



The Obama experiment

BY JEFF TOLLEFSON

Nearly four years after US President Barack Obama pledged to put science in its rightful place, Nature asks if he kept his word.

On 15 December 2008, president-elect Barack Obama made clear to the world that science would have a central seat in his administration. At a press conference in Chicago, Obama introduced Nobel laureate Steven Chu as the next secretary of the energy department and the person who would help to wean the country off its addiction to climate-warming fossil fuels. "His appointment should send a signal to all, that my administration will value science," Obama said.

Within days, he announced other members of his future staff, who would make up a star-studded science team (see 'The science dream team'): marine ecologist Jane Lubchenco

would head the National Oceanographic and Atmospheric Administration in Washington DC and physicist John Holdren would be Obama's science adviser and head the Office of Science and Technology Policy, also in Washington DC. They joined Lisa Jackson, a respected chemical engineer with political experience, who had been named to run the US Environmental Protection Agency (EPA) in Washington DC. After taking office, the

president completed the team by appointing geneticist Francis Collins at the National Institutes of Health (NIH) in Bethesda, Maryland, and geophysicist Marcia McNutt at the US Geological Survey in Reston, Virginia. Never before had a president assembled such a strong crop of researchers to lead his science agencies.

"The truth is that promoting science isn't just about providing resources — it's about protecting free and open inquiry," Obama proclaimed as he made the initial appointments. "It's about listening to what our scientists have to say, even when it's inconvenient — especially when it's inconvenient."

Scientists and environmentalists swooned; they had spent 8 years complaining that the administration of President George W. Bush had overly politicized science. Climate researchers in government had charged that they were being muzzled and that their data were being manipulated. Pollution regulations were blocked or watered down. With Obama's election, scientists would finally have a president who not only said the right things but actually appointed the right people. Even journalists drooled. "Science Born Again in the White House, and Not a Moment Too Soon," read a headline in *Wired* magazine, endorsing Obama's appointments with a swipe at Bush's reputation as a born-again Christian.

The love affair would soon cool, however, as the Obama administration started to hit a number of obstacles while trying to govern a politically fractured nation in the midst of the worst economic crisis in 70 years. The president has not fulfilled some of his top science-related

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promises, such as passing climate legislation to reduce the nation's emissions of greenhouse gases. He has paid relatively little attention to NASA and the NIH, and got into bruising budget wars with Congress that sapped support for some science agencies. And his vaunted team stumbled in its response to the Deepwater Horizon oil spill in the Gulf of Mexico, which damaged the administration's credibility with some researchers.

But as Obama and his science team round out their first term in office and make a bid for a second, they can point to substantial achievements, some of them little noticed. Even in fiscally tight times, Obama has invested heavily in science education and research, particularly in energy. His administration has also made headway in tackling pollution, in part by introducing the country's first greenhouse-gas regulations. And by driving the creation of integrity policies that seek to protect scientists from political interference (see 'Integrity test'), his team has sent positive signals to agencies that had become demoralized during the Bush years.

"The president never let up in his consistent support for science, and actually he got a lot done in spite of the Republican resistance," says Neal Lane, who was science adviser to former President Bill Clinton and is now a professor at Rice University in Houston, Texas.

STIMULATING SCIENCE

Within a week of the election in November 2008, and with the economy in free fall, Obama's advisers started working with the scientific community to survey 'shovel-ready' projects for potential inclusion in a stimulus package intended to boost construction and get people back to work. They initially aimed for US\$5 billion in initiatives, but House Democrats doubled that in a draft of the stimulus bill released on 15 January 2009, five days before Obama's inauguration. And the role of science and innovation continued to grow.

On 17 February, exactly 4 weeks into office, Obama signed a \$787-billion stimulus bill that contained at least \$53 billion for science. The bill made good on Obama's promises to advance basic and applied research and development aimed at the major problems of the day, including clean energy and global warming. It boosted research funding by \$2 billion at the National Science Foundation in Arlington, Virginia, and by \$8.2 billion at the NIH. As he signed the bill at the Denver Museum of Nature & Science in Colorado, Obama called it the biggest increase in the history of basic-research funding.

"You would have to go back to the 1940s, when Harry Truman became president, to find an administration that was receptive to doing something really significant on scientific research straight out of the box," says Michael Lubell, who handles government affairs for the American Physical Society in Washington DC and was one of a trio of scientists who helped to compile the initial suggestions for the science

stimulus package. "And I think part of it has to do with Obama himself. This guy likes science."

In those early months, the science agenda continued to ride high. In April, Obama visited the National Academy of Sciences in Washington DC and proposed a long-term expansion of funding for basic and applied research and development. When he submitted his budget for 2010, Obama fulfilled that promise by including full funding for the America COMPETES Act, a stalled 2007 initiative that called for a doubling of the federal budget for physical sciences. He also increased funding for science and mathematics education.

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Bigger budgets were not the only things that were fuelling optimism. In March, Obama overturned Bush's restrictions on using federal funds to support research into human embryonic stem cells, and other early moves by the administration thrilled energy and climate researchers. On 19 May 2009, the president invited the chief executives of ten of the world's largest car manufacturers to the White House Rose Garden to announce a historic agreement to establish the first greenhouse-gas standards for US vehicles. For two decades, the companies had been fighting against attempts to make cars more efficient, but the economic crisis and new regulatory authority had given Obama some leverage over the industry. Tough regulations in California had also helped to make car makers more receptive to higher standards. Obama's team later brokered a pact with the automobile industry to nearly double the average fuel efficiency of cars by 2025, to around 23 kilometres per litre.

"A lot of the credit goes to the president, who really persevered and insisted that this was going to be part of the package," says Kevin Knobloch, president of the Union of Concerned Scientists, an advocacy group based in Cambridge, Massachusetts. "He believed that technology was the key to saving the industry."

The deal was part of a broader push by the White House to reduce emissions. In 2007, the Supreme Court had given the EPA the power to regulate greenhouse gases, but the Bush administration had declined to do so. When Jackson came in, she immediately went to work building up the regulatory system.

This new-found authority extended beyond vehicles; in theory, the EPA could regulate greenhouse-gas emissions from any source, but neither the president nor Congress preferred that route for cutting emissions. Instead, there were high hopes that Congress would act. In June, the House of Representatives took the first step and passed comprehensive climate

legislation seeking to reduce US greenhouse-gas emissions by roughly 80% below 2005 levels by 2050, leaving the Senate as the next big hurdle.

But then the climate bill had to wait. Obama and his team wanted first to push a health-care overhaul through Congress that would tame rising costs and expand insurance to millions of Americans. The plan was to deal with health care before Congress took its August break and then shepherd climate legislation through the Senate in time for Obama to take something concrete to the United Nations' global-warming summit in Copenhagen in December. But the health-care initiative

proved divisive and time-consuming.

Obama ended up flying into Copenhagen empty-handed. He pledged that the United States would reduce its emissions; but without the backing of law-makers at home, he could make no binding commitments.

On Christmas Eve of 2009, the Senate finally passed the health-care legislation. It was a historic achievement, decades in the making, but it would come at a heavy political price.

AN OILY MESS

If the health-care bill demonstrated the administration's skills with Congress, then the way it handled NASA in early 2010 revealed how easily relations could sour. When the president rolled out his budget request in February, it held a bitter surprise for congressional supporters of the space agency. On the list of projects to be eliminated was Constellation, a programme to develop massive rockets to return humans to the Moon.

"This was a major policy pronouncement but it was revealed in a budget release," says Scott Pace, director of the Space Policy Institute at George Washington University in Washington DC. Normally, an administration prepares Congress for such a change — but Obama's sudden move led to what Pace calls a "bruising, year-long fight" with lawmakers in both parties. Eventually, several parts of the Constellation programme were reinstated. But by then, NASA had become an agency adrift, left to the mercy of parochial interests in Congress.

Human space flight and many other elements of NASA's mission were never priorities of the Obama administration. In the 2013 budget request, the agency's astrophysics and planetary-science programmes lost 8% of their funding compared with 2008. Obama was more interested in fixing problems with his home planet, and boosted funding for NASA's Earth-sciences programmes by 44% over the same period.

With health care finally out of the way, in early 2010, Obama's team set out to build a coalition for the president's climate and energy policies. Obama started on 31 March by announcing a plan to open up large swathes of the US coast, including the eastern Gulf of Mexico and parts of the east coast, to offshore drilling. The decision was enormously controversial, with environmentalists and many lawmakers in his own party, who had opposed such plans for years, arguing that accidents were inevitable. But Obama saw the offshore-drilling expansion as part of a broader strategy to move the US economy from foreign to

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domestic sources. By increasing oil production, the president also aimed to soften opposition to a comprehensive climate policy that would require cuts in carbon emissions.

But any lingering hopes for a climate agreement disappeared in a plume of smoke above the Gulf of Mexico on 20 April.

The crisis began with an explosion that killed 11 crewmen on the Deepwater Horizon oil rig. Two days later, the rig sank, leaving untold quantities of oil and gas spewing into the gulf at a daunting depth of some 1,500 metres. British energy giant BP would not succeed in capping the well until 15 July, and the clean-up efforts continued for months. This was Obama's Hurricane Katrina, and the incident raised questions about the president's commitment to scientific integrity. Critics charged that administration officials were downplaying the risks by publicizing extremely low estimates of the amount of oil spilling into the gulf and by misstating what was known about the fate of the oil. The administration was also accused of misrepresenting scientists when it said — incorrectly — that they had recommended a temporary drilling moratorium, imposed in late May.

But the political ramifications went well beyond the crisis in the gulf. The administration's response kept top officials from several agencies working around the clock for weeks on end, leaving little time or energy for a simultaneous effort to push the climate bill. Worse, the disaster ruptured the shaky coalition that Obama had been trying to build over climate and energy. Most visibly, when his administration responded by placing a moratorium on drilling in the gulf, Republicans argued that the Obama administration was harming US industry through excessive regulations at a time

when the economy was still deep in recession.

In the run-up to congressional elections in November 2010, Tea

Party candidates pushed the idea that the administration was overspending, overregulating and overreaching by exerting government control over issues such as health care. The Republican party swept the Congressional elections, and many ultra-conservative politicians went to Washington DC promising that they would block Obama's initiatives.

Within weeks of arriving, the new Republican-controlled House of Representatives passed a spending bill for 2011 that took aim at Obama's energy and environment agendas. The measure slashed the budgets of key science agencies by nearly \$6.7 billion as part of a broad

reduction in federal spending. But Obama and the Democrats in the Senate fought back, and the final budget trimmed core science activities by just \$1.2 billion. A similar story would play out during negotiations over the fiscal 2012 budget, and few doubt that Obama will try to protect science this year, which is shaping up to be his biggest budgetary showdown with conservatives yet.

The administration deserves credit for recognizing that science is a priority even when times are tough, says Norman Augustine, former chief executive of aerospace and defence firm Lockheed Martin in Bethesda, and the Republican who chaired the 2005 report *Rising Above the Gathering Storm*, which made the case for greater federal investment in science. Augustine says that in terms of the science budget over the past few years, “things are not as bad as they might have been”.

MODEST GOALS

In late February 2011, just as the new Republican majority was flexing its muscles in the budget battle, energy secretary Chu threw a party to celebrate one of his newest projects: the Advanced Research Projects Agency-Energy (ARPA-E). Former California governor Arnold Schwarzenegger stole the show with a rousing speech calling on Democrats and Republicans to advance the clean-energy research agenda in the name of public health, national security and economic competitiveness, if not global warming. He ended his pep talk quoting one of the film characters he had played, Conan the Barbarian. “Conan was not big on philosophical arguments, or navel gazing or complaining,” said Schwarzenegger. “He believed in action.”

Obama would not have chosen the same source of inspiration, but his team shared the sentiment. During the second half of Obama's term, the administration scaled back some of its grand goals and instead advanced the science agenda through smaller actions.

For Chu, ARPA-E was one of the success stories, part of his effort to shake up the Department of Energy and create a more nimble agency that could tackle complex research challenges. Initiated with \$400 million in stimulus money, ARPA-E provides grants for the type of high-risk energy research that industry tends to avoid. Obama and Chu managed to build lasting bipartisan support by convincing Congress that such blue-sky research was key to establishing US leadership in new energy technologies. Even in this year's tight budget, ARPA-E received \$275 million. Chu also battled to create a series of ‘energy innovation hubs’ to bring together scientists from different disciplines in institutes reminiscent of the defunct Bell Labs, where Chu had done some of his seminal work. The five hubs focus on simulations for nuclear reactors; fuels from sunlight; energy-efficient buildings; energy storage; and critical materials. “Have the energy hubs worked?” asks the American Physical Society's Lubell. “It's too soon to tell, but I give him credit for trying.”

Chu paid a political price for his energy agenda when a US solar manufacturer that had received \$535 million in federal loan guarantees as part of the stimulus went belly-up in September 2011, in part because competition with Chinese manufacturers had driven down prices for solar cells. Applied research and development has always been a harder sell among conservatives, who fear that the government will ‘pick winners and losers’, and in this case, Republicans were all too happy to run advertisements pointing out that the government had chosen a loser. Chu was sanguine during congressional testimony in November 2011. “When it comes to the clean energy race, America faces a simple choice: compete or accept defeat,” Chu told lawmakers. “I believe we can and must compete.”

And even though the climate legislation has stalled, the president's policies have helped to change the landscape. According to the Office of Science and Technology Policy, the capacity for generating electricity from renewable sources has nearly doubled since Obama took office. A boom in natural-gas production and tightened air-quality regulations have led many utilities to switch from coal to gas, helping to reduce US carbon emissions in the electricity sector. And rising oil production in the United States has cut imports substantially. Obama cannot take credit for all this, but his broad energy policies supported those trends.

Roger Pielke Jr, a science-policy expert at the University of Colorado Boulder, says that the administration swerved politically toward the centre on energy and environmental issues after realizing that its climate objectives were unachievable on Capitol Hill. In the end, Pielke says, Obama proved himself to be a policy pragmatist who is more interested in achieving modest goals than in shooting for the Moon.

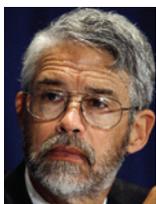
At the NIH, however, Collins did not rein in

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For an interview with Francis Collins, see: go.nature.com/mmudjj

The science dream team

Early in his administration, Barack Obama named some stellar scientists to lead the agencies that oversee US civilian research and development activities. Here is how some of the scientific team have fared over the past 4 years.



JOHN HOLDREN

Office of Science and Technology Policy and president's science adviser



STEVEN CHU

Department of Energy



JANE LUBCHENCO

National Oceanographic and Atmospheric Administration



FRANCIS COLLINS

National Institutes of Health



LISA JACKSON

Environmental Protection Agency

2009

• Less than 2 months after taking office, Obama asked him to provide agencies with guidance on developing scientific-integrity policies within 120 days.

• Convinces Congress to provide funding for high-risk energy research programme, ARPA-E, and for small energy hubs for innovative research.

• Helps to resolve management problems in building new weather satellites.

• Approves first new human embryonic-stem-cell lines made available to agency grantees under Obama's liberalized policy.

• Announces agreement with car makers to establish first greenhouse-gas standards for US vehicles.

2010

• After a long delay, he finally issues guidelines at the end of year and agencies begin crafting policies.

• Launches hubs that focus on computer simulation for nuclear reactors; fuels from sunlight; and energy-efficient buildings.

• Helps to lead effort to create national ocean policy that harmonizes management of coastal and marine areas.

• Goes public with plans for a translational-research centre.

• Works with transportation department to finalize greenhouse-gas and fuel-efficiency standards for vehicles.

2011

• Gets into fight with Congress after he met with Chinese officials, despite a congressional ban. Congress slashes budget of his office by one-third.

• Comes under fire from Congress after Solyndra, a solar-energy company that had received more than \$500 million from the energy department, goes bankrupt.

• Alienates scientists over disputes about amount and fate of oil spilled in Deepwater Horizon accident.

• Congress kills plan to create a National Climate Service, one of her main goals.

• Agency's grant application success rates fall to historic low of 18%.

• Issues rule to reduce emissions of mercury and other toxins from power plants, one of multiple regulations that has made coal-fired power plants less competitive compared with natural gas and renewables.

2012

• By September, federal agencies have produced draft or final integrity guidelines.

• Department starts work on two new hubs, focusing on energy storage and critical materials.

• Withdraws plan to appoint chief scientist after losing battle with Congress over administration's response to oil spill; new ocean policy encounters troubles on Capitol Hill.

• Translational-research centre operates for 9 months without a permanent leader. Christopher Austin is named head in September.

• Proposes rule to set greenhouse-gas emissions standards for new power plants.

• Court overturns rule to limit amount of pollution from power plants that crosses into other states.

BOTTOM LINE

Helped to raise profile of science and science integrity but could have done more to push for better policies across the federal government.

Tried to overhaul bureaucracy while invigorating and focusing research and development activities at the energy department.

Despite stumbles during the oil spill, Lubchenco pushed a solid scientific agenda but encountered opposition in Congress to marine policies.

Oversaw massive budget infusion early on, but funding picture turned grim, leading to widespread unhappiness among biomedical researchers.

Tightened pollution controls and laid the groundwork for regulating greenhouse-gas emissions, despite an openly hostile environment on Capitol Hill.

H. N. GHANBAR/AP PHOTO; T. KRIST/ISIFA/LIDOVE NOVINY/GETTY; J. S. APPLEWHITE/AP PHOTO; PALLAVA BAGLA/CORBIS; D. BRACK/NEWS.COM

INTEGRITY TEST

A drive to put science above politics has hit some rough patches.

Two months into his new job, President Barack Obama gathered a group of scientists at the White House to sign a memorandum on scientific integrity that declared “Science and the scientific process must inform and guide decisions of my Administration”. The 2009 statement promised that “political officials should not suppress or alter scientific or technological findings and conclusions”. For US researchers, the agreement came as a welcome change from the administration of George W. Bush, which had frequently been accused of infringing on science.

Watchdog groups that track scientific integrity say that Obama’s administration has generally kept those promises — with some notable exceptions. Government scientists are reporting less political interference and more freedom to speak publicly than they experienced under the previous administration. “Agencies change slowly, but if they can change slowly into this culture of transparency, then we can win,” says Francesca Grifo of the Union of Concerned Scientists in Cambridge, Massachusetts, who has spent time working with staff at federal agencies to develop integrity policies.

Even so, the transition has taken much longer than anticipated. Obama’s science adviser, John Holdren, was supposed to issue guidelines for agencies within 120 days of Obama signing the memo, but it took nearly two years. Now, however, all US government agencies have either final or draft policies on scientific integrity, says Rick Weiss, chief of communications for the White House Office of Science and Technology Policy, which Holdren heads. Many of the policies that have been released explicitly forbid agency leadership from tampering with scientific results.

Still, there have been lapses, charge critics. In December 2011, the US Food and Drug Administration (FDA) concluded that the morning-after contraceptive pill, Plan B One Step (levonorgestrel), should be made available to girls under the age of 17 without a prescription. But that decision was overruled by Health and Human Services Secretary Kathleen Sebelius. Obama said that he supported Sebelius’ decision and that “her judgement was that there was not enough evidence” that the youngest adolescents would be able to use the pill properly. Margaret Hamburg, the FDA commissioner, disputed that decision and stood up for agency scientists, who had determined there was sufficient evidence that younger teens were able to use the medication correctly and safely.

Sebelius’s intervention was “deeply disturbing”, said Susan Wood, a health-policy expert at George Washington University in Washington DC and a former assistant commissioner for women’s health at the FDA. “Once again the scientific and medical expertise has been overruled.” The FDA faced controversy again two months ago when agency managers were found to have spied on the e-mails of five staff scientists.

The April 2010 oil spill from BP’s Deepwater Horizon rig in the Gulf of Mexico also raised concerns about integrity. In May 2010, Marcia McNutt, director of the US Geological Survey in Reston, Virginia, wrote in an e-mail to scientists working to estimate the size of the spill that the White House was trying to understate the numbers. That e-mail was obtained and released by the watchdog group Public Employees for Environmental Responsibility, based in Washington DC. McNutt’s comments echoed the concerns of many scientists, who had argued that government estimates of the oil spill were much too low.

Grifo says that a major problem with translating policies on scientific integrity into action has been a lack of commitment by agency leadership. But that is not the case across the board. Wood says, for instance, that Hamburg took a remarkable public stance by backing her agency’s scientists, even though she was overruled. “Her Plan B decision was a clear stand-up for both science and public health in the face of controversy. Good for her. You don’t often see that in senior political appointees,” she says. **E.S.R., J.T., M.W.**

his big ambitions. In December 2011, he and a few dozen colleagues gathered for beers at the Rock Bottom brewery in Bethesda to celebrate one of the biggest changes at the agency in a generation. Collins and his team had succeeded in creating the National Center for Advancing Translational Sciences (NCATS), providing the administration with another victory in applied research.

Collins had proposed NCATS a year earlier, to catalyse the ailing process of drug development by attacking bottlenecks in clinical trials, toxicology research and other areas. Although his plan hit some resistance in the NIH, in industry and on Capitol Hill, Collins managed to convince key members of Congress to support the shifting of funds within the NIH to create the \$575-million

centre, and it opened in the final days of 2011.

Some critics question the centre’s mission. At a congressional hearing in March, Roy Vagelos, former chief executive of drug-maker Merck, asked whether anyone believed that NCATS would be able to solve problems that are stumping the pharmaceutical industry. “If you believe that, you believe in fairies,” he said.

In May, Collins announced the first fruits of the centre. Standing with the research chiefs of three top pharmaceutical companies, he unveiled a \$20-million effort to resurrect drugs that had passed safety trials but had been shelved by industry for business reasons or because they did not work for specific conditions. Under the agreement, the companies gave NIH-funded scientists a stab at repurposing those compounds. “The Obama administration is all about innovation,” says Collins. “And that’s very much what NCATS means to do.”

As the election nears, Obama’s science team is racing to finish up its work. On 28 August, the EPA and the transportation department finalized the changes in vehicle standards that Obama initiated in the rose garden with car makers more than three years ago. In the intervening years, the EPA has moved forward with its Supreme Court authority and begun to lay the groundwork for a broad array of climate regulations. In March, it proposed a rule that would set emissions standards for new power plants and effectively ban coal plants unless they capture and bury carbon dioxide.

Looking back over the past four years, Holdren says that “President Obama has made an unprecedented commitment to science, technology and innovation. ... He promised on inauguration day to ‘restore science to its rightful place’ — a promise he has kept in spades.”

But even his supporters acknowledge that the president did not achieve some of his biggest science-related goals. Carol Browner served as Obama’s climate and energy adviser during the first two years and led the administration’s push to pass climate legislation. “There’s the disappointment of not getting legislation,” she says. “But we didn’t just sit on our hands.”

In his speech to the Democratic Convention on 6 September, Obama laid out some of his energy goals, should the country extend his stay in the White House. He talked about further reducing oil imports and advancing natural-gas production. He discussed improving energy efficiency and advancing clean, renewable energies. “And yes, my plan will continue to reduce the carbon pollution that is heating our planet because climate change is not a hoax,” he said. But in sharp contrast to the soaring rhetoric and bold plans of 2008, he didn’t make any big promises. ■ **SEE EDITORIAL P.473**

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