Clinton and Trump: Where do they stand on science?

The candidates' positions on climate change and energy policy differ starkly. Comparing their views on other issues is harder.

As in past elections, it's an understatement to say that science and technology (S&T) haven't been much of an issue in this presidential campaign. Apart from climate change and its close kin energy policy, S&T issues have barely been mentioned on the campaign trail by either Democratic nominee Hillary Clinton or Republican nominee Donald Trump. If Trump has positions on science policy matters, he has kept them to himself. Clinton, on the other hand, has published a considerable amount in position papers available on her campaign website.

Neither campaign responded to multiple requests from PHYSICS TODAY for input to this article or to make their S&T advisers available for interviews. Clinton did provide answers to a list of 20 S&T questions posed by ScienceDebate.org, a coalition of 56 scientific societies, universities, and other nonprofits; Trump provided more general, terse responses to the questions.

"I watch the nightly news, and if [Trump's] even mentioned science, I must admit I'm not in the room when it's happened," says Princeton University physicist William Happer. "I think science for him and his team is sort of a sideshow."

David Goldston, a former staff director of the House Science, Space, and Technology Committee who now oversees the Natural Resources Defense Council Action Fund, agrees: "Where he's going on science is a total mystery. It's not clear who he talks to. We know he's not a reader. We know he's taken the most extreme nonscientific position on climate change possible, and that's kind of it."

Even identifying which members of Trump's nascent transition team will handle science, space, and technology issues has proven difficult. Bob Walker, a lobbyist and former Republican chairman of the House Science Committee, says he has heard nothing to indicate that a member of Trump's small campaign staff is "doing any serious work on the science, space, and technology agenda." He says that Clinton, conversely, has a couple hundred staffers, some with S&T backgrounds, already working on transition.

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Neal Lane, a former science adviser to President Bill Clinton, notes that Trump personally "has said very negative things about his respect for scientific evidence, as with vaccines and climate change, where he repeats views that are not based on science. There's nothing positive I've seen about the Trump campaign's views on science. But they haven't said very much."

The Clinton campaign has not been particularly visible when it comes to science policy. "It may be important to them when they need to govern, but it's not particularly important in terms of winning the election," says Albert Teich of the George Washington University's Elliott School of International Affairs.

Regardless of who controls the White House and Congress next January, it's likely that basic research, with the possible exceptions of climate change and social sciences, will continue to enjoy bipartisan support. "I'm not really worried we'd move away from an understanding that the federal government needs to be in basic research," says Walker.

Lane is also guardedly optimistic. "Good things about science are said by both parties in Congress and by presidents," he says. "But bigger issues related to ideological battles over federal spending are holding down the budgets." Basic research, particularly at the National Institutes of Health, has been underfunded for the past decade, he says, but not because of opposition from either party. "Nobody seems to be against the physical sciences or the biomedical sciences."

The outcome of the presidential election could well affect science budgets,

says Goldston, since funding for R&D depends on the amount of discretionary spending available. "If you look at Trump's fiscal plan, while he hasn't said much specific about science or much else, you've got an overall spending approach and tax proposal that would severely limit the amount of investment the government could put into anything, including science." In contrast, Goldston notes, Clinton hasn't advocated policies that would reduce the federal budget, either by curtailing spending or cutting taxes.

Rodney Nichols, a consultant and former president of the New York Academy of Sciences, says the next administration must grow federal R&D budgets to keep the US competitive with China and other emerging economies. Regarding S&T, he says, "The US shouldn't expect to be number one in every area, but it should look to be number two so it can understand what is going on in every important field. It's very likely that over the next decade, we're going to be lucky to be number two in all the important fields," he warns.

Walker says he's concerned about Trump's silence on science policy issues "because some of the revolutionary changes that are taking place in technology are having a major impact on the culture and the economy."

Happer, a former director of energy research at the Department of Energy in the George H. W. Bush administration, notes that Democrats have favored federal support for applied research, whereas the GOP generally believes it should be left to the private sector. Walker agrees, saying he worries that Clinton may try to "stack the technology agenda with applied science that favors a certain political agenda."

At least two well-known S&T publications, *Scientific American* and *Wired,* have come out strongly against Trump. Both have traditionally steered clear of political endorsements. Republicans William Ruckelshaus and William Reilly, former administrators of the Environmental Protection Agency, back Clinton. In a joint statement released in August, they said Trump "has shown a profound ignorance of science and of the public health issues embodied in our environmental laws," whereas Clinton "is committed to reasonable, science-based policy."

An open letter signed by the leaders of 145 technology companies warns that Trump "would be a disaster for innovation."

The following is a summary of the candidates' known views on major S&T issues as derived from speeches, interviews, tweets, and other publicly available sources.

Climate change

On no scientific issue could the candidates' stated positions be further apart than climate change. Rush Holt, executive officer at the American Association for the Advancement of Science, believes Trump's attitude on climate change "is pretty telling in that he immediately dismisses it as a political statement without seeming to have any interest in getting to the bottom of the issue."

In a much-quoted 2012 tweet, Trump famously derided climate change as a hoax perpetrated by China to make US manufacturing noncompetitive. He later dismissed the comment as a joke, but his statements and tweets in the years since have consistently downplayed climate change as a major concern. On 30 December 2015 Trump told a rally in Hilton Head, South Carolina, "Obama's talking about all of this with the global warming and . . . a lot of it's a hoax. It's a hoax. I mean, it's a money-making industry, OK? It's a hoax, a lot of it."

And in August he told the *Miami Herald,* "I'm not a big believer in manmade climate change . . . [temperature] goes up, it goes down, and I think it's very much like this over the years. We'll see what happens." He added, "Many years ago, I believe it was in the 1920s, they talked about the phenomena of global cooling." Other Trump statements on the subject are confusing. After telling interviewers at the *Washington Post* in March of concerns in the 1920s that Earth was cooling, he noted that "our biggest form of climate change we should worry about is nuclear weapons."

Trump was more tempered in his responses to ScienceDebate.org, saying, "There is still much that needs to be investigated in the field of 'climate change.'" He went on to suggest that the nation's limited resources be used for accessing clean water, eliminating diseases, increasing food production, and developing energy sources that "alleviate the need for dependence on fossil fuels."

Incongruously, in December 2009 Trump and three of his children were among dozens who signed an open letter in the *New York Times* that urged President Obama, at a UN climate conference in Copenhagen, "to ensure meaningful and effective measures to control climate change." It also exhorted Congress to pass meaningful legislation. The letter continued, "If we fail to act now, it is scientifically irrefutable that there will be catastrophic and irreversible consequences for humanity and our planet."

Trump has said he would cancel the UN climate agreement reached in Paris last December and halt US payments to "UN global warming programs." He would rescind the Obama administration's Climate Action Plan, which imposes limits on carbon dioxide emissions from new and existing power plants, tightens energy efficiency standards, and encourages actions to adapt to and mitigate the effects of climate change. He has promised to revitalize the US coal industry.

During a May rally with West Virginia coal miners, Trump lamented the elimination of ozone-depleting propellants from hairspray. "I said, Wait a minute, so if I take hairspray and if I spray it in my apartment, which is all sealed, you're telling me that affects the ozone layer?" he said. "I say no way folks, no way."

For her part, Clinton's position papers say climate change "threatens our economy, our national security, and our children's health and futures." She embraces the current administration's approach of implementing climate policy through administrative measures rather than attempting to work with an unwilling Congress on enacting legislation.

Clinton has said that by 2025 she will reduce greenhouse gas emissions by 30%, relative to their 2005 level; that is more than the 26–28% reduction the Obama administration pledged in Paris. And Clinton says she will put the country on a path to an 80% cut in emissions by 2050, the amount that many climate scientists believe will be required to stabilize world temperatures at safe levels.

"I believe in science," Clinton said in accepting the Democratic nomination in July. "I believe that climate change is real and that we can save our planet while creating millions of good-paying clean energy jobs."

Energy

Clinton has ambitious plans to rapidly grow renewable energy over the next 10 years. "Let's build a cleaner, more resilient power grid with enough renewable energy to power every home in our country," she said in an 11 August speech outlining her economic policy. Residential usage is roughly one-third of total US electricity consumption, and renewables were about 13% of total US generation in 2015.

Within her first term, according to Clinton campaign materials, 500 million solar panels will have been installed in the US, the equivalent of rooftop solar installations on 25 million homes. That additional 140 GW of solar capacity would be an eightfold increase from current levels. The Solar Energy Industries Association estimates about 100 GW of new solar capacity will be on line by 2021.

Clinton described how over 10 years she would increase 10-fold the amount of wind, solar, and hydroelectric generation on public lands and waters. She would extend current subsidies to wind and solar generation and increase spending on R&D for energy storage, advanced nuclear technology, and carbon capture and storage. A proposed $60 billion, 10-year "clean energy challenge" would create a partnership with state and local governments to provide competitive grants and other incentives for accelerating clean-energy deployments. Clinton says she will cut by one-third both oil consumption and energy wasted in buildings.

Clinton told ScienceDebate.org that she will increase R&D on advanced nuclear power and work to ensure that existing nuclear plants are "appropriately valued" for the contribution they make toward the nation's zero-carbon-emission electricity supply.

Trump's announced energy policy focuses on achieving energy independence, saving the declining coal industry, and encouraging increased oil drilling, particularly on federal lands and on the outer continental shelf. He promises in a position paper to scrap unnecessary and outdated regulations, "revoke policies that impose unwarranted restrictions on new drilling technologies," and encourage a reapplication to build the Keystone XL pipeline, which Obama rejected.

Trump has voiced disdain for renewable energy and energy efficiency. In April 2012 he tweeted, "Not only are wind farms disgusting looking, but even worse they are bad for people's health." In October of that year, he tweeted, "Remember, new 'environmentally friendly' lightbulbs can cause cancer. Be careful—the idiots who came up with this stuff don't care."

In his ScienceDebate.org responses, however, Trump said energy independence required exploring "every possible energy source, including wind, solar, nuclear, and biofuels. We can make nuclear power safer, and its outputs are extraordinary given the investment we should make," he said.

R&D, NASA

Clinton laments in her campaign materials that federal spending on R&D as a share of GDP today is lower than before the 1957 launch of *Sputnik 1*. She says she will increase R&D budgets at NSF, DOE, and the Defense Advanced Research Projects Agency, "so that we can tackle big challenges—like ensuring America continues to lead the world in High Performance Computing, green energy, and machine learning."

"Advancing science and technology will be among my highest priorities as president," Clinton told Science Debate.org. "I am deeply concerned by the recent increase in partisan political efforts to interfere in science. I strongly support the free exchange of ideas and data, peer review, and public access to research results and other scientific information, all of which can help protect science-based policy decisions from undue influence from special interests."

Clinton, who has noted her desire as a girl to become an astronaut, told a questioner at a New Hampshire townhall meeting in December that the space program "is a huge economic boon" that has produced commercial products and spin-off companies. She told ScienceDebate.org, "We must maintain our nation's leadership in space with a program that balances science, technology and exploration; protect our security and the future of the planet through international collaboration and Earth systems monitoring; expand our robotic presence in the solar system; and maximize the impact of our R&D and other space program investments by promoting stronger coordination across federal agencies, and cooperation with industry."

In her position statements, Clinton says that she will set aside a small portion of federal research budgets for commercialization efforts, enact reforms to reduce excessive patent litigation, and revise export controls. She would allow entrepreneurs temporary relief from student-loan repayments and would forgive up to $17 000 of student loans for innovators who start businesses in distressed communities.

In responses to ScienceDebate.org, Clinton says she will boost the NIH budget, which will include increasing research on Alzheimer's and other dementias to $2 billion annually and continuing Vice President Joe Biden's cancer "moonshot" initiative.

Trump told ScienceDebate.org that "the federal government should encourage innovation in the areas of space exploration and investment in research and development across the broad landscape of academia." Regardless of budget pressures, "we must make the commitment to invest in science, engineering, healthcare and other areas that will make the lives of Americans better, safer and more prosperous."

Speaking specifically of space exploration, Trump told the organization it will "bring millions of jobs and trillions of dollars in investment to this country." Observation from space and exploration "beyond our own space neighborhood" are priorities, he said, but they should be done with international partners.

Trump's few utterances concerning federal R&D programs have been confusing at best. At a New Hampshire rally in August 2015, he responded to a question about returning to the Moon by saying, "I think it's wonderful. I want to rebuild our infrastructure here on Earth first." In a 2012 tweet, he accused Obama of gutting NASA and making the country dependent on the Russians, a reference to the cancellation of the space shuttle program, which was terminated by President George W. Bush. More recently, on 3 August, in Daytona Beach, Florida, he declared, "Look what's happened with our whole history of space and leadership. Look what's going on folks. We're like a third-world nation."

In an October 2015 interview with conservative radio talk show host Michael Savage, Trump offered, "I hear so much about the NIH, and it's terrible."

David Kramer