No money, no research

For innovations in basic science to continue at the pace of previous decades, a solid funding strategy is needed.

Basic biological research funding in the USA is in a very different situation now than it was a decade ago. A large percentage of this research is underwritten by grants funded by federal agencies, mainly the National Institutes of Health (NIH). From 1998 to 2003, the NIH budget grew from $16.1 billion to $27.1 billion (Johnson, J.A., *Congressional Research Service*, 2013) with annual funding increases of up to 16%. In 2003, this translated to a 30% success rate for research grants. In 2014, funding cuts have reduced grant success rates overall to 17% or even less at certain NIH institutes. These numbers are alarming and could fundamentally change how science is conducted.

Prominent voices in the research community are warning that biomedical research in the USA cannot be sustained with current funding levels (B. Alberts, M.W. Kirschner, S. Tilghman and H. Varmus, *Proc. Natl. Acad. Sci. USA* **111**, 5773–5777, 2014). Hypercompetitiveness for grants discourages risk-taking and makes it less likely that applications that cannot promise success are funded. Paired with an ever-increasing pressure on principal investigators to devote more of their time to securing funding and less to conducting and overseeing experiments, this means that new ideas will go unexplored.

Young investigators find it particularly challenging to obtain funding: only 3% of all awarded NIH grants go to recipients under 37. And this understandably leads to an exodus of talent from academic research, a trend the NIH is trying to reverse by making the nurturing of young scientists (via an Early Independence Award or a Pathway to Independence Award) one of its main goals for the coming budget year.

Focused strategies to retain young researchers are welcome, but for science as a whole to thrive, predictable and sustained federal funding based solely on scientific merit must be assured. This is currently not the case. The budget requested by the NIH for 2015 stands at $30.4 billion, an amount that would restore funding to the levels prior to the deep sequester-related cuts of 2013. It represents an increase of 0.7% over 2014 funds, but even if it is passed entirely intact, it is still a decline compared to the 2003 budget in inflation-adjusted dollars. On 10 June, a Senate subcommittee approved the bill, but a full Senate committee vote was postponed owing to controversial amendments. In the meantime, both the House and Senate passed a continuing resolution that extends funding for all programs through 11 December 2014. The bill will be taken up again after the November midterm elections, but its outcome is uncertain.

It is important to impress upon the general public, and the policymakers who represent them, that those funding decisions affect far more than scientists.

Conceptually, this is easy to do. With reduced funding, ideas go unexplored, cures for diseases are not discovered and drugs remain undeveloped. Putting concrete numbers on the return on investment from research is more difficult, but it is important to include economic considerations in this debate to assess how broadly science affects other segments of society.

To assemble the tools to evaluate the return, the NIH—together with the National Science Foundation, other federal science agencies and several research institutions—launched STAR METRICS in 2010. The goal is to develop a repository and standardized measures to assess the impact of science spending on job creation, social outcomes (health and environmental impact) and economic growth.

A recent example shows the usefulness of such data. As part of the UMETRICS (Universities: Measuring the Impacts of Research on Innovation, Competitiveness and Science) initiative, an analysis of the 2012 expenditures from nine universities found that the production of research, though complex, is traceable (B.A. Weinberg *et al.*, *Science* **344**, 41–43, 2014). The study detailed how much funding money is spent on research staff and trainees and tracked expenditures on the local and national level. It brought to light that research funding supports not only large vendors but many small businesses too, which in turn build new services and products. Of course not every benefit of science is quantifiable, and grants should be awarded on the basis of scientific merit, not economic impact, but it is helpful to have a better idea of how the two are connected.

Studies such as these emphasize that spending cuts affect not only scientists themselves and the accumulation of knowledge but also the local and global economy.

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