

White House science adviser talks space, climate change, and budgets

John Holdren recaps the Obama administration's science policy achievements and disappointments.

Longtime policy wonk John Holdren describes his nearly eight years as science adviser to President Obama as “the pinnacle” of his career and a “wonderful and exciting ride.” As the administration nears its end, the former academic physicist says Obama’s science and technology accomplishments far outweigh Holdren’s few regrets.

Although the US must rely on Russia to transport Americans to the International Space Station and no humans have gone beyond low-Earth orbit since the Apollo era, Holdren says President Obama’s space program is on track. “We’re planning a wide variety of missions beyond low-Earth orbit. There will be some further announcements about that over the remainder of the term,” he said in a 25 August interview with *PHYSICS TODAY*. Although Holdren didn’t elaborate, a spokesman later said he wasn’t talking about new crewed missions, but “additional public discussion of steps on our journey to Mars” and elsewhere in the solar system.

The scaling back of an earlier plan to send astronauts to explore a near-Earth asteroid shouldn’t be seen as a setback, Holdren says; rather, the adjustment was necessitated by “a variety of physical and technical realities.” The current plan is for a manned trip in the mid 2020s to a stable orbit near the Moon, where the astronauts will rendezvous with a chunk of an asteroid placed by a robotic spacecraft set to launch in 2021.

Holdren insists Obama made the right call in terminating the Bush administration’s program to return to the lunar

surface. A commission established by Obama in 2009 had determined that the Bush plan, known as Constellation, was “unexecutable,” he notes. “It was years behind schedule; it was three- to fourfold over budget; it was sucking the oxygen out of every other NASA program. We had to fix it, and although it has been described as a cancellation, actually we reshaped it.” Development continues on the components—the Ares heavy-lift rocket and the Orion crew vessel—both

needed for traveling beyond low-Earth orbit.

Having astronauts operating near the Moon “has enormously important implications for all kinds of things,” Holdren says, one of which is that a stable lunar orbit “is a much better jumping-off point for going to Mars” because of the energy required to escape the Moon’s gravity. “We are on track with a trajectory that ultimately will get us to Mars in the 2030s,” he says, noting that getting there sooner was never possible because the required technologies don’t yet exist.

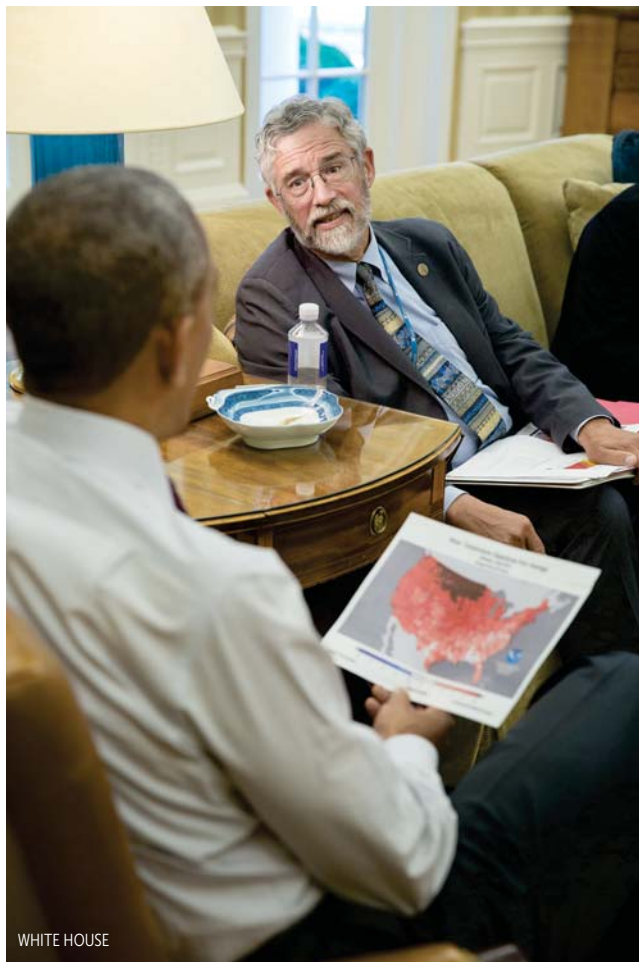
Holdren praises Obama’s record on arms control and nonproliferation. For successes, he cites the 2011 New START agreement with Russia, which will reduce the number of deployed nuclear warheads to 1550 on each side by early 2018 (*PHYSICS TODAY*, May 2012, page 24), last year’s deal to suspend Iran’s nuclear

program (*PHYSICS TODAY*, December 2015, page 26), and the removal of hundreds of weapons’ worth of fissile materials from 30 countries (*PHYSICS TODAY*, May 2014, page 18). But he avoids a question about costly programs under way to modernize the nation’s nuclear arsenal; he says he can’t discuss future budget issues.

An optimist

Trained in plasma physics, Holdren was a professor of environmental policy and director of the science, technology, and public policy program at Harvard University before he became Obama’s science adviser and the director of the Office of Science and Technology Policy (OSTP) in 2009. A self-described optimist, Holdren thinks the growing symptoms of a warming planet will lead the world to conclude that the costs of inaction on climate change are much greater than the costs of responding to it. The plummeting cost of renewable energy and corresponding rapid

increase in its deployment should further reduce mitigation costs. Energy efficiency is also becoming cheaper and more widespread. Nuclear energy and



WHITE HOUSE

NEARING THE END of his almost eight years in office, John Holdren has surpassed his predecessor, John Marburger, as the longest-serving science adviser to a US president.

carbon capture and storage could be significant in limiting temperature rise, he says.

Although Obama failed to get congressional approval for a carbon cap and trade system early in his administration, Holdren believes that a future president and Congress eventually will agree “in one way or another” to put a price on carbon. “Right now, we’re doing it in effect through regulations of various kinds. That’s not the most efficient way to do it.”

Holdren is the longest-serving science adviser to a US president; his term surpasses that of his predecessor, John Marburger, by several months. Holdren has some advice for his successor. “Keep your priorities straight. Your first responsibility is to the president”—not the federal science and technology agencies, the scientific community, or the media.

The science adviser’s second priority is to run OSTP, which has doubled in size to about 120 staff during the Obama years. That growth, Holdren says, occurred because the president “is more interested in science and technology and why it matters to every aspect of his agenda” than any other president, with one possible exception. “I like to say President Obama is the most science-savvy president since Thomas Jefferson, but there is a lot more science to be savvy about.”

Holdren says his successor also should “stay close to the action; be at the table.” He quotes an unnamed chief of staff to Obama admonishing the science adviser, “If you’re not at the table, you’re on the menu.” It’s one reason Holdren couldn’t be “in all places at all times and all things to all people,” he adds. Finally, the next adviser should partner with, cooperate with, and get to know colleagues throughout the agencies and in the White House, he says. “You will get a lot more done working together than you ever will fighting over territory.”

Although the science adviser position, established after World War II, has been filled by physicists or, less frequently, chemists and engineers, Holdren says “it would be great” if a life scientist were to be chosen next. Precisely because he didn’t want his science advice to come solely from physical scientists, Holdren says, Obama appointed two life scientists, Harold Varmus and Eric Lander, to cochair his President’s Council of Advisors on Science and Technology.

Although Holdren denies looking forward to retirement, the 72-year-old insists he won’t stay on under a new president. “My wife would divorce me; it would end a 50-year marriage.” But when asked, he says his biggest regret is that Obama can’t serve another term, then quickly adds that he also regrets being unable to obtain more funding for federal R&D.

Public support needed

For sustained, large budget increases, he says, the scientific community “will need to get better at telling concrete stories about how investments in research and development have improved the quality of our lives, strengthened our economy, created jobs, and opened new horizons in understanding the world around us and the universe around us. We just have tended to talk too much in abstract terms—how many dollars, what percentage of GDP, and so on.”

Obama’s intent to double the budgets of NSF, NIST, and the Department of Energy’s Office of Science over a 10-year period faltered in the face of budget constraints imposed to reduce deficits. Pointing to basic research investments that serendipitously resulted in inven-

tions such as the laser, Holdren notes that “the folks that sit in Congress and read the titles of NSF research grants and say ‘I don’t see how this makes sense’ are barking up the wrong tree. . . . We know from historical experience the portfolio of investments in basic research yields enormous results, and we have in place at NSF and at our other science-related agencies the sort of gold-standard peer-review process that ensures we are making the best possible bets.”

Holdren says caps on discretionary spending justify Obama’s decision to propose that Congress create a new mandatory account to fund \$4.6 billion of R&D in fiscal year 2017 at a half-dozen science agencies, including NASA, NSF, and DOE. Some \$1.9 billion of that would pay to establish a network of 45 NIST manufacturing technology centers. But Congress is unlikely to approve new mandatory programs because they cede lawmakers’ control over the budget. Still, he says, “We believe that even if we don’t get everything we want from Congress there is merit in putting out before the public and before Congress the things we believe the government needs to be doing and should be doing in R&D.”

David Kramer

Extragalactic survey aims to shed light on dark energy

Robot-controlled optical fibers will help create 3D map of the cosmos.

It won’t be the “billions and billions” that astrophysicist and science popularizer Carl Sagan famously referred to, but the 35 million galaxies that the Dark Energy Spectroscopic Instrument (DESI) will map in three dimensions will increase by more than an order of magnitude the number of galaxies with precisely known redshifts. DESI will lead the way among several next-generation projects to characterize dark energy; the data may also yield insights about dark matter, general relativity, neutrinos, galaxy formation, and more.

The DESI project will entail reincarnating a 45-year-old, 4 m telescope on Kitt Peak in Arizona. Until now, under

the auspices of the NSF-funded National Optical Astronomy Observatory (NOAO), the Mayall telescope has been a workhorse used by the wider astronomy community. But in 2012 NSF, following a review of its budget and priorities, decided to cut purse strings to the telescope, although it retains ownership.

The DESI collaboration saw an opportunity, and next year it will begin reconfiguring the telescope for a roughly \$115 million, five-year dedicated extragalactic redshift survey. The Department of Energy is footing the running costs of up to \$8 million annually in addition to \$56 million of the \$75 million conversion. The remaining \$19 million comes