Obama, Romney agree on support for basic research, but little else

The GOP challenger would halt federal funding for technology commercialization. Both candidates have given short shrift to climate change.

To say that science and technology policy has not been an issue in this year's presidential contest is an understatement. The painfully slow economic recovery and continuing high unemployment levels have dominated the campaign, crowding most everything else off the table.

As governor of Massachusetts, a state whose academic institutions perennially receive outsized shares of federal R&D funding no matter who is the chief executive, Republican nominee Mitt Romney dealt little with scientific and technological issues he would face as president. President Obama, for his part, has a record of strong support for federal R&D, as evidenced by his annual requests to Congress to increase spending on those programs. But with the exception of the one-time surge of funding from the 2009 American Recovery and Reinvestment Act (ARRA), lawmakers have trimmed Obama's R&D requests.

Romney also backs increased spending for R&D, although he doesn't specify how much. "Government funding for basic science has been declining for years," he wrote in his 2010 book, *No Apology: The Case for American Greatness* (St. Martin's Press). "It needs to grow instead, particularly in engineering and the physical sciences."

For the past nine presidential races, PHYSICS TODAY has asked the nominees to respond to a questionnaire addressing major science policy issues. This year, however, both campaigns agreed to answer 14 questions that were submitted by Science Debate 2012, a group of nonprofit scientific associations (including the American Institute of Physics, which publishes PHYSICS TODAY). The responses to its questionnaire were released on 4 September and are available at http://www.sciencedebate.org/debate12. What follows is based on those responses and on the candidates' records and relevant actions.

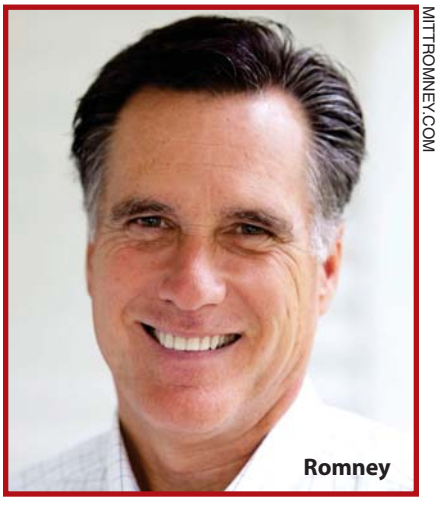
Winners and losers

Although both candidates call for continued strong support for basic research, their views sharply diverge over government spending for the development and commercialization of inventions. Whereas the Obama administration touts the billions of dollars of public money in grants and loan guarantees it has brought to developing renewable energy technologies, Romney shuns such spending as the "picking [of] winners in the marketplace."


Obama

PETE SOUZA, WHITE HOUSE

Both nominees take an "all of the above" approach to energy, backing nuclear, renewables, and fossil fuels, including coal. Romney's energy plan, released on 23 August, is heavy on expanding fossil-fuel production, and he raises the prospect of North America becoming energy independent as soon as 2020. Still, according to his economic plan, "government has a role to play in innovation in the energy industry." Romney applauds the Department of Energy's Advanced Research Projects Agency–Energy, which got its start with funding from ARRA. He says it provides "long-term, non-political sources of funding for a wide variety of competing, early-stage technologies" and "holds the most potential for achieving significant advances in the energy sector."


Romney

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Obama boasts that his administration's $90 billion investment in clean energy from ARRA "will produce as much as $150 billion in clean energy projects" and was the largest single US investment in clean energy to date. Investments in energy, Obama says, "not only focus on research, but on the deployment of these new technologies." Romney calls that same $90 billion "a failed attempt to promote [Obama's] green energy agenda."

Romney expresses ambivalence to clean energy, arguing that the growth of renewables will paradoxically result in a net loss of jobs. Green energy is capital intensive, he maintains, but "old energy," defined as fossil fuel and nuclear, is job intensive. He cites a 2011 study by Verso Economics showing that for every green job created in the UK, 3.7 jobs have been lost; another 2009 study by Spanish economists identified a loss of 2.2 jobs for each new green job created in that country. And though Romney denounces the Obama administration for investing taxpayer dollars in renewable energy startups, when he was governor Romney created a $15 million green energy fund that provided equity capital, loans, and management assistance to Massachusetts-based renewable energy businesses.

Nuclear energy, weaponry

Romney has embraced nuclear energy, which by any reckoning is capital intensive. He would streamline the Nuclear Regulatory Commission licensing process to accelerate approval of new reactors to be built on or adjacent to preapproved sites and using preapproved designs. He would also expand the NRC's capabilities so the agency could swiftly approve new reactor designs such as small modular units. Obama also favors growth for nuclear energy; his administration has

provided $8 billion in loan guarantees to finance construction of the first two reactors to be built in the US since the 1970s.

As for nuclear waste, Obama early on ordered a halt to the decades-old effort to construct a geological repository at Yucca Mountain in Nevada and appointed a blue-ribbon commission to recommend a new path forward. In its January 2012 report, the commission urged the formation of a new federal agency that would solicit and evaluate voluntary proposals from states to host one or more repositories. In a debate among Republican presidential hopefuls in October 2011, Romney proposed a "free market" approach in which states would offer disposal sites in exchange for payment. "Here's a geological site that we've evaluated," he said then. "Here's the compensation we want for taking it. We want you electric companies around the country that are using nuclear fuel to compensate us a certain amount per kilowatt hour, a certain amount per ton of this stuff that comes," he explained.

Obama has said that the US and other nuclear weapons states should strive for global nuclear disarmament, while acknowledging that the goal wouldn't be reached in his lifetime. In 2010 the administration gained Senate ratification of the New Strategic Arms Reduction Treaty with Russia. Romney's campaign material called nuclear disarmament a declaration "of utopian aspirations" and described New START as "we give, Russia gets." According to Romney, the treaty has allowed Russia room to expand its arsenal while requiring the US to reduce its own. He has pledged to review implementation of the treaty and other Obama administration nuclear and arms-control policies.

The elephant in the room

Although both candidates acknowledge that climate change is under way (see PHYSICS TODAY, September 2012, page 20), neither has made global warming an issue in the campaign despite this summer's record-breaking heat waves, droughts, and wildfires. As governor, in 2004 Romney championed a "climate protection plan" for Massachusetts that included a 25% reduction in greenhouse gas emissions from state-owned facilities and called on industry to curtail its carbon dioxide emissions to 1990 levels by 2010. A further 10% reduction was to come by 2020 through adoption of strict standards for old coal-fired power plants, promotion of renewable energy, and other steps.

But after negotiating a regional greenhouse gas cap-and-trade compact with other New England states and neighboring Canadian provinces, Romney declined to sign the agreement. He maintains that scientific consensus on the extent of warming and the degree to which humans have contributed is still lacking. In his response to Science Debate 2012, he argues for a "no regrets" policy that "will lead to lower emissions, but that will benefit America regardless of whether the risks of global warming materialize and regardless of whether other nations take effective action." In addition to "robust government funding for research on efficient, low-emissions technologies," he would streamline regulations hindering the deployment of new energy technologies, including advanced nuclear reactors.

Romney opposes a carbon tax or a cap-and-trade system; he argues that it would harm the economy and drive manufacturing jobs abroad. If elected, Romney has pledged to revoke the Environmental Protection Agency's authority under the Clean Air Act to regulate CO_2 emissions. Ironically, Massachusetts was among a dozen states that successfully sued the EPA to force the agency to regulate CO_2, a case that was decided by the Supreme Court in 2007.

Early in his presidency, Obama pushed for a cap-and-trade system for curbing US CO_2 emissions, but the legislation failed in 2009 to muster the 60 votes required to overcome a Senate filibuster. Obama points to his success in substantially elevating mileage standards for cars and trucks. But he acknowledges that to curb global warming, much more needs to be done, including the negotiation of an agreement among both developed and developing nations to set carbon emission caps.

STEM education

"There is no greater indictment of American government than the sorry state of American education. It is an epic failure," Romney wrote in his 2010 book. During his tenure as governor, he created the John and Abigail Adams scholarships, which continue to provide free four-year tuition to any state school for Massachusetts high school students who score among the top 25% in their school in math and English. This year 18 200 such scholarships were awarded.

At the K–12 level, Romney advocates attracting more highly qualified teachers, eliminating or reforming teacher tenure, and allowing parents to select public schools of their choice, according to a white paper published in May. He supports charter schools and would work to reduce the influence of teachers' unions and reward teachers based on their effectiveness. As governor, Romney added a high school graduation requirement that students pass a science exam. Romney says he will work to establish a policy that automatically confers resident alien status on every foreign graduate of a US university who has an advanced degree in math, science, or engineering.

President Obama calls for the training of 100 000 new science, technology, engineering, and math teachers and for 1 million more students to obtain STEM degrees over the next 10 years. In addition, he advocates the development and implementation of more effective methods of teaching STEM fields to undergraduates. His Change the Equation public–private initiative program has brought 100 CEOs from industry into the effort to advance STEM learning. Obama has also initiated an interagency process aimed at coordinating and consolidating the dozens of federally supported STEM programs.

Space

"America has enjoyed a half-century of leadership in space, but now that leadership is eroding despite the hard work of American industry and government personnel. The current purpose and goals of the American space program are difficult to determine," Romney says in his response to Science Debate 2012. Several space experts—including former NASA administrator Michael Griffin and Scott Pace, director of the Space Policy Institute at the George Washington University—have been advising Romney. "We have watched with dismay as President Obama dismantled the structure that was guiding both the government and commercial space sectors, while providing no purpose or vision or mission," their letter, posted on Romney's campaign website, stated. "This failure of leadership has thrust the space program into disarray and triggered a dangerous erosion of our technical workforce and capabilities. In short, we have a space program unworthy of a great nation." Without citing specifics, Romney's answer to Science Debate 2012 says he "will strive to rebuild an institution worthy of our aspirations and capable once again of leading the world toward new frontiers."

Obama, in his Science Debate 2012 response, points to extension of the International Space Station's lifetime until 2020 or later and his commitment to send humans to an asteroid by 2025, to be followed by a flight to Mars sometime after 2030, as the goals he has set forth for NASA. "The recent landing of NASA's Curiosity rover on Mars was a great leadership moment for our nation and a sign of the continued strength of NASA's many programs in science, aeronautics, and human spaceflight," he says.

Critical materials

Asked by Science Debate 2012 how he would improve US access to critical materials, Romney calls for a new regulatory system that gives states the authority to manage the development of their resources, including those located on federal lands. Obama touts steps his administration has taken, such as pursuing a trade case against China, the source of about 95% of rare-earth elements, for imposing restrictions on exports. And he points to his budget request to Congress to create a new DOE energy research "hub," an interdisciplinary center that would focus on research to minimize the need for, and to find substitutes for, rare earths and other strategic elements.

David Kramer

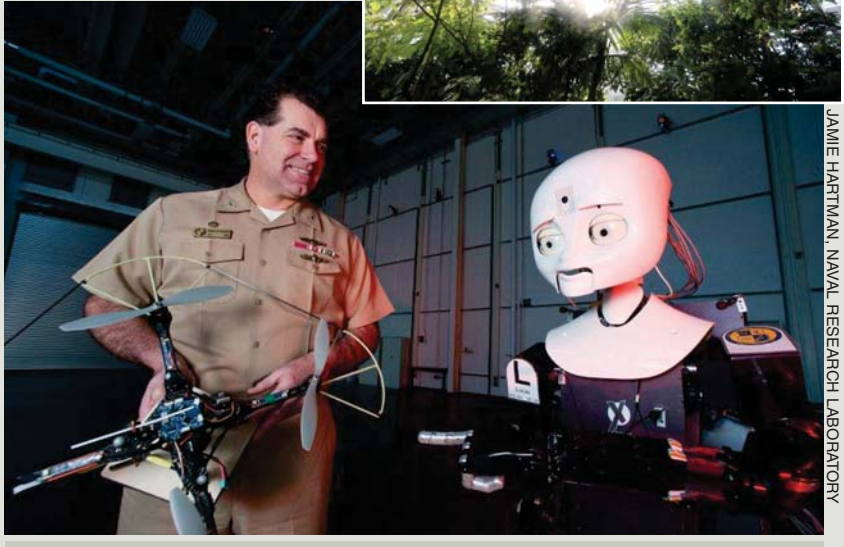
Robots headed out to sea

Lucas, a dexterous, social robot created by the Naval Research Laboratory, is used to study human–robot interaction and to develop cognitive robotic systems. The NRL opened the Laboratory for Autonomous Systems Research (LASR) on its campus in Washington, DC, in March.

Alan Schultz, LASR director, says the 4645-square-meter facility, which cost nearly $18 million to build, offers navy researchers artificial environments in which to develop and test new robotic systems. An onsite rainforest is capable of producing up to six inches of rain per hour, a water tank can generate waves, and a desert produces sandstorms. Among the projects currently under development in LASR is a firefighting robot designed to move autonomously throughout a ship, interact with crew members, and handle dangerous firefighting duties that are otherwise done by humans.

Other features of LASR include a three-dimensional sound system for simulating battle conditions and an onsite machine shop with a 3D printer. But Schultz says that LASR is available only for military work: "We've already turned people down who wanted to rent us out."

David Kramer



JAMIE HARTMAN, NAVAL RESEARCH LABORATORY

Paul Stewart, former commanding officer of the US Naval Research Laboratory, stands with Lucas, a robot developed by the NRL in Washington, DC. Stewart holds a quadrotor mini air vehicle used to test new sensors and algorithms. The facility includes an in-house rainforest (top).