NEWS IN FOCUS

ZACH GIBSON/GETTY

US president-elect Donald Trump (right) surveys the National Mall in Washington DC.

POLITICS

The Trump experiment

Researchers struggle to predict US president-elect's impact on science.

BY SARA REARDON, JEFF TOLLEFSON, ALEXANDRA WITZE & LAUREN MORELLO

The long campaign for the White House is over — but incoming US president Donald Trump's work is just starting. With about two months to go before his inauguration on 20 January, he and his staff are busy vetting candidates for top government jobs and clarifying his agenda for governing.

Some scientists have expressed fear about how Trump's presidency will affect research in the United States. The president-elect has questioned the science underlying climate change and has linked autism to childhood vaccinations; the vice-president-elect, Indiana governor Mike Pence, does not believe in evolution or that human activities have caused climate change. Still, some science advocates caution against a rush to judgement about how the Trump administration will approach science and research issues.

"The verdict remains out," says Tobin Smith, vice-president for policy at the Association of American Universities in Washington DC. "There are many people who have been strong supporters of science you might not have been expecting." Smith says that a prime example is Newt Gingrich, the former Republican congressman for Georgia, who is rumoured to be up for a top job in Trump's administration.

As speaker of the US House of Representatives in the 1990s, Gingrich supported a plan to double the National Institutes of Health (NIH) budget over ten years. Since leaving Congress, he has advocated significant spending hikes for the National Science Foundation and other science-funding agencies.

But it's hard to draw any conclusions about Trump's views on science, given his limited comments on such issues, other policy specialists caution. "He speaks positively of innovation, but 'innovation' is a big word," says Kevin Wilson, director of public policy and media relations at the American Society for Cell ▶

Biology in Bethesda, Maryland. "You can drive a truck through innovation. We don't know what that means."

Here, *Nature* looks at key science issues that Trump will confront during his first few months in office.

BIOMEDICAL SCIENCE

Trump has said that one of his priorities after taking office will be to reverse several executive orders that President Barack Obama, a Democrat, issued on topics ranging from climate change to immigration. Some biomedical researchers are worried that Trump will cancel an Obama order that authorized experiments with human embryonic stem cells.

"It's something very tangible," says Wilson. "He could do away with it on day one."

There's precedent for such actions: Obama's March 2009 executive order on stem cells reversed limits put in place by his predecessor, Republican George W. Bush.

And Pence opposed Obama's decision to authorize research with human embryonic stem cells. "It is morally wrong to create human life to destroy it for research," he wrote in a March 2009 newspaper commentary.

Overall, however, Trump has said little about biomedical science — aside from an oft-quoted 2015 radio interview in which he called the NIH "terrible".

Mary Woolley, president of the advocacy group Research!America in Arlington, Virginia, worries that biomedical science will not be a priority for Trump. "A lot of it is not really controversial," she says. "We tend in this country to take progress for granted."

CLIMATE CHANGE

If Trump keeps his promises, the United States will reverse course on global warming. The president-elect has blasted the US Environmental Protection Agency (EPA) and said that he will repeal Obama's climate regulations. And Myron Ebell, a prominent climate sceptic who directs energy and global-warming policy at the Competitive Enterprise Institute in Washington DC, is leading Trump's transition team for the EPA.

"I take Trump at his word," says Jeffrey Holmstead, an attorney at the firm Bracewell in Washington DC who worked at the EPA under George W. Bush. "And I think they won't have any difficulties."

Trump's first target will probably be the Clean Power Plan, Obama's regulations to reduce greenhouse-gas emissions from power plants, which roughly two dozen states are challenging in court. The case is expected to reach the Supreme Court as early as next year. By then, Trump may have filled the court's current vacancy with a conservative justice. That would put the climate regulations in jeopardy.

But it would be easy enough for the Trump administration to just revoke the Clean Power Plan on its own, Holmstead says.

Trump's vow to pull the United States out of the Paris climate accord — a process that could take four years to complete — is still sinking in at the United Nations climate talks in Marrakesh, Morocco. Delegates there are busy hashing out a plan to implement the Paris agreement. "We're sort of in the denial stage," says Jake Schmidt, international programme director at the Natural Resources Defense Council in New York City. "I suspect there will be some disappointment and anger starting to bubble up in the next couple of days."

Already, many nations are looking to China for leadership on climate. The country leads the world in renewable-energy investment because it views clean energy as a necessity and an opportunity, says Andrew Steer, president of the World Resources Institute, an environmental think tank in Washington DC. He hopes that Trump will come to see tough climate-change policies as a tool to ensure that the United States remains competitive in the development of energy technology.

SPACE

Trump himself has said little about space policy, but astronaut Eileen Collins — the first woman to command a space shuttle — spoke at the Republican national convention in July. Collins called for the United States to reassert its leadership in space exploration.

In October, two of Trump's campaign advisers wrote a pair of commentaries in SpaceNews laying out possible directions for space policy under a new president. The articles argued that NASA should focus more on deep-space exploration and less on what they called "politically correct environmental monitoring".

NASA's Earth-observing missions account for more than one-third of the agency's science budget, an expense that has come under fire from congressional Republicans. "It's conceivable that the Trump White House could go after NASA Earth science," says John Logsdon, former director of the Space Policy Institute at the George Washington University in Washington DC.

The Trump advisers also argued for more public–private partnerships in civilian space. Such efforts are already under way with private companies now ferrying US cargo, and soon US astronauts, to the International Space Station.

Casey Dreier, director of space policy for the Planetary Society in Pasadena, California, says that space is likely to be a low priority for Trump during his first 100 days as president.

SCIENTISTS SPEAK

How researchers reacted to the election of Donald Trump.

"I don't actually know a Trump supporter who I could talk to about the election. How can I reach the public if I'm only speaking to my own circle?"
Peter Peregrine, anthropologist at Lawrence University in Wisconsin and the Santa Fe Institute in New Mexico.

"I feel sad for the United States and its scientists, and would like to welcome good scientists to work and live in China."
Yi Rao, neuroscientist at Peking University.

"Political events do not and cannot change the reality of climate change."
Philip Duffy, president of the Woods Hole Research Center in Falmouth, Massachusetts.

"As a Canadian working at a US university, a move back to Canada will be something I'll be looking into."
Murray Rudd, studies environmental economics and policy at Emory University in Atlanta, Georgia.

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SPACEX

Falcon9 rockets built and launched by SpaceX carry cargo to the International Space Station.

Dreier will be watching whether the new Congress cuts government spending. "If that's the case, NASA will be impacted by that along with every federal agency," he says.

IMMIGRATION

Trump reinvigorated the national debate on immigration with his campaign pledges to build a wall along the US border with Mexico and to temporarily ban Muslims from entering the United States.

"Our hope is that the rhetoric of the election was only a façade for something hopeful that's going to be more pragmatic and engaging communities," says Carl Saab, a neuroscientist at Brown University in Providence, Rhode Island, and the former president of the Society for Arab Neuroscientists.

Trump has variously said that the ban would apply to all Muslims and to anyone from "nations tied to Islamic terror", drawing vigorous criticism from civil-liberties groups that say such a policy would violate the US Constitution. He has also proposed deporting more people who are in the United States illegally, which could include those who came to the country as children.

Some researchers worry that such policies would threaten US research dominance. About 5% of US university students come from other countries, including more than 380,000 people studying science, engineering, technology or mathematics.

"The rhetoric that Mr Trump ran under has frightened lots of immigrants," says Benjamin Corb, director of public affairs for the American Society for Biochemistry and Molecular Biology in Rockville, Maryland. "I certainly hope that we don't end up losing some brilliant minds as a result of some near-sighted policies." ■

POLITICS

Why the polls missed Trump

Pollsters lament failure to foresee outcome of US election.

BY RAMIN SKIBBA

What went wrong? That's the question many political pollsters in the United States are asking themselves in the aftermath of the 8 November presidential election. Republican candidate Donald Trump won in an electoral landslide, but for months most polls forecast a victory for his Democratic opponent, Hillary Clinton.

Many types of poll, including randomized telephone polls and online polls that people opt into, indicated a tightening of the gap between the two candidates in the weeks leading up to the election — but still pointed to a Clinton win. "The industry is definitely going to be spending a lot of time doing some soul-searching about what happened," says Chris Jackson, head of US public polling at Ipsos, a global market-research and polling firm based in Paris.

The most recent national polls — including those conducted by ABC News/*Washington Post*, Ipsos, YouGov and Fox News — all estimated a Clinton lead of 3–4% over Trump. Yet as the last votes are being counted, Clinton leads the popular vote by a razor-thin margin: just 0.2%. The majority of states have tipped for Trump, giving him their valuable electoral-college votes and ensuring his victory. These include several Midwestern states that Clinton was expected to win.

"It seems like Trump voters were more enthusiastic about turnout and less enthusiastic about responding to polls."

Poll aggregators such as FiveThirtyEight nonetheless forecast Clinton's chances of victory at 71% or higher. This dramatic polling failure could have been due to poorly assessed voters, people misreporting their voting intentions, or pollsters inadequately surveying some segments of the population.

"It's a big surprise that such a wide variety of polls using such a wide variety of methodologies have all the errors fall in the same direction," says Claudia Deane, vice-president of research at the Pew Research Center in Washington DC.

The University of Southern California Dornsife/*Los Angeles Times* presidential election poll, which included an online panel of nearly 3,000 people, was the only major national poll to forecast a Trump lead days before the election. "But we're not sure we were right either," says Jill Darling, survey director at the university's Center for Economic and Social Research in Los Angeles. She notes that Trump did not defeat Clinton by 3%, as her group's most recent poll predicted.

With each election, pollsters have a harder time reaching people. Now that Americans have fewer landlines and more mobile phones with caller ID, they don't respond to calls from unfamiliar numbers. Online surveys also struggle to recruit participants. A poll generally needs at least 1,000 participants who are representative of the general population with respect to gender, race, education, income level and geographic distribution to produce statistically significant results.

Pollsters strive to assess not just who supports whom, but also who will be likely to vote. This year, 119 million people cast ballots, accounting for 55.6% of registered voters, according to Michael McDonald, a political scientist at the University of Florida in Gainesville. That is the lowest percentage since 2000.

There were also more undecided voters this year than in previous presidential elections. Such voters may be under-represented in polls, yet tilt towards one candidate, Darling says. Only 53% of poll respondents disclosed who they would vote for, lower than the 70% in earlier elections, she adds. And people overestimate their own likelihood of voting.

"It seems like Trump voters were more enthusiastic about turnout and less enthusiastic about responding to polls. That's a deadly combination," says Andrew Gelman, a statistician and political scientist at Columbia University in New York City.

Polling experts in Britain conducted a formal inquiry following polling failures in last year's general election, when polls underestimated the turnout of older, Conservative voters. Now, in the United States, the American Association for Public Opinion Research has already named an ad-hoc committee to dig into the data and conduct a post-mortem on the election polls. They aim to produce findings by next May, Deane says. ■

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