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“It’s not every day you have robots running through your house,” Barack Obama quipped last week at the White House science fair, a showcase for student exhibitors that also gave the US president a chance to reiterate a favourite theme. Science and technology, he said, “is what’s going to make a difference in this country, over the long haul”.

Obama would clearly like to see many more robots, as well as researchers and engineers, running around in the future, a wish reflected in his budget request for fiscal year 2013, released on 13 February. The document’s message is one of big ambitions with fewer resources.

A year ago, Obama proposed bold increases for science agencies, but a Congress intent on curbing government spending refused to back many of them. This time, the White House has scaled back in several areas but boosted overall funding for non-defence research and development by 5%, pushing it up to US\$64.9 billion.

“Overall, the budget sustains an upward trend,” says John Holdren, director of the White House Office of Science and Technology Policy in Washington DC. “Because of fiscal restraints, it’s not at the rate we preferred.”

With an election coming this November, House Republicans are unlikely to be generous with the president’s request. As in previous years, Congress could delay action on the budget, especially if it decides to wait for voters to weigh in on Obama’s presidency before making its decision. And the spectre of a severe across-the-board cut dangles over the government because of an act introduced last year that aims to chop \$1.2 trillion from spending, starting in January 2013.

Here is an overview of what the president’s request would mean in key science domains (see ‘Tough decisions’).

BIOMEDICINE AND PUBLIC HEALTH

The National Institutes of Health (NIH) in Bethesda, Maryland, by far the largest US research agency, sees its budget held level at \$30.7 billion — a far cry from the \$1-billion increase Obama proposed a year ago. Despite the ceiling, Lawrence Tabak, the NIH’s ▶

Barack Obama aims high with an air cannon at this year’s science fair at the White House.

US BUDGET

Obama shoots for science increase

US president wants to make room for research to grow in 2013 — but faces an uphill battle.

► principal deputy director, sees the budget as “continuing our priorities in basic science”, and it allows the agency to boost the number of new and competing grants it funds by 8%.

The newly launched National Center for Advancing Translational Sciences (NCATS) in Bethesda will grow by 11%, to \$639 million. Much of the rise goes to the Cures Acceleration Network, an effort to spur development of badly needed medicines through bold, multi-million-dollar grants. The programme’s allocation grows fivefold next year, to \$50 million.

Accomplishing all this within a flat budget requires cuts. Losers include the National Children’s Study, a long-term study of early influences on the health of more than a hundred thousand children, which received \$194 million in 2012, but has been cut by \$29 million; and the Institutional Development Award programme, aimed at developing research infrastructure in rural and underserved states, which loses nearly \$48 million.

To pinch the pennies that will make new grants possible, the NIH plans to eliminate inflationary increases for some existing grants, cut others by 1% and keep grants seeking renewal at current levels. The agency predicts that these measures would boost the success rate for grant applications, currently at a historic low of 18%, but only to 19%.

The flat-lined budget has drawn bleak appraisals from NIH advocates. “We are talking about a budget that is probably close to 20% smaller than it was a decade ago, adjusted for inflation,” says David Moore, senior director for government relations at the Association of American Medical Colleges in Washington DC.

Jennifer Zeitzer, director of legislative relations at the Federation of American Societies for Experimental Biology in Bethesda, says that her organization will work with research champions to persuade Congress to boost the allocation for the NIH. The president’s request, she says, “is not what we need to take advantage of the scientific opportunities that are before us”.

The outlook is even less favourable for the Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia, which has had its budget cut by 12%, to make a total of 22% in cuts since 2010. Those cuts are, in part, counterbalanced by bringing in funds from a long-standing health-services evaluation fund and from the Prevention and Public Health Fund, which is part of the health reform law that Obama introduced in 2010.

The dependence on the Prevention and Public Health Fund worries public-health advocates. Using the fund to patch holes in the CDC’s budget is “troubling”, says Emily Holubowich, executive director of the Coalition for Health Funding, based in Washington DC. “The future of the fund is tenuous at best.”

Obama has also kept the budget mostly flat for the Food and Drug Administration (FDA) in Silver Spring, Maryland. However, the

TOUGH DECISIONS

The winners and losers in President Barack Obama’s budget request for 2013 (US\$ millions).

Agency	2011 actual	2012 estimated	2013 requested	Details
Biomedical research and public health				
National Institutes of Health	30,470	30,702	30,702	Flat funding overall but 11% boost for translational science centre
Centers for Disease Control and Prevention	5,726	5,732	5,068	Efforts in public health and disease prevention bear the brunt of a deep cut
Food and Drug Administration	2,403	2,506	2,517	Flat government funding, but surge in industry user fees lifts overall budget by 17% to \$4,486 million
Physical sciences				
National Science Foundation	6,806	7,032	7,372	Big gains for interdisciplinary ideas — as well as marketable ones
NASA (science)	4,919	5,074	4,911	Flagship telescope still on track, but future of Mars exploration less certain
Department of Energy Office of Science	4,897	4,874	4,992	Overall increase masks cuts to some basic-research programmes
National Institute of Standards and Technology	754	761	860	Substantial increase, with around half to advanced manufacturing research
Earth and environment				
Environmental Protection Agency	8,681	8,450	8,344	Despite ongoing declines, core science and regulatory programmes preserved
National Oceanic and Atmospheric Administration	4,727	5,014	5,179	Modest rise, with satellite programme getting much-needed boost
US Geological Survey	1,084	1,068	1,102	Increased money for disaster response and research on hydraulic fracturing

Source: White House Office of Management and Budget

agency will receive a \$583-million bolus from new industries, mainly from food-registration and inspection fees and from makers of generic drugs and biosimilars.

The FDA has already been criticized for becoming too reliant on industry funding, but Margaret Hamburg, the FDA’s commissioner, says that the fees are needed to ensure effective and timely drug and device review. “There is a common good here,” she says.

PHYSICAL SCIENCES

The White House continues to support a long-term doubling of budgets for physical-science agencies, including the National Science Foundation (NSF) in Arlington, Virginia; the Department of Energy’s Office of Science in Washington DC; and the National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland. The doubling, relative to 2006, is a goal of the America COMPETES Act, introduced under former President George W. Bush that year, and signed into law in 2007. Congressional appropriators have, however, slowed the pace of these agencies’ growth considerably since then (see ‘A long way to go’).

The budget also shifts funding towards the applied end of the research spectrum, where advances should translate into economic gains more quickly. It continues to fund I-Corps, a programme launched last year that partners entrepreneurs with scientists seeking to test the marketability of their research. And advanced manufacturing, which supports industry by

developing measurement capabilities and standards to guide new product development, gets \$149 million — money that NSF director Subra Suresh says will help to stem a decline in US manufacturing. “In times of constrained budgets, we need to be crystal clear about why NSF matters,” Suresh says.

The NSF emerges as a clear winner in Obama’s request, with a 5% boost to its bottom line. And one thing is very clear at the agency: researchers pursuing interdisciplinary research will be rewarded, with \$63 million allocated to a programme that supports such work.

The NIST also gets a large increase, much of which is aimed at advanced manufacturing, including both a robotics programme and a ‘materials genome’ initiative that aims to speed up the development of new materials.

The Department of Energy’s Office of Science receives a more modest rise, much of which goes to its national laboratories and Energy Innovation Hubs. Several basic-research programmes are trimmed, including nuclear physics and high-energy physics, a shift that is consistent with the administration’s emphasis on applied research that is most relevant to energy technology.

“Basic research is systematically down,” says Milind Diwan, a physicist at Brookhaven National Laboratory in Upton, New York, and co-spokesman for a planned particle physics experiment that received a drop in funding. “Those of us in fundamental-research have to live within those priorities.”

At NASA, the talk is of “tough but sustainable choices” for an agency that would receive \$17.7 billion in 2013, \$59 million less than in 2012. Its science budget drops by 3.2%, but planetary science bears the brunt of that, with a cut of 21%. For years, NASA has been pursuing plans with the European Space Agency for joint missions to Mars in 2016 and 2018. But on Monday, NASA administrator Charles Bolden pulled the plug. “We just cannot do another flagship right now,” he said. Officials fear that the costs for these missions would spiral out of control, as they have for the \$8.8-billion James Webb Space Telescope, a follow-on to the Hubble telescope that is slated for a 2018 launch.

The pinch will perhaps be felt most keenly at the Jet Propulsion Laboratory (JPL) in Pasadena, California, the traditional home of the Mars Exploration Program. Last year, the laboratory had to lay off the equivalent of 246 full-time employees, reducing its staff to 5,047. When the \$2.5-billion Mars Science Laboratory lands in August, the JPL will have to quickly find new work for a few hundred employees so the latest Mars cancellations make more lay-offs likely. “Our expectation was that we’d have another mission to move these people on to,” says Richard O’Toole, the JPL’s manager of legislative affairs. “We definitely feel the pressure.”

ENERGY, EARTH AND ENVIRONMENT

In Obama’s plan, spending on energy efficiency and renewable energy rises by \$457 million, to \$2.3 billion, with the largest increases targeting advanced manufacturing, and vehicle and building technologies. These programmes, run by the Department of Energy, are aimed at bolstering the competitiveness of industry. “Our motto is ‘Invented in America, made in America, sold worldwide,’” says energy secretary Steven Chu.

Included in the package are increases for research in solar energy, bioenergy and fossil fuels, including \$155 million for carbon capture and storage systems. But there are reductions and shifts as well: the budget for wind power remains unchanged but is allocated mainly to offshore technologies. Spending on nuclear energy continues an ongoing move toward small, modular reactors.

The National Oceanic and Atmospheric Administration (NOAA) in Washington DC receives a boost of 3%. That isn’t enough to offset both inflation and rising salaries, but

nonetheless protects a core agency priority: a programme of polar-orbiting weather and environment satellites that has been troubled by delays and cost overruns. Last year, NOAA requested a hefty increase of \$688 million to get the programme back on track, but received just under two-thirds of that. This year, the satellite programme is boosted by \$169 million.

NOAA watchers looking for signs of the

A LONG WAY TO GO

The push to double funding for three key US science agencies to boost innovation is proceeding more slowly than planned.

■ Economic stimulus funding
■ National Institute of Standards and Technology
■ Department of Energy Office of Science
■ National Science Foundation

president’s proposed reorganization of the Department of Commerce, which would move NOAA from there to the Department of the Interior, found no trace of the plan in the 2013 budget. The budget is also silent on another big initiative, the creation of a climate service within NOAA.

In what could be a third straight year of declining budgets for the US Environmental Protection Agency (EPA) in Washington DC, the agency’s funding has been slashed by 1%, to \$8.3 billion, almost \$2 billion less than in 2010. Nonetheless, funding for initiatives that target climate change and the environment rises slightly, to \$807 million, protecting core science and regulatory efforts. To compensate, the White House has cut \$359 million from a pair of clean-water grant programmes. These programmes are popular in Congress, and lawmakers have reversed similar cuts in the past.

“They did a pretty good job in making sure we are not hurting our environment and conservation programmes,” says Scott Slesinger,

legislative director at the Natural Resources Defense Council in Washington DC. But Slesinger expects Congress to inflict further cuts.

With a 3% rise for its overall budget, the US Geological Survey (USGS) in Reston, Virginia, fares better than most mission-oriented science agencies. The agency’s research and development portfolio expands from \$675.5 million to \$726.5 million. Part of the increase includes an extra \$13 million for research on the effects of hydraulic fracturing, the process used by the oil and gas industry to squeeze hydrocarbons out of non-porous rock. The president has also pumped an extra \$10.3 million into natural-hazards work, including \$2.4 million for research on quick responses to earthquakes, volcanic eruptions and landslides, and \$1.6 million to study the risk of earthquakes in the eastern United States, which was shaken by a magnitude-5.8 tremor last August.

Daniel Sarewitz, a geoscientist and co-director of the Consortium for Science, Policy and Outcomes at Arizona State University in Tempe, supports the increase for the USGS. “The survey doesn’t get a lot of attention, but it does things that are important for the nation and it’s structured in ways that make its science very useful.”

EDUCATION

The administration has taken pains to advertise a \$3-billion effort to increase and strengthen the future US science and technology workforce. For example, a combined expenditure of \$135 million by the Department of Education and the NSF aims to boost the number of science and mathematics teachers by 100,000 over the coming decade. An even more ambitious effort allocates an additional \$81 million to increasing the number of science graduates by one million — roughly 30% more than there are today — over the same period. According to Carl Wieman, associate director for science at the Office of Science and Technology Policy, simply reducing the attrition of science majors, which currently runs as high as 60%, could drive much of that increase.

Obama made a point of previewing both initiatives during the White House science fair, telling students there, “You give me confidence that America’s best days are still to come.” Now, as the budget goes to Congress, the battle to support lofty goals with real dollars begins a new round. ■

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