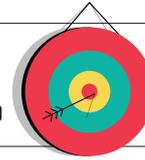


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John Holdren is the longest-serving presidential science adviser in US history.

## POLITICS

# John Holdren looks back

*Obama's top scientist talks to Nature about shrinking federal budgets, Donald Trump, and his biggest regret after nearly eight years in the White House.*

BY JEFF TOLLEFSON AND SARA REARDON

John Holdren is no stranger to the spotlight. Over his long career in science, Holdren — a physicist by training — has worked on controversial high-profile issues such as climate change and nuclear non-proliferation.

But for nearly eight years, he has enjoyed an even higher profile, as US President Barack Obama's science adviser, and director of the White House Office of Science and Technology Policy (OSTP).

With Obama due to leave the White House in January 2017, Holdren, now the

longest-serving US science adviser, recently sat down with *Nature* for a wide-ranging chat. The interview has been edited for length and clarity.

**Opinion polls continue to show a divide between what the American public thinks about science and what scientists think. Has Obama done enough to change the way that science is perceived?**

The president has done an incredible job in making science cool for young people. This is already evident in all kinds of numbers: you see more kids enrolling in science courses, more

kids participating in science fairs, more kids going to 'makerspaces'. We have substantially increased the number of engineers graduating from college in this country. I say 'we', but obviously, that is a large cooperative operation that includes colleges and universities.

I'm not sure which polls you are referring to, but my impression is that the public is more interested in and enthusiastic about science, technology and innovation than it was at the beginning of this administration.

**Leaders at the National Institutes of Health (NIH) and other government agencies have** ▶

► discussed the widespread perception that we are training too many PhDs. Do you worry about that?

If every PhD we train believes that her or his only acceptable career trajectory is a tenured professorship in a college or university, then it's true: we are training more PhDs than there are slots of that kind. But the PhD is, in fact, a very versatile degree. Far more than just demonstrating that you know more than practically anybody else about one narrow topic, it demonstrates that you have the fortitude, the focus, the commitment and the intellectual capacity to tackle a very tough problem.

PhDs are finding constructive and rewarding employment all across the economy, and, overall, our view is that there are still more opportunities for highly trained people in science, technology and innovation than there are people being trained.

**Do you worry about future science funding?**

The president has consistently recommended more money for science and technology than Congress has been willing to pass.

The success ratio of proposals to the NIH is something like 17% — that is, we are funding one-sixth of the proposals that the NIH gets. And those proposals are already self-selected. Investigators don't bother writing a proposal to the NIH unless they think they have got a really good idea, a capable team and a plausible strategy. If you ask Francis Collins, the NIH director, what fraction of the proposals they get that are worthy of funding, he'll tell you 50%.

That means we are funding about a third of the potentially productive, influential, path-breaking research that is proposed to the NIH. But the NIH has a budget of over US\$30 billion per year. It's not very easy in these budget times to increase a \$30-billion budget by a large factor, like 50% — never mind 100% or more, as director Collins would say is warranted in terms of the quality of the research. The same is true at the National Science Foundation — far more worthy proposals than they are able to fund. This is a consistent problem. I would like



Holdren and Obama have pushed for bigger science budgets — with mixed results.

to see more public support for raising public spending on research and development.

**Science is global today. How do you think that complicates matters? Can the regulators keep up?**

I'm going to China this week for a strategic and economic dialogue and for a US–China dialogue on innovation policy. I'll be talking with my Chinese counterpart, Wan Gang, the minister of science and technology, about some of these very problems and what we are doing about them.

We have a lot of cooperation with China on biomedical issues. We talk to them all of the time about gain-of-function research and about gene-editing issues. And in fact, when the current round of interest in gene editing emerged with the rise of the CRISPR technology, the [US] National Academies of Sciences, Engineering, and Medicine gathered leading scientists from all over the world in a format very much like Asilomar [a landmark conference in 1975 that set rules for research on recombinant DNA], but strongly international. The top Chinese people came to talk through what the implications



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For an extended version of this interview, see: [go.nature.com/29mxyuj](http://go.nature.com/29mxyuj)

of these technologies are, and how we should think as a global science community about regulating them.

**Shortly after he took office, Obama said that this was going to be the most transparent administration ever. But journalists have found some agencies to be fairly opaque.**

In the first months of the administration, the president issued executive orders on transparency, on scientific integrity, on openness in government. I was put in charge of a number of the implementation [efforts]. That has been a focus of OSTP throughout this administration. We've gotten virtually all of the departments and agencies to

produce for public review and comment, and then to finalize, policies on openness and on scientific integrity. I think we've made great progress in terms of open data, in terms of the publication in open venues of federally funded research. But I would not argue that that job is finished.

There is always a tendency in government, some of it quite legitimate, not to expose internal deliberations prematurely. You know, it's quite challenging to have a discussion between the president's senior advisers with reporters from *Nature*, *Science* and *The New York Times* sitting around in the room, because if you do that, nobody will float a trial balloon for fear that the trial balloon will get into the news as a done deal.

**You've spent almost eight years inside what is arguably the most powerful institution on Earth. Do you come away more or less optimistic about humanity's ability to deal with its problems?**

I come away more optimistic, and that's in large measure due to the extraordinary leadership that President Obama has provided. I have felt for many decades that science, technology and innovation are crucial if human society is to get its arms around the biggest challenges we face. And I've had the pleasure of working for a president for nearly eight years now who shares that view. ■

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