Changing the Federal–University Partnership

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Commentary

Changing the Federal–University Partnership

by Richard N. Zare

A diamond jubilee anniversary for the *Journal of Chemical Education* is a time to learn from history and a time to look forward. It is also such a time for the federal–university partnership. That partnership, having its antecedents in the land-grant colleges established after the Civil War, witnessed rapid growth following World War II and the launch of Sputnik, but now shows signs of weakening as each partner demands more of the other and seems to offer less. There is no question that the university system will survive and that some relationship will exist between it and the Federal government. The question is whether this relationship will be that of a functioning partnership or that of contractor and contractee. If only the latter, then we will have lost something quite precious.

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In its support of research and graduate education, the federal–university partnership has been a huge success. Students from all over the world clamor for admission to our universities. Much of this extraordinary success can be attributed to a uniquely American notion, namely, that fundamental research and graduate education reinforce each other and are best pursued in an environment of free and open inquiry, centered on university campuses. By implementing this concept, we train the next generation of highly skilled members of the nation's work force while at the same time achieving research breakthroughs that contribute significantly to our nation's health, wealth, and quality of life.

Although impressive statistics show that the nation is getting an excellent return on its investment in this partnership, I see clear indications of stress and distress in the two partners as the federal discretionary budget shrinks and as universities find that tuition, endowment, and government contributions are not increasing at a rate that keeps pace with rising costs. Universities, one of the most enduring of human institutions, resist change. Yet paradoxically, what makes universities so durable is their ability to adapt to new circumstances. My comments examine some of the forces for change today in the federal–university partnership.

Both partners bear responsibility for maintaining the relationship. On the government side, one clear problem is excessive regulation, often accompanied by ambiguous directives. In a speech given at my home institution, Stanford University, to the National Commission on the Cost of Higher Education, University President Gerhard Casper said, "Approximately seven and a half cents of every Stanford tuition dollar go toward supporting these regulatory costs." He further estimated that an additional five cents of that dollar are consumed by faculty–staff time spent in attempting to be in compliance.

Mixed messages are not only irritating, they are also expensive. Universities are routinely encouraged to invest in improvements in their research infrastructure. Yet the policies for cost reimbursement, not to mention building codes, are revised with such frequency and even arbitrariness that prudent planning is rendered problematic. All these regulations are imposed with the best of intentions, but the cumulative effect would be comical if it were not so harmful. To make matters worse, these regulations are often administered with an accountant mentality and in a peremptory manner that de facto sets policy, in contradiction to the spirit of a partnership.

Universities are not keeping their end of the bargain either, and their rhetoric is troubling. For example, they demand full recovery of expenses incurred in association with carrying out research; but a real partnership means that both parties contribute, even if unequally, to the costs of research that is for the benefit of both. Universities are slow to correct some serious problems of their own making. Let me give an example.

University productivity has not increased much in many decades. While costs continue to escalate with concomitant increases in tuition and faculty salaries, universities have been painfully slow to incorporate into instruction advances in information technology. One would expect universities, as organizations that are sometimes called "knowledge factories", to be greatly affected by those rapid advances in how we compute, how we prepare papers for publication, and how we convey information to others. Yet most universities have not given sufficient attention to ways the delivery of their services can be enhanced, without sacrificing quality, by the current revolution in information handling and communication. Emerging information technologies have removed constraints of space and time, so that we can deliver educational services to anyone at any place and at any time. This fact may signal a major change in the demographics of students, because the new information technology makes it possible to reach a much broader potential student body and engage students in a lifelong pursuit of learning. Woe to those who ignore this force for change.

Some problems in the partnership demand attention from both parties. Few people seem to realize that the very nature of scientific investigation is changing. Much leading science today proceeds by solving complex problems that cut across many disciplines. The federal–university partnership needs to adapt to this new kind of research that is conducted by a network of investigators at research universities, research institutes, undergraduate colleges, government labs, and in-

dustry—all loosely organized around one or more university sites, all making opportunistic connections, and all participating in knowledge production that is often powerfully propelled by cyberforces. The behavior of this network contradicts the venerated image of the cohesive, self-contained university department that can draw a sharp boundary about itself.

Many people also fail, to various extents, to recognize the breakdown of another cherished myth. Doctoral students should not be trained primarily to be the future members of the professoriate. For quite some time now the number of Ph.D. degree holders being produced has exceeded the number of job openings in academia. Real progress could be made if there were a more explicit recognition that Ph.D.'s would be better trained as creative problem solvers who can pursue a large number of options for useful, satisfying careers. I suggest a reshaping of Ph.D. training so that the Ph.D. degree comes to mean not only deep mastery of at least one research area but also some breadth in preparation for multiple career opportunities.

But perhaps what most threatens the federal–university partnership, if not the larger partnership of society, is our failure to achieve inclusiveness. Bluntly put, we are not utilizing all the human talent pool in our country, much to our country's detriment. The statistics speak for themselves. In 1995, according to the Directorate for Social, Behavioral, and Economic Sciences of NSF, doctoral awards in science and engineering reached the highest level ever. Of the 41,610 research doctorates awarded by our nation's universities, about two-thirds were in science and engineering (S&E). But women and many ethnic groups remain significantly underrepresented among these S&E Ph.D.'s. For example, in 1995 women received 31% and blacks, Hispanics, and Native Americans received 6% of the S&E Ph.D. degrees that were awarded in our country. Yet in that year women were 51% and together blacks, Hispanics, and Native Americans were 23% of the resident population in the United States.

Is it that more white American men earn S&E doctorates? Analysis shows rather the opposite. The number of S&E doctoral awards increased from 22,865 in 1990 to 26,515 in 1995. Of this increase, two-thirds were non-U.S. citizens on permanent or temporary visas. But even in 1990 this country was relying heavily on foreign students to fill its S&E graduate programs.

Historically, we are a nation of immigrants. By attracting and accepting the world's best and brightest graduate students to American universities, we benefit through those who stay in our country, and we also enjoy the benefits of goodwill ambassadors through those who do not. But it can also be argued that as a society we are failing to draw upon our homegrown talent. Such a society cannot long cohere. In rethinking the federal–university partnership, we must seek to put in place incentives to increase the diversity of Ph.D.'s awarded among our own population. Clearly, the solution to this fundamental problem must address the educational system long before graduate school. Moreover, this problem cannot be solved for many years to come, so we will need to continue to attract outstanding foreign students to our Ph.D. programs. But at the same time we must increase the diversity of our Ph.D. degree holders soon; the window of time in which we can make opportunities available to all our citizens is closing.

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We confront today two contradictory principles, each of which is laudable. On the one hand, we wish to avoid imposing quotas based on race and gender; on the other hand, we seek to make progress in increasing diversity in Ph.D. degree holders. The reconciliation of these two goals is our biggest challenge.

Universities find themselves in a quandary partly because the K-12 system has not successfully addressed the problem of inclusiveness. Attempting to solve the diversity issue at the university level alone is an extremely costly and probably futile way to proceed. But universities must be willing to do their share.

Perhaps a way out of this thorny thicket can be found by understanding better that all participants in our system of higher education—universities, four-year colleges, two-year colleges, and high schools—are interdependent. In this regard I believe that the entire education enterprise should be considered an ecosystem. A growing need exists to foster coalitions and alliances among all parts of this ecosystem. By working together and replacing rivalries with cooperation, we can make our ecosystem become much stronger than the sum of its parts. And in doing so, we can look forward to the continuation of the benefits we Americans reap from a highly educated and diverse citizenry.

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