

Presidential



Science Lessons

*Bush Made an Enemy of Scientists.
The Next President Needs Them to Help Set a
New Course for American Exploration.*

By Josh McDaniel

Illustrations by Chris Murphy

Early in the administration of the next president, the first synthetic organism—a bacteria-like creature—is due for production in the United States. When that happens, the president, the U.S. public and the world will be dealing with the first in a series of scientific, ethical and policy concerns that will come to the forefront in the next few years. Other challenges will follow in the fields of nanotechnology and genetics. How do we harness the benefits of scientific exploration into the very nature of life without crossing moral lines? How do we promote manipulation of matter at the atomic and molecular level while regulating the potential hazards?

Given the complexity of the questions facing the next president and the nation, many in the scientific community joined forces to enlist the support of the next administration. A grassroots movement called Science Debate 2008 started in late 2007 inviting all of the presidential candidates to address scientific questions in a debate setting. Over 30,000 scientists, engineers and concerned citizens signed on to the movement along with 20 Nobel Laureates and 80 university presidents. But the debate never occurred during the primary season and is unlikely to be adopted during the general election campaign, lacking support from both the candidates and the media. Instead Science Debate 2008 has made plain what's missing from the national discourse, and raised the question of why the public and the media pay more attention to flag pins than to how the President directs and draws upon the country's scientific resources.

Presidential Power

The president's role in providing direction to research is immense. The executive branch controls a \$150 billion research budget and entire research programs can hinge on support from the Oval Office. President Bush's refusal to fund research on stem cells, for example, has caused the U.S. to fall far behind programs in Europe, China and elsewhere. The executive branch also has 200,000 federal scientists working in the Environmental Protection Agency (EPA), the

Food and Drug Administration, Centers for Disease Control, the Fish and Wildlife Service and other agencies, and controls 38 major research institutions.

The scientific stakes are high, especially as the world enters a new technological era defined by synthetic biology, genetics and nanotechnology. Nations are already jockeying for position to secure the commercial, military and societal gains from these fields. Scientists are working to create customized organisms and minute technology that could manufacture and deliver drugs, clean up pollution and cheaply and efficiently produce biofuels like ethanol, and the potential benefits are huge.

The risks are also enormous. Military applications could lead to a new arms race as miniaturized and biological weapons become more readily available. Artificial life forms created for more benign purposes could behave unpredictably or mutate, leading to new health and environmental threats. There is concern that carbon nanotubes, already commercially available to reinforce plastic materials, can affect the lungs in ways similar to asbestos. And an avalanche of nanoproducts will be released in the coming years.

At present, there is little government oversight of work in nanotechnology and synthetic biology, and the labs themselves provide the only safety checks. Regulations that do exist were drawn up years before these industries developed and do not apply to the specific challenges they present. Critics worry that it will only be a matter of time before a synthetic life form is released and runs amok or a disaster at a nanotechnology plant creates a major health crisis.

The President will have to take the lead in creating the proper regulatory environment for these technologies. This means promoting research into the environmental and health impacts of the manufactured products and health services that are rapidly entering the marketplace. The President will also guide the nation through the moral and legal questions surrounding areas such as genetic discrimination and genetic patenting. This will take real leadership: the active engagement of a president with the best available information and scientific advisors. ▶

Restoring Science in Washington

It is no secret that the scientific community has been at odds with the Bush administration. Reports of oil industry lobbyists rewriting scientific reports on climate change, and political appointees in the Fish and Wildlife Service bullying scientists on reports related to endangered species listings have been well publicized. A number of books such as *The Republican War on Science* by Chris Mooney (Basic Books) and *The Assault on Reason* by Al Gore (Penguin) have pointed to an unprecedented White House-directed effort to distort and suppress science on issues ranging from lead poisoning and mercury pollution to the effectiveness of condoms in preventing HIV/AIDS.

Dr. Francesca Grifo heads up the Union of Concerned Scientists' Restoring Scientific Integrity Program. She says that the tension of the past eight years has made it impera-

like climate change, research funding priorities, and the connection between science education and U.S. competitiveness. "There has been so little discussion of science during the campaign—that is why this is so important," Mooney says. "We wouldn't have to do this if the media had made it a priority."

He has a point. There have been very few questions directly related to science during the primary debates or in TV news interviews. The League of Conservation Voters analyzed the transcripts of the major debates and interviews and found that out of 3,302 questions asked of the candidates, only eight of them mentioned global warming.

The most significant discussion of science and policy occurred during the Compassion Forum at Pennsylvania's Messiah College. Democratic candidates Hillary Clinton and Barack Obama were asked to explain how they related their faith and personal convictions to issues of science, stem cell research and climate change policy. Given the setting and the audience, the answers were understandably weighted more towards the senators' personal ideology than the intricacies of climate modeling.

While climate change is the science issue that receives the most attention in the press, it routinely fails to crack the top 10 issues covered by the media in the Pew Media Index, a weekly analysis of news coverage. According to Pew, the height of media interest in climate change occurred in the first few months of 2007 after the release of *An Inconvenient Truth* on DVD and the publication of a report from the Intergovernmental Panel on Climate Change, which showed that humans were almost certainly causing global warming, that sea levels were likely to rise and Arctic summer sea ice is likely to disappear in the second half of the century. Still, climate change made up only 5% of the news coverage as compared to tensions with Iran (13%), the presidential campaigns (11%), and the Iraq War (9%).

Matthew Nisbett, a professor of communications at American University, says that there is a complex cycle of reinforcement between the public and the media. If the media doesn't put climate change or science on the agenda, he says, the public is unlikely to see it as a priority, either.

Nisbett says climate change actually ranks in the third tier of key issues in polling. "The media looks at the polls and climate change is just not showing up," he says. "And the candidates are looking at those same polls."

A recent Pew study of policy issue priorities found that climate change ranked 15th out of 20 issues for Democrats, right between the need for middle class tax relief and the decline in morality. For Republicans, climate change ranked 20th out of 20 issues, far behind insuring the uninsured, which placed 19th.

The Science Debate 2008 organizers were fighting an uphill battle from the start. Even those within the science community had their doubts about the debate's merits. Crit-



tive to get the current presidential candidates on record regarding how they would use scientific information and how they would support research.

















"The most important thing we need is leadership," says Grifo. "Science is not always the primary factor in any decision, but you need to say, 'The science says one thing on the topic, but for these other reasons, we have decided to choose this other path.' Over and over again, this administration has chosen instead to manipulate the science to an endpoint that is palatable to them."

Mooney, who is a contributing editor to *Science Progress* and blogs on science issues at The Intersection (www.scienceblogs.com/intersection), was one of the organizers of Science Debate 2008. He says the idea was not to spring a pop quiz on candidates about the periodic table or the functions of the mitochondria, but to get them to discuss some of the big issues

The Breakdown

By Josh McDaniel

Comparing candidates' environmental positions is a new political phenomenon, and never has it been more important. Both Democrat Barack Obama and Republican John McCain have said they will maximize resources while searching for better energy solutions, but while the former is looking to shed the nation's fossil fuel dependency as cleanly and quickly as possible, the latter projects a future full of offshore drilling, nuclear power and liquid coal. Below, a point-by-point comparison.

Issue	Obama	McCain
 League of Conservation Voters Lifetime Score	86%	24%
 Cap-and-Trade Policy for CO2	Supports a mandatory cap on emissions with a 100% auction of pollution permits.	One of the first Republican senators to push for capping CO2 emissions. Favors an allocation of permits to polluters based on existing emission rates.
 CO2 Emissions Reduction	80% reduction by 2050.	65% reduction by 2050.
 Federal Renewable Electricity Standard	Supports setting 25% federal renewables standard by 2025.	Voted twice against setting federal renewable standards. Supports states setting own standards.
 Auto Fuel Efficiency	Supports 52 mpg fleetwide standard by 2026.	"Open to negotiations" on increasing CAFE standards. In 2002 introduced bill to raise fuel economy to 36 mpg by 2016.
 Alternative Fuels	Would invest up to \$50 billion per year towards development of clean energy and green jobs. Proposes investing \$150 billion over 10 years in R&D on renewables.	Has said federal government should invest in alternative energy sources but voted against alternative energy funding bills.
 Energy Efficiency	Supports 50% reduction in consumption by 2030.	General support for efficiency but no targets specified.
 Nuclear Power	Believes nuclear power could be expanded if waste and security problems are addressed.	Has proposed adding 45 new nuclear reactors by 2030, and 55 more later on.
 New Coal Plants	Would consider moratorium if emissions cap doesn't slow construction of new plants.	Supports use of conventional coal.
 Liquid Coal	Has "qualified" support for investment in liquid coal technology.	Supports development of liquid coal technology.
 Ethanol	Has supported wide array of ethanol subsidies, but now says that the U.S. should move away from corn to cellulosic ethanol.	Has long opposed corn ethanol subsidies.
 Drilling in Arctic National Wildlife Refuge (ANWR)	Opposes drilling in ANWR.	Mixed voting record on ANWR.
 Public Lands	Does not support rolling back protection to allow drilling in the West. Has proposed increased national park funding and greater land conservation.	Cosponsored bill to allow handguns in parks. Sponsored bill to restrict flights over the Grand Canyon. Opposed bills on wilderness designation.
 Roadless Rule	Supports the rule which keeps 60 million acres of national forest land off-limits to logging and road construction.	Opposed the Clinton-era roadless rule. Has stated that he would repeal it, if elected.
 Offshore Oil Drilling	Opposes lifting the ban on offshore oil drilling.	Reversed his opinion in June and now supports lifting the offshore oil ban.
 Endangered Species Act	Says that the ESA needs to be updated and improved.	Voted to exempt U. of Arizona land development project from compliance with ESA.

Sources: Barack Obama's official website, www.barackobama.com; Glass Booth, www.glassbooth.org; Grist Magazine, www.grist.org; John McCain's official website, www.johnmccain.com; League of Conservation Voters, www.lcv.org.



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ics argued that it might further politicize science as viewers chose positions based on their party or personal alignment with certain candidates. And scientists feared they might lose control of the message as politicians and media pundits applied their own interpretations to research results.

Dr. Sheila Jasanoff, a professor of science and public policy at Harvard University's John F. Kennedy School of Government, has been observing and writing about the interplay between science and democracy for 30 years.

"Science has not always been a political issue," she says. "In the

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1950s and '60s it was never an issue—even through the 1970s and early '80s. The only reason it is part of the current political constellation now is because it is so lacking in the current administration."

A New Beginning

"Bush is the easiest act to follow in American political history," says Green Party presidential candidate and consumer advocate Ralph Nader. Nader has long fought for strengthening the role of science in policy-making, and his efforts have been instrumental in the establishment of the Occupational Safety and Health Administration, the EPA, the Consumer Product Safety Commission and the Safe Drinking Water Act. He says he is now seriously concerned about the lack of regulatory oversight in both biotech and nanotech.

According to Nader, there are a number of things the next president can do to restore the proper role of science in the White House. These include upgrading the role of the president's science advisor, creating whistleblower protections for federal scientists and restoring funding for the Office of Technology and Assessment—the scientific advisory agency for Congress.

The major party candidates appear to be listening. Democratic nominee Barack Obama often cites the role of science and technological innovation in driving the U.S. economy. Jason Grumet, Obama's climate change advisor, told *E*, "Senator Obama believes that there is a fundamental need for transparency in government. He does not believe that you can answer political questions solely with science, but there has to be clarity and integrity in how science is used in the political process." Grumet says that the campaign has created a science policy group to search out ways to elevate the role of science in government. Some of the ideas under development include setting conflict-of-interest rules for scientific advisory boards, ensuring that political appointees in positions with research mandates have proper scientific credentials, and creating a new scientific advisory group for the president.

And John McCain, the Republican nominee, has also signaled a break from the Bush administration's approach to environmental issues. In a May 2008 speech on climate change, Senator McCain said, "I will not permit eight long years to pass without serious action on serious challenges. The United States will lead, and it will lead with a different approach." ▶

HIGH ENERGY

Why Renewables

Pat Robertson is conservative Christianity's charismatic spokesperson. Reverend Al Sharpton is the outspoken activist leader of black America. They are very different leaders for very different followers: the sharp right and the sharp left; the conservative "values" versus the liberal "truths." But lately, they've been sharing the same message: Stop global warming.

Robertson and Sharpton appear together in a slickly produced commercial from Alliance for Climate Protection, an organization founded by former Vice President Al Gore. Last March, the alliance began a three-year, \$300 million marketing campaign aimed at encouraging real emissions reductions, one of the most costly public advocacy campaigns in U.S. history. You've probably seen the spot: "If these polar opposites can come together on this important and moral issue," it asks, "why can't you?"

If it were just a question of consumer approval, renewable energy would be home free by now. Voters overwhelmingly believe that oil companies are gouging them, and they support taxes on the windfall profits these companies reap, with the money going to fund renewables. Most Americans now accept that global warming is real, and they want to do something about it.

The problem is the overwhelming inertia in the energy economy, and continued inaction in Congress. Today, 85% of our overall energy use comes from fossil fuels, which also generate 70% of U.S. electricity. The latter number would be much higher if abundant hydropower was removed from the mix.

While Robertson and Sharpton were making nice, the U.S. Senate voted down a windfall profits tax for Big Oil and extension of tax credits for renewable energy (despite widespread bipartisan support for them).

Why did this happen? Ask Mitch McConnell (R-KY), the senator from Big Coal. Realizing that the tax on oil profits would easily win Senate approval, he led a successful filibuster to block any vote. So 44 conservative Republicans, voting with McConnell, thwarted the majority will. The tax, which would have repealed \$17 billion in oil subsidies over the next 10 years, was also blocked along party lines. Republicans want more oil drilling, and are still calling for exploration in the Arctic National Wildlife Refuge (ANWR).

A study by Navigant shows that killing renewable energy credits threatens \$19 billion in invest-

Are **Still** Just Around the Corner



So happy together: Al Sharpton and Pat Robertson take on climate change.

ment, plus 78,000 wind and 34,000 solar jobs. The Department of Energy (DOE) believes that wind could provide a fifth of U.S. electricity by 2030 (halting the growth in carbon emissions from electricity), but for growth to continue those expiring credits are vital. In 2007, the U.S. added 45% more wind to the grid than it did in 2006, despite the well-funded opposition that has stalled big-ticket installations such as the Cape Wind Project in Massachusetts. Wind currently accounts for 1% of U.S. energy.

Chris Miller, a senior energy aide to Senate Majority Leader Harry Reid (D-NV) says a cap-and-trade carbon program could bring in \$300 billion for renewables and other positive uses, but that needs political will, too.

A 2007 *Scientific American* study estimates that solar could provide 69% of U.S. electricity and 35% of its total energy by 2050. Of course, to make that happen, Congress would have to invest \$400 billion over the next 40 years. But it would be money well spent.

"Solar energy's potential is off the chart," says the magazine. "The energy in sunlight striking the earth for 40 minutes is equivalent to global energy consumption for a year." The U.S. has 250,000 square miles of available land in the Southwest that could be converted to utility-level solar plants. Just 2.5% of the 4,500 quadrillion British thermal units (BTUs) of energy that could be generated there would meet total 2006 U.S. energy consumption.

Groups such as the American Council on Renewable Energy (ACORE) are trying to achieve bipartisan consensus for solar,

wind, geothermal, biofuels and the rest with buy-in from 500 organizations to "build a greater sense of common purpose." It convenes conferences with, among others, the American Bar Association, developers, entrepreneurs and financiers. It's working, but slowly.

The 2008 election is certain to produce a stronger consensus for renewable energy, and probably enough votes to overcome filibusters by the likes of Mitch McConnell. Electing Barack Obama would make a big difference, too, since he's called for \$150 billion in green energy investment over the next 10 years. In a speech last June, he called for a low-carbon fuel standard and major investment in wind and solar.

Dialing Down Demand

Renewables alone aren't enough to solve our enormous fossil fuel dependence. Analysts agree that reducing oil dependence and carbon emissions requires big cuts in demand. That was happening, even without Sharpton and Robertson, because of rising oil prices. The Federal Highway Administration reported that Americans actually drove less in March 2008 (11 billion miles less, a 4.3% drop) than they did in March 2007. That may not sound like much, but it's the first time since 1979 that the agency observed a decline in vehicle miles traveled. And it's the sharpest monthly drop in the agency's history.

People are actually studying mass transit schedules and inflating tires on their bicycles. "Smart grid" technology can make a difference, too. By cutting electricity use during peak hours the U.S. could save \$120 billion on estimated costs for new power plants and transmission lines, say researchers and government officials. Appliances with "smart grid" circuit boards could be grid-connected to shut down for short periods during heavy load times.

Even more futuristic is the idea of connecting hybrid cars like the Toyota Prius to the grid to provide backup power from onboard battery packs. Pacific Gas and Electric is just one utility experimenting with that technology in a collaboration with Google.

And California is a country-wide leader. Since its grid crisis and blackouts of 2000 and 2001 it has embarked on a crash course of conservation. It worked: Kateri Callahan of the Alliance to Save Energy says that the state, at least for a while, had lower per-capita energy consumption than any industrialized country in the world.

California utilities spent \$2 billion through 2008 on conservation programs, resulting in \$3 billion in reduced utility bills (and reducing emissions to the equivalent of taking 650,000 cars off the road). Despite major population gains, California avoided the construction of three large power plants. That's real progress.

CONTACTS: ACORE, (202)393-0001, www.acore.org;
Alliance for Climate Protection, www.wecansolveit.org.
—Jim Motavalli

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Douglas Holtz-Eakin, a Senior Policy Advisor to McCain, told *E* that one of McCain's primary goals was "to stop the demagoguery of the science of climate change in the place of real debates. He believes the president is the one who will set the tone of that debate." Holtz-Eakin also said that McCain views the restoration of science in the policy process as fundamental to restoring faith in the government mission. "He believes that we need to reform government to be responsive—maintaining infrastructure, keeping people safe, encouraging civil society—not just being an election machine in D.C."

The antipathy to science that has characterized the past eight years looks to be coming to an end. "I am absolutely optimistic that this can be turned around with the right leadership," says Grifo. "This is absolutely solvable."

Jasanoff points out that the U.S. has the deepest turnover in bureaucracy of any western society. Most of the political appointees who have been working against science will be looking for new jobs this coming January. She believes that the Bush years

Critics worry that it will only be a matter of time before a synthetic life form is released and runs amok or a disaster at a nanotechnology plant creates a major health crisis.

will be seen as an aberration, with a return to a much more stable relationship between the executive branch and the scientific community no matter who the next president is.

But a return to the status quo won't be enough. The new president will be faced with scientific breakthroughs that require a much deeper engagement with science. And if efforts to curb CO₂ emissions prove to be too little, too late, adaptation to climate change may require risky and controversial large-scale geoengineering projects. Proposals range from building massive seawalls to dumping iron into the oceans to encourage the growth of plankton and the absorption of CO₂.

These are complex questions that dwarf debates over stem cell research and the causes of climate change. The incoming president will play a primary role in guiding the public through that process, deciding on the proper role of government and negotiating the divisive dance between science and religion that has come to characterize public discussion of these issues.

But mostly it will be the next president's task to inspire the country to look to science in facing our biggest challenges. Mooney has argued that the currents are in place for a science revival in U.S. public dialogue—one that could "alter the very zeitgeist of the nation, and even that of the world." The selection of the next president, and that person's engagement and interest in science, will play a critical role. Our standing in the world, and the health of that world, may well depend on it.

CONTACTS: Science Debate 2008, www.sciencedebate2008.com; Union of Concerned Scientists, www.ucsusa.org. **E**

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Green Notes from a Political Insider

By Tiernan Sittenfeld

The League of Conservation Voters (LCV), where I am the legislative director, is calling—loudly—for a strong global warming bill that brings about a clean energy future. The World Health Organization estimates that global warming already cuts short the lives of 150,000 people each year. James Hansen, who is head of NASA's Goddard Institute for Space Studies and perhaps the world's leading researcher on global warming, has said we have just 10 years to reduce greenhouse gases before global warming reaches the point of no return. Without action, the problem could get much worse.

My story is this: One summer in high school, I went backpacking out West and saw forests devastated by clear-cut logging. When I returned to school that fall, I started a recycling club and have been working to protect the environment ever since. Last summer, I became a mother and the urgency I felt about saving the environment went into overdrive. Without action, we risk leaving our children a world that's vastly different than the one we inherited.

I'll start with the good news: We're making progress in the fight to get Congress to pass a strong bill that achieves the emissions reductions necessary to avoid the worst impacts of global warming. Throughout the spring and early summer, LCV worked to strengthen the Lieberman-Warner Climate Security Act (S. 2191), a bill that would have made significant reductions in global warming pollution. That act would have resulted in about an 18% reduction in greenhouse gas emissions by 2020 and about 65% by 2050. It relied on a cap-and-trade system that would limit total greenhouse gas emissions and gradually reduce them each year. The money generated from auctioning pollution permits would be used to help provide assistance to working families and help states and localities adapt to the impacts of global warming.

LCV worked to increase the bill's emissions reductions targets and to boost funding for things