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Letters to the Editor

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To Keep the Engine of Research Humming, Higher Education Must Rethink Its Organization

To the Editor;

It is time to rethink how institutions of higher education view their mission so that they can better fulfill their obligation as the major basic-research engine in society. It is time that institutions of higher education expect more of their faculty members than their being solitary investigators seeking to garner individual credit for the incremental contributions. It is time for universities to recognize that their faculty members have roles as members of large, interdisciplinary, malleable, and adaptable teams of scientists and scholars addressing big questions and problems. It is time for institutions of higher education to find ways to build multi-institution collaborations and consortiums rather than to treat one another as competitors in a zero-sum game. To accomplish these changes, it is time for institutions of higher education to rethink their organization for, and support and evaluation of, research contributions.

Most people think of universities as the places where kids go for advanced education. In fact, universities are our nation's most important research engine—a point Jonathan Cole makes in his recent book, *The Great American University*. The research and innovations that have come from institutions of higher education

are major reasons for the competitiveness of the United States in the world economy and for the status and influence of the U.S. in international affairs. This does not mean that teaching is unimportant. The best researchers are often also the best teachers. Their deep expertise and passion can be infectious and effective in the classroom and can be transformative in one-on-one mentoring in the laboratory. And teaching can have a synergistic effect on research, as the youthful exuberance, novel perspectives, and obvious questions that students bring to the enterprise can lead to new and important insights.

As the problems that scientists and scholars address have increased in complexity, the once solitary geniuses across our university campuses have changed how they work. They are now more likely to work in larger and larger investigative teams that cut across disciplinary, institutional, and national boundaries. This trend, documented by various bibliometric and scientometric analyses, has transformed how research is done in universities—and how it will be done in the future. Fifty years ago, solitary investigators were doing the most impactful research. For the past decade, it is large teams of scientists and scholars who are doing the most impactful research.

Institutions of higher education have not kept pace with these changes. Universities still evaluate their junior faculty members in terms of their demonstrated ability to make "independent" contributions. Such institutional practices limit the opportunities for these young scholars to become involved in large scientific teams and reduce the likelihood that these teams will continue to be fueled by the brightest young minds and newest methodologies.

Universities tend to provide funds to support large-scale research investigations when the expected value based on the indirect-cost

return from grants makes it rational to do so. Even then the support is available only to a small number of faculty members and tends to be in the form of physical infrastructure—a building, a telescope, or a magnet—whose impact on scholarship at a university is limited in terms of scope and duration. These investments do little to change the overall climate for research in our institutions of higher education.

Foundations, government agencies, and philanthropists who wish to promote progress on big questions or big problems find that institutions of higher education prefer to take ownership of projects for the benefit of their faculty members, reputations, and bottom lines. Given the increased multi-institutional nature of scientific teams today, this inclination—as understandable as it may be—can have a high cost in terms of obstructing progress on these questions and problems.

At present, most institutions of higher education continue to conceptualize scholarship in terms of the work of solitary geniuses despite clear evidence that this conception no longer holds. As a result, institutions of higher education are losing their competitive advantage, and as a consequence so is the U.S.

Teams, of course, can be less effective than the sum of individual efforts. It therefore is essential to continue to embrace the work of solitary scholars when that is best, and to know the problems, contexts, and individuals that favor collaborative efforts. When teams are the most potent engine, we need to develop better guides to identify the leadership style and contingencies that optimize group effectiveness.

In sum, we are at a momentous period in human history. We need to accelerate the rate of basic-research advancement if humankind is to deal successfully with looming challenges and unforeseen

problems. To accomplish this, we need to help scientists and universities develop new institutional frameworks and to promote cultural changes to permit work beyond the current disciplinary silos and intellectual straitjackets imposed by the traditional divisions and contingencies in research universities. Given that institutions of higher education are the largest basic-research enterprise in the world, loaded with extensive intellectual talent and propelled by a culture that encourages the free exchange of information, ideas, and advances, humankind—if not all terrestrial life—will be the beneficiary if those institutions change how they view their missions, how they organize their support for research, how they view their relationships to other institutions, and how they conceptualize the jobs of their faculty members. Now is the time to take a first step in that direction by creating such teams, providing the visionary thinking and infrastructure they need to excel, and sharing their insights and procedures with others.

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