Britain's chancellor George Osborne (centre) will announce a spending review on 25 November.

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POLITICS

Spectre of change haunts UK science

Scientists fear flat budget ahead of the Conservative government's first spending review.

BY DANIEL CRESSEY & ELIZABETH GIBNEY

Uncertainty is haunting UK science. On 25 November, the Conservative government that won a parliamentary majority in May will announce its first spending review — and researchers have no idea what to expect.

Many hold that the science budget desperately needs to increase, and there is renewed pressure to implement a rise from an influential group of politicians. Current investment from both business and government is well below 2% of gross domestic product (GDP). That should be increased to 3%, an internationally recognized target, to safeguard productivity, warned the House of Commons committee on science and technology on 9 November, following an investigation into research spending.

"We need to have that increase," says Nicola Blackwood, the Conservative Member of Parliament who heads the committee. "We need a road map to the 3% target."

But despite pleas for more cash, the goal of the spending review — to reduce overall government outgoings by £20 billion (US$30 billion) by 2020 — does not give most researchers hope. If the science budget is part of the trimming — or if it remains flat, as occurred in the previous comprehensive spending review in 2010 — many say that science will suffer.

"We are so lean now I really can't take anything else out," says Michael Wakelam, director of the Babraham Institute, a life-sciences research centre near Cambridge. Even a flat budget would mean that he could not replace staff who leave and that the quality of research at the institute would decline, he says.

Intensifying the uncertainty is a government proposal announced on 6 November to axe the Higher Education Funding Council for England, which doles out around £1.6 billion each year to universities for research; scientists are also awaiting the results of a government-commissioned review into the seven UK research councils, which dish out a further £3 billion.

The 2010 spending review kept the core science budget frozen at £4.6 billion a year for five years, and slashed a smaller budget for science infrastructure by almost half.

The result was a relief to researchers because the government — then a coalition between the Conservatives and the Liberal Democrats — had committed to substantial cuts in public spending ahead of the review. David Willetts, science minister at the time, even received flowers from the founder of *Research Fortnight* magazine in the wake of the announcement, for his role in protecting science.

Although cash for infrastructure has increased since then, inflation has eroded the core science budget, forcing researchers to cut back. Another five years of the same would now be extremely difficult, says Alison Davenport, who is chair of the independent scientific advisory board to the Science and Technology Facilities Council, and provided evidence about the impact of frozen science funding to Blackwood's parliamentary committee.

Another freeze on science funding "will lead to an accelerated decline with serious and irreversible damage to particle physics", Davenport warned the committee. In one scenario that she considered, Britain's flagship X-ray synchrotron, the Diamond Light Source, would operate at 70% of its optimum capacity, the national Central Laser Facility at 50%, and the ISIS neutron source would need to shut down by 2019.

There are also "serious concerns", says Davenport, that there will not be enough resources to analyse the data coming in from major astronomy projects and the Large Hadron Collider.

The government, however, may not appreciate the impact of a flat budget this time, says Nick Hillman, director of the Higher Education Policy Institute in Oxford, particularly because people regarded it as positive in 2010.

Even worse than a frozen budget would be cuts. That fear has been stoked by the government's demand in July that before the spending review, almost all departments — including that for Business, Innovation and Skills, which manages most of the government-supported science budget — model scenarios in which their budgets are cut by 25% and 40%.

Few think that cuts to the science budget would reach even 25%. Still, at least one major funder, the Medical Research Council, believes that there is a risk that its funds could be cut and has examined various possible scenarios, according to the minutes of a July meeting.

Worried researchers have started taking action: more than 1,000 have written to the government through the Science is Vital campaign. Astrophysicist Phil Evans of the University of Leicester warned in his message that skilled academics are leaving the country because they can not find jobs; others detailed how their own research contributes to the UK economy.

'Backdoor' cuts, says Kieron Flanagan, a science-policy researcher at the Alliance Manchester Business School, could include stretching the science budget to cover areas such as innovation, which is currently separate, or cutting the research

councils' administrative budgets.

Further uncertainty comes in the form of the characters behind the review. The highly respected Willetts is gone, and the current science minister, Jo Johnson, was notably unimpressed by the notion that Britain should be spending 3% of its GDP on research, describing it as "a nice round number, more than anything else" when he appeared before Blackwood's committee.

Chancellor of the Exchequer George Osborne, who holds the purse strings and is seen as the architect of the government's economic austerity programme, has consistently claimed to support science. Osborne got kudos for sparing science in the last review — and for increasing research-infrastructure spending since then. "It would be very odd to spend your first five years as chancellor saying, 'I'm the chancellor for science'," says Hillman, "and then to not see that through in the second term."

Any science spending boost might come with strings attached. Innovation and regional growth are likely to be priorities of future science spending, says Paul Nightingale, deputy director of the Science Policy Research Unit at the University of Sussex in Brighton. So Osborne might continue a trend, established under the last government, of allocating funding directly from the treasury to projects outside London, such as the UK National Graphene Institute at the University of Manchester, in an effort to boost regional economies. ■

PHYSICS

Mega science prize split between more than 1,000 physicists

Multimillion-dollar Breakthrough awards announce winners in glitzy ceremony.

BY ZEEYA MERALI

It is a celebration of the collective over the individual. Whereas only two physicists picked up this year's physics Nobel prize for the discovery that neutrinos have mass and can change identity while travelling, 1,377 collaborators who were involved in the 'neutrino oscillation' experiments behind the finding will share the US$3-million Breakthrough Prize in Fundamental Physics.

The awards, announced on 8 November at a star-studded ceremony at NASA's Ames Research Center in Moffett Field, California, also honour five biologists in the life sciences and a mathematician.

"There is a message here that science is a much more collective effort than it was 100 years ago," says Russian Internet entrepreneur Yuri Milner, who is one of the prizes' founders. "It is international, it is diverse, it involves lots of people."

The Breakthrough physics prize marks the first time that a significant science prize has been awarded to such a large group of people — which Milner describes as "a logistical nightmare". It recognizes the members of five international experiments that established that neutrinos have mass, which contradicts the standard model of particle physics. In October, the Nobel prize was shared between just two people for the same discovery: Arthur McDonald at Queen's University in Kingston, Canada, and Takaaki Kajita at the University of Tokyo. (Both are among the Breakthrough prizewinners.)

"This is recognition for excellent science that could only be achieved by cooperation between many scientists," says McDonald, who led an experiment at the Sudbury Neutrino Observatory in Canada.

Each of the five teams will receive $600,000; team leaders are allotted two-thirds of the money, with the remaining one-third split between other team members.

Because it follows hot on the heels of the Nobels, the Breakthrough prize could be seen as a direct criticism of its older rival, which notoriously refuses to honour more than three individuals in science categories. But Edward Witten, a physicist at the Institute for Advanced Study in Princeton, New Jersey, who chaired the Breakthrough selection committee, notes that the winners were chosen over the summer, before the Nobels were revealed, so the overlap is coincidental. Nonetheless, Witten says, the decision makes a deliberate statement: "We … consider it important to include at least at a symbolic level the many scientists who contributed."

"This is recognition for excellent science that could only be achieved by cooperation between many scientists."

Göran Hansson, former secretary of the Nobel Committee for Physiology or Medicine, stands by the Nobel-prize policy, however. "Precisely because there is so much emphasis on huge organizations, we feel it is important to identify the individuals who pioneered the discoveries," he says. The Breakthrough prizes are no threat to the prestige of the Nobel, Hansson adds: "We have more than a century of legacy, and people will continue to look to the Nobels to identify excellence in science."

Five biologists were also awarded Breakthrough prizes. Neuroscientists Karl Deisseroth at Stanford University in California and Ed Boyden at the MIT Media Lab in Cambridge, Massachusetts, received separate awards for developing optogenetics — the programming of neurons so that their electrical activity can be controlled by light. Helen Hobbs at the University of Southern Texas Medical Center in Dallas was recognized for her discovery of human genetic variants that alter cholesterol levels. John Hardy at University College London was honoured for finding the mutations in the gene encoding amyloid precursor protein that cause early-onset Alzheimer's disease, and Svante Pääbo at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany, was recognized for sequencing ancient genomes.

Mathematician Ian Agol at the University of California, Berkeley, received an award for proving three conjectures relating to how 3D 'manifolds' (higher-dimensional equivalents of two-dimensional surfaces) can be flattened and transformed. The work could one day have applications for understanding how space-time curves, says Agol, who has previously received the Clay prize and other established maths prizes.

Compared to those awards, says Agol, the Breakthrough prize is too new to have established a clear status, and does not yet have the same level of fame among mathematicians. "In any case, it is a great honour to be receiving this," he adds — although he admits that he didn't relish appearing on television.

The award ceremony, hosted by *Family Guy* creator Seth MacFarlane, was broadcast live for the first time on the National Geographic Channel, and an edited version will be aired on FOX. It also honoured eight early-career scientists, who received $100,000 each, and the winner of a prize for schoolchildren. ■