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Don't hide the decline

US scientists should not be placated by the 'flat budget' myth. Funds are decreasing, and the situation will get worse.

For US researchers, the annual unveiling of the presidential budget request can be a time of both hope and trepidation. But after last year's fiscal battles with Congress, complete with an embarrassing government shutdown and painful across-the-board spending cuts, it was always clear that this year there would be little to celebrate.

In that atmosphere, the unveiling on 4 March of President Barack Obama's US\$3.9-trillion budgetary vision for fiscal year 2015 brought both disappointment and a sigh of relief. In one sense, the proposal was optimistic: it exceeded congressional spending limits by \$56 billion, and there were few deep cuts for science. But it leaves the budgets of major scientific funders, such as the US National Institutes of Health (NIH), the National Science Foundation (NSF) and the research efforts at the Department of Energy, essentially flat (see page 147).

Amid a sluggish economy and zealous calls to tighten federal purse strings, the prevailing wisdom is often to be grateful for a flat budget. Things could be worse. But those projects that stand to be gutted — such as the Stratospheric Observatory for Infrared Astronomy (SOFIA), an airborne observatory funded largely by NASA, which would have its budget slashed from \$84 million to \$12 million — stand as painful reminders that a flat budget is not something to celebrate. The proposed \$200-million boost to bring the NIH's budget to \$30.2 billion is paltry, but even worse is the \$1.3-billion cut that could be in store for the Department of Health and Human Services, the NIH's parent agency.

What is more, inflation does not stand still for flat budgets. Overall spending on research and development would increase by 1.2% in 2015 if Obama has his way. But the rate of inflation that year is expected to be 1.7%. The outlook is worse for biomedical research — here, inflation is projected to rise by 2.2% in 2015, according to the Department of Health and Human Services' Biomedical Research and Development Price Index. The 0.7% budgetary bump that Obama has requested will not keep pace.

Indeed, 'flat' budgets such as those proposed last week have steadily eroded the NIH's coffers over the past decade. Controlling for inflation, the NIH's budget shrank by 10% between 2004 and 2014, according to the American Association for the Advancement of Science in Washington DC. The real decline is even steeper when the rate of biomedical inflation is taken into account.

A similar trend is emerging for research and development overall: federal spending on research and development in 2014 is 15.8% lower than in 2010 when inflation is considered.

Greener pastures are nowhere in sight. The president's request was sent to Congress, which will produce a plan of its own. Included in Obama's request is a proposed \$56-billion Opportunity, Growth, and Security Initiative that would add \$5.3 billion to the nation's research and development coffers. But there is little reason to hope that the initiative will make it through a US Congress determined to rein in spending, opposed to raising taxes and not generally known for a willingness to compromise. These are, after all, the same legislators

who in October shut down the government for 16 days and allowed across-the-board spending cuts of 5% last year. Science suffered as a result: the NSF awarded 690 fewer grants in 2013 than the previous year, according to figures released last week by the Government Accountability Office. The NIH cut its grants by 750. The White

House's budget proposal makes it clear: there will be no compensation for these lost opportunities.

Meanwhile, the economic strain on the country is immense. Mandatory spending obligations — on retirement and health-care programmes, for example — are soaring, squeezing discretionary spending on other worthy areas, including research. As a result,

discretionary programmes are battling over slices of a rapidly shrinking pie: in 2010, discretionary funds were 39% of the budget; in 2015, they will be 30%.

This means that the fight will only be more intense in years to come. Rather than a relief, apparently flat budgets are a sure sign that competition for funds will grow still further. And that things will get worse before they get better. ■

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An elegant chaos

Universal theories are few and far between in ecology, but that is what makes it fascinating.

To some scientists in other fields, ecology must seem relatively straightforward. Many of the organisms live at a very human scale and are easy to access, especially in community ecology. Ecologists do not need special equipment to see and count elk. There are no electron microscopes, space telescopes or drilling rigs that can go wrong. Easy.

And yet, ecologists know that their subject can prove as troublesome as any other. Ecology would be easy, were it not for all the ecosystems — vastly complex and variable as they are. Even the most austere desert or apparently featureless moor is a dense, intricate network of thousands of species of photosynthesizers, predators, prey animals, parasites, detritivores and decomposers. As naturalist E. O. Wilson put it: "A lifetime can be spent in a Magellanic voyage around the trunk of a single tree." And not all of what one might learn from such a voyage would be transferable to the next tree. History, chance, climate, geology and — increasingly — human fiddling mean that no two ecosystems work in the same way.

Scientists like to impose structure and order on chaos, and ecologists