



Crunch time for US science

Researchers must make a stronger case for funding in the face of a perfect storm of budget cuts and eroding political support, says **Jay Gulledge**.

The current US debt crisis sets the stage for a potential tipping point in federal science spending. The ideology that government-sponsored science is crucial to the well-being of society has eroded along with the cold-war security agenda, which embraced and fortified science for decades. Meanwhile, science has been pulled repeatedly into political clashes on cultural issues. Against this backdrop, the global economic crisis portends a decade-long reduction in federal budgets. To avoid a permanent retraction of government support for research, the science community must be more strategic and aggressive in conveying the value of its work to society and in gaining robust support from politicians.

US federal science spending has long been rooted in the national security agenda. The

National Science Foundation (NSF) was established shortly after the Second World War “to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense”. NASA was established less than 10 months after the Soviets launched Sputnik 1 in 1957, in a frenzied response to the Soviets’ early lead in developing ballistic missiles. Through the decades of the cold war, support for science straddled party lines.

But, after the fall of the Berlin wall, the United States stood as the sole great power and shifted its strategic emphasis from establishing scientific superiority to cultivating democratic movements in the developing world. The 11 September 2001 terrorist attacks reinforced this shift: security analysts believed that Al Qaeda and the Taliban, the main US enemies, would

be defeated by winning hearts and minds, not by building a better mouse trap.

The erosion of the cold-war security doctrine therefore removed the bipartisan backstop to science funding. The quest for economic competitiveness might reasonably have replaced it, but has not done so. For example, the America COMPETES Act, passed in 2007 and reauthorized in 2010 by Democrat-run Congresses, planned to expand the NSF’s budget from US\$6.6 billion in 2008 to \$8.1 billion in 2010, but appropriators froze NSF budgets in response to the economic crisis. The current Republican-led House of Representatives is unlikely to support the increase of science budgets. Representative Ralph Hall (Republican, Texas), the recently installed chair of the House Committee on Science, Space and Technology, has said that the ▶

▶ America COMPETES Act is “just too heavily drowned in money”.

Add to this the ‘culture wars’ that have gripped the United States for some time. They split the nation into two camps along divisive issues such as abortion, gun control and gay rights. In recent decades, some of the most contentious issues have put science in the crossfire, from evolution to tobacco health effects, stem-cell research and most recently my own area of expertise — climate change. This year, an informal survey of US Earth-science teachers found that climate change was second only to evolution in evoking protests from parents and school administrators (S. Reardon *Science* 333, 688–689; 2011).

These divisions threaten science budgets. Hall has expressed doubts about the scientific evidence for human-induced climate change and recently sponsored an amendment to the 2011 spending bill to stop the National Oceanic and Atmospheric Administration from spending money to set up a national climate service; the bill passed with support from 227 Republicans and 6 Democrats.

ECONOMIC SHOCK

In the midst of all this, the debt-ceiling deal — formally the Budget Control Act of 2011 — has the potential to administer a massive shock to science budgets. The law requires non-defence discretionary spending (which includes science funding) to be cut by \$917 billion over the next ten years, an average of 15% per year. On top of this, an automatic trigger will reduce spending on defence and on social entitlements — the sacred cows of Republicans and Democrats, respectively, if by the end of the year Congress cannot agree on ways to reduce the deficit by \$1.2 trillion over the next decade. The two parties will therefore be strongly motivated to cut non-defence discretionary budgets as much as possible.

Whether future Congresses will soften the impact of the debt-ceiling deal depends on the pace of economic recovery, the evolution of the culture wars and the public’s perception of the return on taxpayer investment in research. The scientific community can directly influence the last of these, but it needs a coherent strategy to do so. Like industry, it needs to document its net value to society and flaunt it. Unfortunately, through decades of cold-war complacency, the scientific community has developed a culture that runs counter to doing this.

An institution representing the US science community is needed to undertake a broad, ongoing, quantitative assessment of the overall contribution of science to society

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and the economy and communicate these effects to the public and politicians, through the media and other channels. As ever, the contribution to national security is a good place to start. Neutralizing today’s threats — terrorism, biological and chemical weapons, nuclear proliferation, and cyberwarfare — is an intensely scientific undertaking. Social sciences are needed to tackle joblessness, food and energy insecurity, financial disruptions and climate-change-induced destabilization of developing countries. Economic development, cost savings through innovation and efficiency enhancement, environmental quality, mental health and happiness are all affected by scientific research and development.

The American Association for the Advancement of Science is the traditional home for such cross-cutting efforts, and its work is laudable. But the ongoing public misunderstanding of science shows that the established approaches are inadequate.

There are signs of new ways of thinking. In March, the American Geophysical Union hosted a gathering of the presidents and top administrators of 17 US scientific societies and research consortia, from a broad spectrum of fields, to discuss how they might cooperate to improve public understanding of climate science — a unique and remarkable effort that should be expanded.

At the same time, science institutions need to enhance their value to society by incorporating socioeconomic benefits into their missions. Although some branches of academies already embrace this role to some extent — medical, law and engineering schools, for example — basic-science and social-science schools traditionally eschew it.

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In part this is because the production of social benefits is scantily rewarded. In the words of Anthony Janetos, director of the Joint Global Change Research Institute at the University of Maryland in College Park, at a 2009 meeting of the Center for a New American Security in Washington DC: “Nobody asks me, ‘How many policy decisions did your work inform?’ Instead they ask, ‘How many papers did you publish and how much grant money did you raise for the institute?’” Both should matter.

Peer-reviewed publications, research grants and professional impact should remain the core metrics of success in academia. But the remit should be broadened so that recognized publications include assessment reports and science-based articles in public-policy, interdisciplinary and business journals. Recognized grants should include those from mission-oriented agencies, foundations and non-governmental organizations. And recognized impact must include influence on government, business and civil-society decision-makers.

The drive for international superiority during the cold war passively nourished a wide spectrum of sciences, the true value of which manifested in an array of benefits outside defence. In today’s chillier strategic and political climate, the scientific community must work hard to enhance and advertise those benefits. Those in academia who worry about the erosion of curiosity-driven science should have a greater fear: the erosion of science in general. ■

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