COMMENTARY

UNIVERSITIES, BASIC SCIENCE, AND TECHNOLOGY TRANSFER

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In recent months there has been a flocculent array of pronouncements, written and spoken, on the need to include universities in the rush to commercialization. The arguments seem strikingly compelling, particularly to the naked eye of the uninformed and the amazement of the converted to the new religion of competitiveness at any cost.

A favorite target of this dangerous movement are universities and the practice of basic science. In the name of competitiveness of US industry in the global economy, there is an urgent call for universities to change, to adapt to the demands of the 1990s, and to emphasize industrial needs and the transfer of technology to industrial companies.\(^1,2,3\)

A basic assumption shared by many of these writers considers the university to be a supplier to the industrial company, which in turn is perceived to be a potential customer of the university. On the one side of the equation, universities have developed in the past 50 years an impressive inventory of knowledge and technology. A substantial portion of this technology was financed by taxpayers through federal grants and tuition support. On the other side, here are industrial companies, eager to receive technology from universities. It is assumed that successful transfer from universities to industry will thus enhance corporate America’s competitiveness in international markets. It is simple, engaging, and appeals to the followers. Yet, it’s also dangerously wrong and potentially harmful to our economic well-being.

Typical suggestions in the writings of this movement include: 1) resocialization of university faculty who cling to outdated practices of basic science; 2) changing the culture of American universities so that industrial linkages and technology transfer to industry will be highly rewarded; 3) changing the current infatuation of US universities with basic science, publishing, and peer review, to an environment that supports applied research and the accelerated transfer of outcomes to industry; and 4) making university research more "relevant" to the industrial corporation.

In all of the flurry of this movement to "commercialize" university research, there is an undercurrent of a perilous assumption. Universities are debasingly perceived to be staunchly inflexible and utterly resistant to any changes. Faculty are perceived to be holding onto outmoded institutions and practices, opposed to progress, and unwilling to acknowledge the dangers of the lack of global competitiveness that inflicts our economy. Thus, if faculty can be persuaded to drastically change their ways through cultural modifications, attrition, and new hires devoted to the revised tenets of the university’s role in the nation’s economy, then technology transfer to industry will become a glowing reality.

MYTHS OF SCIENCE POLICY

The arguments listed above are the product of active science-policy experts in academia and government. Their thinking is laudable, yet counterproductive and utterly disastrous if fully implemented.

There are two principal categories of myths associated with the movement to “relevantize” university research and basic science. The first category contains the myth that claims overindulgence of the university research system as an independent entity with its own rules and its own criteria for selecting scientific topics. This myth further claims that university research is encapsulated in its isolated confines of purism, with little influence from social and economic forces that essentially finance this hedonistic recluse.

Believers in this myth fail to understand how research uni-
versities and basic science function in our complex society. University research is currently guided and directed by science policymakers at the federal and state levels. Federal agencies fund the bulk of the universities' basic research. These agencies impose their agendas and research priorities on the nation's universities, to an extent that their funds dictate the direction in which basic research will flow. The system set up by the federal agencies practically guarantees wide latitude and unhindered control by the bureaucracy over the nation's basic science. Universities have become highly dependent on federal research funds for basic science.

Therefore, we already have strong science policy exercised by the many agencies dispensing research funds. Typical requests for proposals reflect the agency's priorities and channel funds to research topics deemed relevant to the agency's needs, strategic plan, and the perceived wishes of the agency's constituencies. If believers in the movement to "relevantize" university research want to impose additional control and planning of basic science, in a centralized mode, they should carefully assess the experiences of other nations. Centralized government planning and control of university research has failed miserably in Eastern Europe, and in modified versions failed in Brazil, Venezuela, and even in Western Europe. The reason that our nation's universities are world leaders in basic science is that we have struck in the past 50 years a workable balance between federal control (through funding) and academic freedom of university researchers. Any plan to upset this balance, in the name of holy relevancy, ignores the intricacies of the system and the fact that it works to the benefit of society and the economy.

The second-category myth is that university researchers are isolated, out of touch with industry, and resist any change in their practices, however beneficial this change may be to the nation's economic position in international markets. Believers in this myth lack understanding of how basic science functions, and the crucial role it plays in the nation's (and the world's) economic strength.

Basic science relies on relative freedom and the right to engage in exciting research. Universities are the last bastion of basic science. They are good at doing precisely what they do best: basic science. Any large-scale attempt to thwart their mission into the realm of relevancy will be detrimental to their natural abilities.

Moreover, in the past decade, industry has abrogated its participation in basic science. IBM has recently laid off hundreds of scientists, following layoffs by General Electric and other manufacturing companies. Conversion to a civilian economy will eliminate some basic research programs in defense-oriented industries. There are calls for relevancy, assuming that somewhere there is a basic science well from which we all draw fundamental knowledge. Yet, with industrial basic science rapidly and methodically drying up, universities are the sole major contributor to the well. If universities are restricted in their basic science efforts, who will produce fundamental knowledge?

In this sense "relevancy" is a dirty word. If we pursue the route advocated by prophets of relevancy, it will be impossible to rebuild the nation's basic science capabilities, at least in the next decade or two. Even now, with industry shedding its basic science capabilities, it will be extremely hard and costly to rebuild such capabilities when the pendulum swings back and they will again be in demand.

**BASIC SCIENCE AND TECHNOLOGY TRANSFER**

Universities are already engaged in many forms of transfer of their outputs to industry and federal agencies and laboratories. (4,5,6) Arguments abound on what constitutes transfer activities, and whether universities transfer technology or simply knowledge. Yet, universities interact with industrial firms in a variety of modes, including seminars, people exchanges, student internships, funded research, and consulting by individual faculty. Industrial firms approach the university in search of windows to technological development and a chance to enhance the scientific horizons of their staff. (7,8)

If we force technology transfer modes and mechanisms (as practiced by industry with its own R&D and its vendors) on