editorial

Universities' obsolete instrumentation

For years many individuals in the scientific community have been concerned about the growing obsolescence of scientific instrumentation in the universities. As long ago as 1970, when the National Science Board commissioned a study by the National Research Council, the need for new instrumentation was estimated at $200 million. Since that time, high consumer price inflation, higher inflation in instrumentation costs, and natural forces within universities in the face of declining budgets to place the highest priority on retention of quality research personnel (at the expense of the instrumentation) have combined to inhibit even more drastically the modernization of instrumentation. Donald Langenberg, deputy director of NSF, has estimated in written testimony that the accumulated need to modernize the instrumentation in university laboratories in the physical and life sciences would be at least $1 billion and perhaps as much as $4 billion.

The implications for the training of research scientists and engineers in this country are serious. It has been said that we are educating a generation of scientists who, when they move from their university training to industrial research laboratories, may experience problems analogous to those of a person from a less developed country who comes to work in a technologically advanced country. Beyond the problems in training future researchers must be an ultimate concern for whether the leading quality of US university research can be maintained. At stake is the soundness of the research base and the capability of the talent pool upon which the future vigor of our technological economy depends.

Stimulated by a number of such concerns, an *ad hoc* Working Group on Scientific Instrumentation was convened in March 1982 (see July, page 55). The initiative came from within what is now the NRC Commission on Physical Sciences, Mathematics, and Resources. The focus of the meeting was on instruments (not including centralized computers) in the $50 000 to $1 million range for chemistry, physics and related areas of astronomy and the earth and life sciences. There was full consensus that the obsolescence problem exists and that further documentation is unnecessary; notable corroborations were those of an earlier interagency working group led by NSF and studies by the American Association of Universities.

The *ad hoc* Working Group brought together over 50 scientists and engineers from the three major segments that perform and fund US R&D—industry, universities, and government—to explore new approaches and to recommend possible ways for the NRC to help. Examples of suggested new approaches that universities could consider were

- debt financing of the sort many states now provide for academic buildings
- allowing recovery of interest charges through the indirect-cost reimbursement on government-funded research
- mechanisms for funding the depreciation of instrumentation as industrial laboratories do
- one-time special initiatives for instrumentation modernization by the funding agencies.

However, there was wide agreement that special "one-shot" programs are not an answer unless accompanied by new approaches that will counter an otherwise normal drift into a new obsolescence cycle.

It seems to me, after having been responsible in my personal experience both for university research budgets and for an industrial R&D budget, that one advantage industrial research exploits to keep its equipment modern is the mechanism of the planning unit—a laboratory group or a research center of appropriate size for effectively coordinating the planning of instrumentation needs and capital budget allocations. When a scientific instrument costs between $50 000 and $1 million, the typical university research-project team is often too small a unit, and occasionally even the academic department may be too small. University-wide budgeting of major instruments may more and more be the answer.

In meeting the challenges associated with new approaches—indeed, even in developing ideas for such approaches—it is important for members of the university research community to exchange thoughts with each other and with their counterparts from industry and government. The *ad hoc* Working Group recommended that the NRC organize a series of regional workshops—east coast, mid-continent, and west coast. Within each region, experimental researchers from universities, industrial research laboratories, and federally-funded research centers would participate. I hope that physicists throughout the country will attend these workshops planned by NRC.

If physics teaching, research training, and basic research are to flourish in the future in our nation as they have in the three past decades, our university laboratories must have state-of-the-art instrumentation. But there is far more at stake here than the stature of our academic physics and of our universities. For if we allow a decline in the quality of the scientific training and the basic research that our universities produce, we shall place in serious jeopardy our technologically driven economy, which produced the overall prosperity of 1950–1980 and thereby enabled the US to afford the great social advances of that period. Modernization of university research instrumentation is a critically important step toward preserving the quality of university research and scientific training that are so essential to our national welfare.

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