorium to attend the five workshops on financing strategies, Schmitt warned them that trench warfare would leave many wounded. "We cannot afford to break up into factions that try to outflank each other. . . . We must fight out our differences among ourselves—at meetings like this one—and then work together to achieve our mutual objectives," he said.

Schmitt's plea for a unified approach to the problem went unheeded. At the sixth workshop of the conference, a session called "Comprehensive merit evaluation for facilities," a duel broke out over words and deeds. Defending the academic establishment were several champions of merit review—notably, Richard C. Atkinson, former NSF director who now heads the University of California's San Diego campus, and Norman Hackerman, president of Rice University and onetime Science Board chairman. Their fiercest opponent was John R. Silber, president of Boston University, who spoke out against the "tightly knit old-boy network" at the principal research schools and the "academic cartel" led by the Association of American Universities—a frontal attack he has made before (*PHYSICS TODAY*, August 1984, page 65).

Boston University, it so happens, appears on the Science Board's dishonor roll for wheeling a \$19-million appropriation from Congress last year for a new Science and Engineering Center—though Silber needs to raise an additional \$70 million elsewhere before the center can be completed.

New phraseology. Silber's tactics worked. He supported the phrase that NSF staff chose to supplant peer review for facilities. The phrase is "comprehensive merit review"—a concept that takes into account such factors as "local capabilities and aspirations" and "social, economic and political considerations" in the decision-making process for academic research facilities. This approach, said Silber, "acknowledges complexity where complexity exists." A statement endorsing the idea of comprehensive merit review was approved by a majority at the workshop. While nodding politely to the traditional principle of scientific peer review, the workshop recognized the legitimacy of Congressional intervention.

Still, when the statement reached the floor, there was strong criticism.

First on his feet was William D. Carey, executive officer of the American Association for the Advancement of Science, who reminded the audience that the Science Board, most of the major scientific organizations, including his own AAAS, The American Physical Society and the Academy of Sciences, had issued statements "in opposition to 'fence-jumping' when it comes to obtaining Congressionally funded research facilities for universities which bypass the quality control that has operated for a very long time."

Such strategies were used in the past, said Carey, who had been a budget bureau official in the 1960s, "in periods in which we did not face the acute constraints that we now face. Many of them occurred at a time of economic expansion and growth and discretionary resources—a situation that does not prevail today, when there are apparently no discretionary resources."

'Cut a deal.' By introducing a different concept "in competition to peer review," Carey warned, universities will be forced to "shove and push and cut a deal . . . a situation where it's every man for himself." To Carey's side came Frederick Seitz, former president of NAS and retired president of Rockefeller University, warning that "if you open this door of fence-jumping too wide . . . it will become very, very wide," and the whole merit review system for scientific infrastructure "will be politicized."

Silber defended his position with fervor. During an earlier debate at the workshop, where participants relied mainly on anecdotes, Silber had said it was clear that "wholly objective" peer-review standards were never predominant in Federal decisions about constructing scientific facilities and, therefore, "no one has bypassed anything." The direct approach to Congress, he went on, is usually "the only approach available and, consequently, any notion of illegitimacy or any notion of bypass is nonscientific and false, with no evidence to support it. . . . When we talk about peer review, let's not talk about it as if it were the Immaculate Conception. Let's talk about it the way it really is." Silber referred to studies by scientists indicating that peer reviews were often marred by bias.

Against bypass. Bernadine Healy, a physician who is deputy director of the White House science office, disagreed with Silber's dictum that the academic bypass, like the medical bypass, was sometimes an essential operation to maintain a lifeline for the problem of facilities failure. Even so, she said, bypass should not be seen as an attack on peer review. It is another procedure in the care and feeding of ailing colleges and universities. "If one thinks

only about a single solution for a diverse population, whether for humans or universities, we face dangers of homogenization," she said. "We need to provide the opportunity for people and institutions to develop. In the case of academic institutions, the so-called B or C places need to have chances for attaining facilities so that they may become Class A institutions of recognized merit." When Jack Yost of Purdue asked Healy how many Class A institutions the nation "really needed," she replied: "I believe in a free market system—as many as the market will bear."

As other scientists and administrators joined the fray, it became apparent that most were caught in a conflict between academic principles and economic realities. To help solve the problem, Representative Don Fuqua, a Florida Democrat and chairman of the House Committee on Science and Technology, informed the argument-weary audience about the legislation he introduced last June. His bill, the University Research Facilities Revitalization Act of 1985 (HR 2823), would provide \$10 billion in a decade, beginning in fiscal 1987 with some \$470 million in the science budget to prime the pump for academic facilities—a sum that is somewhat less than 10% of the total that the six foremost Federal agencies now devote to science R&D. During the second through tenth years of Fuqua's proposed program, each of the agencies, including Agriculture, Defense, Energy, NASA, NSF and the National Institutes of Health, would set aside 10% of their R&D funds in a systematic investment program for academic buildings or other facilities, which would provide some \$10 billion in all. The bill also calls for at least 15% of the money to go to colleges and universities that rank below the first 100 in overall Federal R&D spending. It carries a 50% requirement for matching funds from the institutions, states and private sources.

Fuqua's bill is not the first of its kind. Missouri senators John C. Danforth and Thomas F. Eagleton introduced somewhat sketchy legislation in June 1983, with the idea of providing a blueprint for Congress to construct an enduring facilities program for universities. While many academics are attracted to the new scheme, as they were to the 1973 bill, Fuqua himself describes it as a "trial balloon" for arousing Congress to deal with the problem. But, with Congress concerned with budget deficits and tax reform, few people, including Fuqua, count on any action on the bill until next year, if then.

Zero-sum. The principal sticking point of Fuqua's bill is that, in effect, it turns science research and academic

facilities into a zero-sum game. Although the provisions would go into effect only if science research is allocated more money than it gets now, the bill calls for diverting new funds the agencies could otherwise spend to increase research on campus.

Congressman Buddy MacKay, another Florida Democrat, gave some unsolicited advice to the NAS assembly. He urged them to make common cause with state officials, corporate executives and public-interest leaders. He cautioned that "if they see an irreversible move to the pork barrel, they are no longer your supporters"—rather, they will be competitors with superior skills when it comes to "reaching for the levers of power." MacKay addressed the squabble directly: "Unless we expand this nation's commitment to basic research," he said, "you are going to be at each other's throats."

Lest the audience not grasp MacKay's meaning, Fuqua, at another session, was more blunt. It would be folly, he said, if scientists and academics think the Federal government will provide "the kind of money you people are talking about. There's no way that's going to happen. We're in for some rough, rough times—at least until the end of this century."

Funding academic research facilities can be more complicated and controversial than appropriating money for a new weapons system, according to Fuqua. Large sums of money for academic research will be "hard to get," he said. "We've grown accustomed to success. The public wants to know when it's going to get something useful. A good deal of the public just doesn't understand basic research... What you must do is look to alternative financing... in new investment strategies."

Among the ideas for financing new buildings and facilities:

► State bond issues, such as the \$90-million issue that New Jersey voters approved in November 1984 for academic high-tech, was a concept advocated by Edward Bloustein, president of Rutgers University. The issue provided Rutgers with \$38.2 million earmarked for laboratories to study ceramics, food technology, biotechnology and computer-aided production tech-

niques. In addition to this, Rutgers, which can issue tax-exempt bonds, like most state universities, sold \$17 million in general obligation bonds to supplement the state's funds. Interest and principal on the bonds will be paid back from overhead charges to Federal grants that would otherwise go to the state.

► An independent, nonprofit corporation that would be funded by Congress, with additional contributions from business, foundations and other investors, for the purpose of providing direct loans as well as credit supports



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and "leveraging" guarantees so that banks and other financial institutions can offer low-interest tax-exempt bonds to finance large academic projects. The idea comes from David C. Clapp, partner in the Goldman, Sachs investment house. In this concept the leveraging capability is similar to the Federal program of Urban Development Action Grants, which provides direct grants or low-interest loans, in combination with tax-exempt borrowing, for rehabilitating inner-city areas. Clapp's idea already meets requirements of the Internal Revenue Code pertaining to tax-exempt financing. But he foresees trouble ahead if the Reagan Administration's current tax-reform plan becomes law, thereby eliminating tax-exempt bonds for private educational and health-care institutions. Even so,

Clapp argues, Congress could preserve the proposed corporation for academic facilities by enacting a special provision dealing with the matter.

► Variations of financial arrangements already practiced, such as linkages between university medical centers and pharmaceutical companies, consortia formed by an entire industry in cooperation with universities (as, say, the Semiconductor Research Cooperative in California's Silicon Valley), university participation in industrial parks, alliances between a single school and a single company or Federal agency (as, say, NASA's support of Caltech's Jet Propulsion Lab), and organizations of universities formed around a local or regional research center, or operating a large national facility.

Such concepts for improving the condition of the nation's academic research infrastructure have been argued at length for nearly two years by a White House Science Council panel headed jointly by David Packard, board chairman of Hewlett-Packard Co, and D. Allan Bromley of Yale. Although the panel's central issue is whether US universities are up to training enough talented scientists consistently and continuously for the foreseeable future, the study of the current health of academic science is also reviewing the problem of physical facilities. One of the key recommendations of the long-awaited Packard-Bromley report calls for faster write-off periods for campus R&D facilities. As it is now, universities charge the government 2% overhead on each contract for facilities, meaning that buildings and labs are written off in 50 years. The panel is reportedly seeking a 4% or 5% overhead, which would enable colleges and universities to pay off their facilities in 20 to 25 years—a period considered a more reasonable lifetime for research installations.

"It is in the national interest," Schmitt told the conference on facilities financing, "that the government provides the right climate for appropriate investment by the public and private sectors to meet our present and future demands for innovative talent and new knowledge."

—IRWIN GOODWIN

Upgrading academic research equipment: Search for solutions

The rapid obsolescence and deterioration of research instruments "threatens the quality of our academic science as well as the quality of education of new scientists and engineers," Richard A. Zdanis, vice-provost of Johns Hopkins University, told the House Science and Technology Committee on 5 September. This dour judgment did not

startle committee members, who are sitting as a task force engaged in a two-year study of US science policy, with academic research facilities and equipment high on the list of issues. Zdanis's testimony confirmed previous accounts that something is very wrong with the nation's research infrastructure on campus (PHYSICS TODAY, August 1984,

page 65).

Representing Johns Hopkins, which, with \$318 million for research from Federal sources in 1983, is in the top ten among some 600 colleges and universities that share \$5 billion in government R&D funds, Zdanis seemingly has nothing to complain about. But as chairman of a steering committee that