

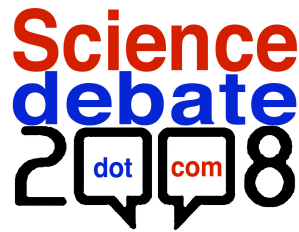
ScienceDebate2008.com presents



**Presidential  
answers to the  
top 14 science  
questions facing  
America**

*Who will be the best president for America in a science-dominated world?*

Developed by



## The Story

In November, 2007, a small group of six citizens - two screenwriters, a physicist, a marine biologist, a philosopher and a science journalist - began working to restore science and innovation to America's political dialogue. They called themselves Science Debate 2008, and they called for a presidential debate on science. The call tapped a wellspring of concern over the state of American science.



Within weeks, more than 38,000 scientists, engineers, and other concerned Americans signed on, including nearly every major American science organization, dozens of Nobel laureates, elected officials and business leaders, and the presidents of over 100 major American universities. See who here. Among other things, these signers submitted over 3,400 questions they want the candidates for President to answer about science and the future of America.



**Compete.**

**Council on  
Competitiveness**



## The Process

Beginning with these 3,400 questions, Science Debate 2008 worked with the leading organizations listed to craft the top 14 questions the candidates should answer. These questions are broad enough to allow for wide variations in response, but they are specific enough to help guide the discussion toward many of the largest and most important unresolved challenges currently facing the United States.

## The Questions and Answers

**Barack Obama's  
answers**

**John McCain's  
answers**



*With support from*

Academy of Natural Sciences  
Allegheny College  
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AAPM  
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American Economics Group  
American Humanist Association  
American Inst Bio Sciences  
American Inst Chem Engineers  
AIMBE  
American Institute of Physics

**1. Innovation.** Science and technology have been responsible for half of the growth of the American economy since WWII. But several recent reports question America's continued leadership in these vital areas. What policies will you support to ensure that America remains the world leader in innovation?

Ensuring that the U.S. continues to lead the world in science and technology will be a central priority for my administration. Our talent for innovation is still the envy of the world, but we face unprecedented challenges that demand new approaches. For example, the U.S. annually imports \$53 billion more in advanced technology products than we export. China is now the world's number one high technology exporter. This competitive situation may only worsen over time because the number of U.S. students pursuing technical careers is declining. The U.S. ranks 17th among developed nations in the proportion of college students receiving degrees in science or engineering; we were in third place thirty years ago.

My administration will increase funding for basic research in

I have a broad and cohesive vision for the future of American innovation. My policies will provide broad pools of capital, low taxes and incentives for research in America, a commitment to a skilled and educated workforce, and a dedication to opening markets around the globe. I am committed to streamlining burdensome regulations and effectively protecting American intellectual property in the United States and around the globe.

Transformative information and communications technologies permeate every aspect of our daily lives. In the last decade, there has been an explosion in the ways Americans communicate with family, friends, and business partners; shop and connect with global markets; educate themselves; become more engaged politically;

American Musm Nat'l  
History  
American Physical Society  
American Psychological  
Assn  
ASBMB  
American Soc for Cell  
Biology  
American Soc of Civil  
Engin'rs  
American Soc of Lndsep  
Archs  
ASME  
ASPB  
American Statistical Assn  
The American University  
Annual Reviews  
Arizona State University  
The Aspen Institute  
Aspen Science Center  
Assn of Amer Medical  
Colleges  
Assn of Nature Ctr Admins  
ARHP  
ASTC  
Assn fr Women in  
Mathematics  
Assn for Women in  
Science  
Astrophysical Journal  
Barnard College  
The Biophysical Society  
The Brain Trauma  
Foundation  
The Carnegie Inst of Wash  
Cal State U, Monterey Bay  
Case Western Reserve  
Univ  
Chemical Heritage  
Foundation  
CRDF  
Center for Inquiry  
Center for Science  
Writings, Stevens Institute  
of Technology  
Columbia University  
Cornell Lab of Ornithology  
Cornell University  
Council on  
Competitiveness  
Council on Undergrad  
Research  
Cosmos Studios  
Dickinson College  
Drexel University  
Duke University  
EarthSky Communications  
Ecological Society of  
America

physical and life sciences, mathematics, and engineering at a rate that would double basic research budgets over the next decade. We will increase research grants for early-career researchers to keep young scientists entering these fields. We will increase support for high-risk, high-payoff research portfolios at our science agencies. And we will invest in the breakthrough research we need to meet our energy challenges and to transform our defense programs.

A vigorous research and development program depends on encouraging talented people to enter science, technology, engineering, and mathematics (STEM) and giving them the support they need to reach their potential. My administration will work to guarantee to students access to strong science curriculum at all grade levels so they graduate knowing how science works – using hands-on, IT-enhanced education. As president, I will launch a Service Scholarship

and consume and even create entertainment. America has led the world into this technology revolution because we have enabled innovation to take root, grow, and prosper. Nurturing technology and innovation is essential for solving the critical problems facing our country: developing alternative fuels, addressing climate change, encouraging commercialization of new technologies, deploying technology to manage cost and enable new jobs, stopping the spiraling expense of health care, and better educating our children and our workforce.

I am uniquely qualified to lead our nation during this technological revolution. While in the Navy, I depended upon the technologies and information provided by our nation's scientists and engineers with during each mission. I am the former chairman of the Senate Committee on Commerce, Science and Transportation. The Committee plays a major role in the development of technology policy,

The Endocrine Society  
Entomological Soc Of  
America  
FBPCS  
FASEB  
Florida Citizens for Science  
FABBS  
Fox Chase Cancer Center  
The Franklin Institute  
Friends of the Earth  
Georgia Institute of  
Technology  
The Hastings Center  
Highlands Coalition  
Humboldt University  
IEEE-USA  
Illinois Institute of  
Technology  
Illinois Science Council  
Independent Colleges  
Office  
The Institute of Medicine  
Issues in Science and Tech  
Johns Hopkins University  
Kavli Inst For Theor  
Physics  
Kenyon College  
Kettering University  
Lawrence University  
Lerner Research Institute,  
The Cleveland Clinic  
Macalester College  
Manhattanville College  
Materials Research Society  
Michigan Tech  
Museum of Science Boston  
National Academy of  
Enginrng  
National Academy of  
Sciences  
NAGPS  
National Ctr for Mfg  
Sciences  
National Center for Science  
Ed  
NEPCC  
National Postdoctoral Assn  
National Wildlife  
Federation  
Natural Science Coll  
Alliance  
Nature Immunology  
The New School  
New York Hall of Science  
New York University  
Nicholas School, Duke  
Univ  
North Carolina State Univ  
Northwestern University

program that pays undergraduate or graduate teaching education costs for those who commit to teaching in a high-need school, and I will prioritize math and science teachers. Additionally, my proposal to create Teacher Residency Academies will also add 30,000 new teachers to high-need schools – training thousands of science and math teachers. I will also expand access to higher education, work to draw more of these students into science and engineering, and increase National Science Foundation (NSF) graduate fellowships. My proposals for providing broadband Internet connections for all Americans across the country will help ensure that more students are able to bolster their STEM achievement.

Progress in science and technology must be backed with programs ensuring that U.S. businesses have strong incentives to convert advances quickly into new business

specifically any legislation affecting communications services, the Internet, cable television and other technologies. Under my guiding hand, Congress developed a wireless spectrum policy that spurred the rapid rise of mobile phones and Wi-Fi technology that enables Americans to surf the web while sitting at a coffee shop, airport lounge, or public park.

Above all, my commitment to innovation is a commitment to the well-established entrepreneurial spirit and creativity of America's thinkers and tinkerers whose inventions have improved our lives and promoted prosperity. To maintain American leadership, I believe we must nurture the conditions under which entrepreneurs can continue to prosper by bringing new innovators to market and the American people can reap the rewards.

As President, I will ---

- Focus on addressing national needs to make the United States a leader

NOVA Television Series  
NOW, PBS weekly TV  
news  
Partners HealthCare  
System  
Physicians for Social Resp  
Planetary Science Institute  
Pomona College  
Popular Science Magazine  
Population Connection  
Presidl Climate Action  
Project  
R&D Magazine  
Renewable Nat'l Resources  
Fdn  
Research!America  
Research Corporation  
Rochester Institute Of Tech  
Saint Francis University  
The Santa Fe Institute  
Sarah Lawrence College  
Science Friday, Inc  
Science Magazine  
Science Illustrated  
Magazine  
Science Museum of  
Minnesota  
The Science Network  
Science Progress  
Scientific American  
Magazine  
The Scientist Magazine  
Scientists & Engrs for  
America  
Secular Coalition for  
America  
Seed Media Group, Seed  
Magazine, and  
ScienceBlogs  
Semiconductor Industry  
Assn  
SETI Institute  
Sigma Xi  
Skeptic Magazine  
Skeptical Inquirer  
Magazine  
Skeptics Society  
Smith College  
SICB  
Society for Neuroscience  
Soc for Science & the  
Public  
Soc for Women's Health  
Resrch  
S.E. Univs Research Assn  
SRI International  
Stanford University  
SETDA  
SSSCR

opportunities and jobs.  
To do this, my  
administration will make  
the R&D tax credit  
permanent.

in developing, deploying,  
and exporting new  
technologies;

- Utilize the nation's  
science and technology  
infrastructure to develop a  
framework for economic  
growth both domestically  
and globally;

- Appoint a Science and  
Technology Advisor within  
the White House to  
ensure that the role of  
science and technology in  
policies is fully recognized  
and leveraged, that  
policies will be based  
upon sound science, and  
that the scientific integrity  
of federal research is  
restored;

- Eliminate wasteful  
earmarks in order to  
allocate funds for science  
and technology  
investments;

- Fund basic and  
applied research in new  
and emerging fields such  
as nanotechnology and  
biotechnology, and in  
greater breakthroughs in  
information technology;

- Promote greater fiscal  
responsibility by  
improving the scientific  
and engineering

Sunshine Week  
Sweet Briar College  
Technology Student  
Association  
Towson University  
Tri-State University  
Tufts University  
Union of Concerned  
Scientists  
University of Arizona  
University at Buffalo,  
SUNY  
University of Cal, Berkeley  
University of Cal,  
Riverside  
University of Cincinnati  
University City Science  
Center  
University of Ill, Urbana-  
Chpn  
University of Maryland  
Univ of Md, Baltimore Cty  
University of  
Massachusetts  
University of Minnesota  
University of Notre Dame  
University of Pennsylvania  
Museum of Arch and  
Anthrop  
U of The Sciences  
Philadelphia  
University of Texas at  
Dallas  
University of Washington  
U.S. Metric Association  
Virginia Tech  
Wesleyan University  
Western Michigan  
University  
Whitehead Inst Biomed  
Resrch  
Widener University  
The Wilderness Center  
The Will Steger Foundation  
Wired.com  
World Wildlife Fund

management within the  
federal government;

- Encourage and facilitate commercialization of new innovations, especially those created from federally funded research;
- Ensure U.S. leadership in space by promoting an exploration agenda that will combine the discoveries of our unmanned probes with new technologies to take Americans to the Moon, Mars, and beyond;
- Grow public understanding and popularity of mathematics and science by reforming mathematics and science education in schools;
- Leverage technologies to create employment in rural areas and deploy the displaced workforce;
- Create greater transparency in government and encourage more citizens-government dialogs using current technology; and
- Develop and implement a global competitive agenda

through a series of business roundtables with industry and academia leaders.

**2. Climate Change.** The Earth's climate is changing and there is concern about the potentially adverse effects of these changes on life on the planet. What is your position on the following measures that have been proposed to address global climate change—a cap-and-trade system, a carbon tax, increased fuel-economy standards, or research? Are there other policies you would support?

There can no longer be any doubt that human activities are influencing the global climate and we must react quickly and effectively. First, the U.S. must get off the sidelines and take long-overdue action here at home to reduce our own greenhouse gas emissions. We must also take a leadership role in designing technologies that allow us to enjoy a growing, prosperous economy while reducing greenhouse gas emissions by 80 percent below 1990 levels by 2050. With the right incentives, I'm convinced that American ingenuity can do this, and in the process make American businesses more productive, create jobs, and make America's

We know that greenhouse gas emissions, by retaining heat within the atmosphere, threaten disastrous changes in the climate. The same fossil-fuels that power our economic engine also produced greenhouse gases that retain heat and thus threaten to alter the global climate. No challenge of energy is to be taken lightly, and least of all, the need to avoid the consequences of global warming. The facts of global warming demand our urgent attention, especially in Washington. Good stewardship, prudence, and simple commonsense demand that we act to meet the challenge, and act quickly.

buildings and vehicles safer and more attractive. This is a global problem. U.S. leadership is essential but solutions will require contributions from all parts of the world—particularly the rest of the world’s major emitters: China, Europe, and India.

Specifically, I will implement a market-based cap-and-trade system to reduce carbon emissions by the amount scientists say is necessary: 80 percent below 1990 levels by 2050. I will start reducing emissions immediately by establishing strong annual reduction targets with an intermediate goal of reducing emissions to 1990 levels by 2020. A cap- and-trade program draws on the power of the marketplace to reduce emissions in a cost-effective and flexible way. I will require all pollution credits to be auctioned.

I will restore U.S. leadership in strategies for combating climate change and work closely with the international community. We will re-engage with the U.N. Framework Convention

To dramatically reduce carbon emissions, I will institute a new cap-and-trade system that over time will change the dynamic of our energy economy. By the year 2012, we will seek a return to 2005 levels of emissions, by 2020, a return to 1990 levels, and so on until we have achieved at least a reduction of sixty percent below 1990 levels by the year 2050. In doing this, we will transition into a low carbon energy future while promoting the technological innovations that keep us on a course of economic growth. The purpose of this approach is to give American businesses new incentives and rewards to seek cheaper emission reductions, instead of just new taxes to pay and new regulations to follow. This approach gives people time to adapt, instead of causing a sudden jolt to electricity bills and potential shutdowns of tradition coal-fired plants.

I have long supported CAFE standards - the mileage requirements

on Climate Change, the main international forum dedicated to addressing the climate change problem. In addition I will create a Global Energy Forum—based on the G8+5, which includes all G-8 members plus Brazil, China, India, Mexico and South Africa—comprising the largest energy consuming nations from both the developed and developing world. This forum would focus exclusively on global energy and environmental issues. I will also create a Technology Transfer Program dedicated to exporting climate-friendly technologies, including green buildings, clean coal and advanced automobiles, to developing countries to help them combat climate change.

that automobile manufacturers' cars must meet. Some carmakers ignore these standards, pay a small financial penalty, and add it to the price of their cars. But I believe that the penalties for not following these standards must be effective enough to compel all carmakers to promote the development of fuel-efficient vehicles. I will strengthen the penalties for violating CAFE standards, and make certain they are effectively enforced.

To bolster research efforts, government must do more by opening new paths of invention and ingenuity. A McCain administration would establish a permanent research and development tax credit equal to ten percent of wages spent on R&D, to open the door to a new generation of environmental entrepreneurs. I am also committed to investing two billion dollars every year for the next 15 years on clean coal technologies, to unlock the potential of America's oldest and most abundant

resource. And we will issue a Clean Car Challenge to automakers, in the form of a tax credit to the American people, for every automaker who can sell a zero-emission vehicle. We will commit up to a 5,000 dollar tax credit to each and every customer who buys that car. In the quest for alternatives to oil, our government has thrown around enough money subsidizing special interests and excusing failure. From now on, we will encourage heroic efforts in engineering, and we will reward the greatest success.

I further propose we inspire the ingenuity and resolve of the American people by offering a \$300 million prize for the development of a battery package that has the size, capacity, cost and power to leapfrog the commercially available plug-in hybrids or electric cars. This is one dollar for every man, woman and child in the U.S. -- a small price to pay for helping to break the back of our oil dependency -- and curb the dangerous effects of global climate

change.

I will continue to support the US Global Change Research Program and ensure that the program's activities support the Nation's needs for climate related information to help it prepare for the future.

**3. Energy.** Many policymakers and scientists say energy security and sustainability are major problems facing the United States this century. What policies would you support to meet demand for energy while ensuring an economically and environmentally sustainable future?

America's challenges in providing secure, affordable energy while addressing climate change mean that we must make much more efficient use of energy and begin to rely on new energy sources that eliminate or greatly reduce greenhouse gas emissions. My programs focus both on a greatly expanded program of federally funded energy research and development and on policies designed to speed the adoption of innovative energy technologies and stimulate private innovation.

Over time, I believe that we must reform our entire energy economy toward a sustainable mix of new and cleaner power sources that meet the multiple shared objective of promoting environmental, economic and national security. One of the prevailing issues of our time and the next presidency will be how to deal with the issues of energy security and sustainability. It is important that we shift to sustainable, clean burning energy sources or advance to technologies that make our more traditional resources cleaner

First, I have proposed programs that, taken together, will increase federal investment in the clean energy research, development, and deployment to \$150 billion over ten years. This research will cover:

- Basic research to develop alternative fuels and chemicals;
- Equipment and designs that can greatly reduce energy use in residential and commercial buildings – both new and existing;
- New vehicle technologies capable of significantly reducing our oil consumption;
- Advanced energy storage and transmission that would greatly help the economics of new electric-generating technologies and plug-in hybrids;
- Technologies for capturing and sequestering greenhouse gases produced by coal plants; and
- A new generation of

burning.

As President, I will put the country on track to building 45 new reactors by 2030 so that we can meet our growing energy demand and reduce our emissions of greenhouse gases. Nuclear power is a proven, domestic, zero-emission source of energy and it is time to recommit to advancing our use of nuclear energy. The U.S. has not started construction on a new nuclear power plant in over 30 years. Currently, nuclear power provides 20 percent of our overall energy portfolio. Other countries such as China, India and Russia are looking to increase the role of nuclear power in their energy portfolio and the U.S. should not just look to maintain, but increase its own use.

In the progress of other alternative energy sources -- such as wind, solar, geothermal, tide, and hydroelectric -- government must be an ally but not an arbiter. In less than a generation, wind power alone could account for a fifth or more

nuclear electric technologies that address cost, safety, waste disposal, and proliferation risks.

I will also work closely with utilities to introduce a digital smart grid that can optimize the overall efficiency of the nation's electric utility system, by managing demand and making effective use of renewable energy and energy storage.

Second, it is essential that we create a strong, predictable market for energy innovations with concrete goals that speed introduction of innovative products and provide a strong incentive for private R&D investment in energy technologies.

These concrete goals include:

- Increasing new building efficiency by 50 percent and existing building efficiency by 25 percent over the next decade, and taking other steps that will reduce the energy intensity of our economy 50 percent by 2030;

of all our electricity. And just in recent memory, solar energy has gone from a novelty to a fast-growing industry. I've voted against the current patchwork of tax credits for renewable power because they were temporary, and often the result of who had the best lobbyist instead of who had the best ideas. But the objective itself was right and urgent. And when I'm signing laws, instead of casting one of a hundred votes, I intend to see that objective better served. We will reform this effort so that it is fair, rational, and permanent, letting the market decide which ideas can move us toward clean and renewable energy.

I will also commit the federal government to a prosperous clean technology agenda and to becoming the world leader in green technologies. Americans have always been the world's leaders in innovation, and it's time for our economy to adapt and take an active role in the new green international economy.

- Increasing fuel economy standards 4 percent per year and providing loan guarantees for domestic auto plants and parts manufacturers to build new fuel- efficient cars domestically;

- Extending the Production Tax Credit for five years and creating a federal Renewable Portfolio Standard that will require that 10 percent of American electricity be derived from renewable sources by 2012, and 25 percent by 2025; and

- Ensuring that regulations and incentives in all federal agencies support the national energy and environmental goals in ways that encourage innovation and ingenuity.

I will also encourage communities around the nation to design and build sustainable communities that cut energy use with walkable community designs and expanded investment in mass transit.

These investments by government into basic research along with aggressive and realistic targets for greenhouse gas emissions will be critical in spurring revolutionary innovations in energy that will, over the long term, reduce energy costs and increase economic growth.

**4. Education.** A comparison of 15-year-olds in 30 wealthy nations found that average science scores among U.S. students ranked 17th, while average U.S. math scores ranked 24th. What role do you think the federal government should play in preparing K-12 students for the science and technology driven 21st Century?

All American citizens need high quality STEM education that inspires them to know more about the world around them, engages them in exploring challenging questions, and involves them in high quality intellectual work. STEM education is no longer only for those pursuing STEM careers; it should enable all citizens to solve problems, collaborate, weigh evidence, and communicate ideas. I will work to ensure that all Americans, including those in traditionally underrepresented groups, have the knowledge and skills they need to engage in society, innovate in our world, and compete in the global economy.

I will support research to understand the strategies and mechanisms that bring lasting improvements to STEM

My Administration will promote economic policies that will spur economic growth and a focus on an innovative economy. Critical to these efforts is the creation of the best trained, best prepared workforce to drive this economy through the 21st century. America's ability to compete in the global market is dependent on the availability of a skilled workforce. Less than 20 percent of our undergraduate students obtaining degrees in math or science, and the number of computer science majors have fallen by half over the last eight years. America must address these trends in education and training if it hopes to compete successfully.

But I believe that education is an ongoing process. Thus our nation's education system

education and ensure that promising practices are widely shared. This includes encouraging the development of cutting edge STEM instructional materials and technologies, and working with educators to ensure that assessments measure the range of knowledge and skills needed for the 21st Century. I will bring coherency to STEM education by increasing coordination of federal STEM education programs and facilitating cooperation among state efforts. I recently introduced the "Enhancing Science, Technology, Engineering and Math Education Act of 2008" that would establish a STEM Education Committee within the Office of Science and Technology Policy (OSTP) to coordinate the efforts of federal agencies engaged in STEM education, consolidate the STEM education initiatives that exist within the Department of Education under the direction of an Office of STEM Education, and create a State

should not only focus on graduating new students; we must also help re-train displaced workers as they prepare for the rapidly evolving economy. Invigorating our community college system is a good place to start. For example, recognizing this, I have long supported grants for educational instruction in digital and wireless technologies, targeted to minorities and low-income students who may not otherwise be exposed to these fields.

Beyond the basics of enabling every student to reach their potential, our country is faced with a critical shortage of students with specific skills fundamental to our ability to compete globally.

The diminishing number of science, technology, engineering and math graduates at the college level poses a fundamental and immediate threat to American competitiveness.

We must fill the pipeline to our colleges and

Consortium for STEM Education. These reforms will strengthen interagency coordination at the federal level, encourage collaboration on common content standards and assessments for STEM education at the state and local levels, and provide a mechanism for sharing the latest innovations and practices in STEM education with educators. I also recently sponsored an amendment, which became law, to the America Competes Act that established a competitive state grant program to support summer learning opportunities with curricula that emphasize mathematics and problem solving.

My education plan is built on the recognition that teachers play a critical role in student learning and achievement. My administration will work closely with states and local communities to ensure that we recruit math and science graduates to the teaching profession. Through Teacher Service

universities with students prepared for the rigors of advanced engineering, math, science and technology degrees.

We must move aggressively to provide opportunities from elementary school on, for students to explore the sciences through laboratory experimentation, science fairs and competitions.

We must bring private corporations more directly into the process, leveraging their creativity, and experience to identify and maximize the potential of students who are interested and have the unique potential to excel in math and science.

We must strengthen skills of existing science and math teachers through training and education, through professional development programs and community colleges. I believe we must provide funding for needed professional teacher development. Where federal funds are involved, teacher development money

Scholarships, a Teacher Residency Program, and Career Ladders, I will transform the teaching profession from one that has too many underpaid and insufficiently qualified teachers to one that attracts the best STEM teaching talent for our schools.

We cannot strengthen STEM education without addressing the broader challenges of improving American education and other priority issues. In addition to a focus on high quality teachers, my comprehensive plan addresses the needs of our most at-risk children, focuses on strong school leaders, and enlists parent and community support. My proposals for a comprehensive “zero to five” program will ensure that children enter school ready to learn. And when they finish school, I will make sure that through the new \$4,000 American Opportunity Tax Credit, they will have access to affordable higher education that will provide them with the science fluency they need to be leaders in STEM fields and across

should be used to enhance the ability of teachers to perform in today’s technology driven environment. We need to provide teachers with high quality professional development opportunities with a primary focus on instructional strategies that address the academic needs of their students. The first 35 percent of Title II funding would be directed to the school level so principals and teachers could focus these resources on the specific needs of their schools.

I will devote 60 percent of Title II funding for incentive bonuses for high performing teachers to locate in the most challenging educational settings, for teachers to teach subjects like math and science, and for teachers who demonstrate student improvement. Payments will be made directly to teachers. Funds should also be devoted to provide performance bonuses to teachers who raise student achievement and enhance the school-wide learning

broad sectors of our society.

environment. Principals may also consider other issues in addition to test scores such as peer evaluations, student subgroup improvements, or being removed from the state's "in need of improvement" list.

I will allocate \$250 million through a competitive grant program to support states that commit to expanding online education opportunities. States can use these funds to build virtual math and science academies to help expand the availability of AP Math, Science, and Computer Sciences courses, online tutoring support for students in traditional schools, and foreign language courses.

I will also continue to support STEM education programs at NSF, DOE, NASA, and NOAA.

These scientific agencies can and should play a key role in the education of its future engineers and scientists. These agencies have the opportunity to add a practical component to the theoretical aspects of the students' educational process.

**5. National Security.** Science and technology are at the core of national security like never before. What is your view of how science and technology can best be used to ensure national security and where should we put our focus?

Technology leadership is key to our national security. It's essential to create a coherent new defense technology strategy to meet the kinds of threats we may face— asymmetric conflicts, urban operations, peacekeeping missions, and cyber, bio, and proliferation threats, as well as new kinds of symmetric threats.

When Sputnik was launched in 1957, President Eisenhower used the event as a call to arms for Americans to help secure our country and to increase the number of students studying math and science via the National Defense Education Act. That educational base not only improved our national security and space programs but also led to our economic growth and innovation over the second half of the century. Our nation is again hearing a threatening “ping” in the

I have been a tireless advocate of our military and ensuring that our forces are properly postured, funded, and ready to meet the nation's obligations both at home and abroad. I have fought to modernize our forces, to ensure that America maintains and expands its technological edge against any potential adversary, and to see that our forces are capable and ready to undertake the variety of missions necessary to meet national security objectives.

As President, I will strengthen the military, shore up our alliances, and ensure that the nation is capable of protecting the homeland, deterring potential military challenges, responding to any crisis that endangers American security, and prevailing in any conflict we are forced to fight.

We are benefiting today from technology that was

distance, this time not from a single satellite in space but instead from threats that range from asymmetric conflicts to cyber attacks, biological terror and nuclear proliferation. I will lead the nation to be prepared to meet this 21st-century challenge by investing again in math and science education, which is vital to protecting our national security and our competitiveness.

As president I will also ensure that our defense, homeland security, and intelligence agencies have the strong research leadership needed to revitalize our defense research activities and achieve breakthrough science that can be quickly converted into new capabilities for our security.

This year, I was encouraged to see the Department of Defense (DoD) requested a sharp increase in the basic research budget for breakthrough technologies. More is needed. My administration will put basic defense research

invented for military use a quarter of a century ago (e.g. the Internet, email, GPS, Teflon). And today, the American military has some of the most advanced technologies in the world to support them as they defend America's interest. We need to ensure that America retains the edge in the most strategic areas and I will continue to encourage this with advanced R&D research funding.

on a path to double and will assure strong funding for investments in DoD's applied research programs. We will enhance the connections between defense researchers and their war-fighting counterparts. And, we will strengthen defense research management so that our most innovative minds are working on our most pressing defense problems. A strong research program can also lower procurement costs by reducing technical risks and increasing reliability and performance. Renewing DARPA (the Defense Advanced Research Projects Agency) will be a key part of this strategy.

My administration will build a strong and more productive research program in the Department of Homeland Security (DHS) that will include critical work on cyber and bio security. Because existing programs have been plagued by management problems, we will bring a renewal of talent, organization, and focus, seeking support from our

universities, companies, and labs. Another critical role for R&D in national security is energy. Our petroleum dependence continually threatens our security, and my proposals for accelerating new alternative energy technologies will be an important part of my national security R&D agenda.

Finally, we will act to reverse the erosion of the U.S. manufacturing base - which could jeopardize our technical superiority. We need to continue to develop the finest defense systems in the world. But, we are losing domestic production capability for critical defense components and systems. I will implement the recommendations of the Defense Science Board on defense manufacturing, strengthen efforts at DoD's Manufacturing Technology program, and invest in innovative manufacturing sciences and processes to cut manufacturing costs and increase efficiency.

**6. Pandemics and Biosecurity.** Some estimates suggest that if H5N1 Avian Flu becomes a pandemic it could kill more than 300 million people. In an era of constant and rapid international travel, what steps should the United States take to protect our population from global pandemics or deliberate biological attacks?

It's time for a comprehensive effort to tackle bio-terror. We know that the successful deployment of a biological weapon—whether it is sprayed into our cities or spread through our food supply—could kill tens of thousands of Americans and deal a crushing blow to our economy.

Overseas, I will launch a Shared Security Partnership that invests \$5 billion over 3 years to forge an international intelligence and law enforcement infrastructure to take down terrorist networks. I will also strengthen U.S. intelligence collection overseas to identify and interdict would-be bioterrorists before they strike and expand the U.S. government's bioforensics program for tracking the source of any biological weapon. I will work with the international community

It is impossible to know whether the H5N1 virus will cause a human pandemic. The widespread nature of H5N1 in birds, the high mortality rates in exposed humans, and the likelihood of mutations over time have illustrated, however, the potentially catastrophic consequences that could arise from a pandemic, whether it arises from the current H5N1 strain or a different strain of the virus. That awareness requires the international community, the federal government, state and local governments, the health care industry, research community and the business community to develop and implement strategies to address this threat. The positive news is that such efforts are underway. They need continued development and attention, however, because by their very nature pandemics have the potential to

to make any use of disease as a weapon declared a crime against humanity.

And to ensure our country is prepared should such an event occur, we must provide our public health system across the country with the surge capacity to confront a crisis and improve our ability to cope with infectious diseases. I will invest in new vaccines and technology to detect attacks and to trace them to their origin, so that we can react in a timely fashion. I have pledged to invest \$10 billion per year over the next 5 years in electronic health information systems to not only improve routine health care, but also ensure that these systems will give health officials the crucial information they need to deploy resources and save lives in an emergency. I will help hospitals form collaborative networks to deal with sudden surges in patients and will ensure that the U.S. has adequate supplies of medicines, vaccines, and

overwhelm society's response capabilities.

There are many common elements to the strategies needed to address pandemics and biological attacks; however, elements of the strategies differ, because we must focus more on containment and response with respect to the former, and prevention and early detection with respect to the latter.

When faced with a global pandemic, the United States must have in place and implement a layered strategy to save lives and protect the continuity of a functioning society. First, we must limit the spread of disease to the United States. Second, we must limit the spread of disease within the United States. This must be accomplished at the community level with strategies that have worked in past pandemics and can be adapted to a current crisis. Third, we must mitigate symptoms of the disease and minimize suffering and death with effective treatments and

diagnostic tests and can get these vital products into the hands of those who need them.

We also have to expand local and state programs to ensure that they have the resources to respond to these disasters. I will work to strengthen the federal government's partnership with local and state governments on these issues by improving the mechanisms for clear communication, eliminating redundant programs, and building on the key strengths possessed by each level of government. I introduced legislation which would have provided funding for programs in order to enhance emergency care systems throughout the country.

I will build on America's unparalleled talent and advantage in STEM fields and the powerful insights into biological systems that are emerging to create new drugs, vaccines, and diagnostic tests and to manufacture these vital products much more quickly and efficiently than is now

countermeasures. And fourth, we must maintain a functioning economy, public service sector and community.

The strategy requires a focus on: preparedness (the activities that should be undertaken before a pandemic to ensure preparedness); communication (the roles and responsibilities of all levels of government and segments of society); surveillance and detection (both domestic and international systems that provide continuous situational awareness to ensure the earliest warning possible to protect the population); and response and containment (actions to limit the spread of the outbreak and to mitigate the health, social and economic impacts of a pandemic).

Similar response capabilities would be necessary if a deliberate biological attack were to occur; but the best defense is deterring the attack from the outset. We must focus on efforts to disrupt and prevent attacks by terrorist groups like al-Qaeda through

possible. Unfortunately, the Bush administration has failed to take full advantage of the Bioshield initiative. Because of the unpredictability of the mode of biological attack, I will stress the need for broad-gauged vaccines and drugs and for more agile and responsive drug development and production systems. This effort will strengthen the U.S. biotech and pharmaceutical industry and create high-wage jobs.

robust intelligence and counter-terrorism capabilities. If an attack were to occur, we must be ready.

Medical surveillance and biological detection technology continues to advance rapidly, but it is not where we need it to be. Samples from currently-deployed detectors must be collected by hand and analyzed in laboratories. This can mean that up to 30 hours elapses between when a biological agent is released and when it is analyzed and identified in a lab. We need to continue to develop and facilitate the development of next generation automated detectors that can analyze as well as sample biological agents and feed information real-time to public health and emergency management officials.

For both pandemics and biological attacks, our final and perhaps most important line of defense are effective medical countermeasures. We must fund research and development of new

medicines and vaccines and make sure that we have adequate stockpiles of countermeasures and a robust and well thought out distribution plan in case crisis strikes.

**7. Genetics research.** The field of genetics has the potential to improve human health and nutrition, but many people are concerned about the effects of genetic modification both in humans and in agriculture. What is the right policy balance between the benefits of genetic advances and their potential risks?

The progress that has occurred in genetics over the past half century has been remarkable—from the discovery of DNA's double helix structure in 1953 to the recent deciphering of all three billion letters of the human genome. New knowledge about genes is already transforming medicine and agriculture and has the potential to change other fields, including energy and environmental sciences and information technology.

I also recognize that the power of modern genetics has raised important ethical, legal, and social issues that require careful study. For example, new developments in human

Genetic research holds great promise, but also demands great responsibility. We stand on the threshold of life-changing breakthroughs shepherded by the human genome project. I share in the wonder that unlocking the human genetic code affords and the life-changing treatments and therapies it could allow. But this discovery should inspire restraint to equal to its promise to ensure nascent discoveries are not abused. As genetic research becomes increasingly deployed, the need to ensure privacy of human records will become all the more essential, as will be the rigor to ensure there is no genetic discrimination.

genetics allow individuals to be informed about their risks of various diseases; such information can be useful for diagnosing and treating disease, but it can also be misused by employers or insurers to discriminate. For this reason, I have been a long-time supporter of the recently passed Genetic Information Non-Discrimination Act. In addition, concerned about the premature introduction of genetic testing into the public domain without appropriate oversight, I introduced the Genomics and Personalized Medicine Act of 2007 aimed at ensuring the safety and accuracy of such testing.

Advances in the genetic engineering of plants have provided enormous benefits to American farmers. I believe that we can continue to modify plants safely with new genetic methods, abetted by stringent tests for environmental and health effects and by stronger regulatory oversight guided by the best available scientific advice. Disease treatment and

The scientific potential and ethical issues associated with genetics are important and complex enough that I will actively seek out the wise counsel of experts about how to ensure that we are best serving the needs of the American people. Genetic research can already provide real assistance for those in some of the poorest regions who lack access to adequate food sources. Through increased research and development, we can help foster a new Green Revolution like the one that transformed Asia several decades ago. In partnership with government institutions, our colleges and universities should help train a new generation of African agro-scientists. Our aid programs should help focus on research into higher-yielding crops and make investments in infrastructure that will help farmers increase their yields and deliver their products to market.

identification is likewise being transformed by modern genetics. Recombinant DNA (rDNA) technology has produced a number of products such as human growth hormone or insulin or other complicated proteins that are known to be involved in bone metabolism, immune response, and tissue repair. The promise of rDNA is its ability to sidestep potentially harmful intermediaries that could have a pathogenic effect. Some forms of gene therapy-replacing faulty genes with functional copies-in comparison have encountered safety issues that arise from how the functional gene is delivered. As a result, the NIH established the Recombinant DNA Advisory Committee, which now provides advice and guidance on human gene therapy as well as other ethical concerns or potential abuse of rDNA technology. Until we are equipped to ascertain the safety of such methods, I will continue to support the activities and recommendations of the

Recombinant DNA  
Advisory Committee.

**8. Stem cells.** Stem cell research advocates say it may successfully lead to treatments for many chronic diseases and injuries, saving lives, but opponents argue that using embryos as a source for stem cells destroys human life. What is your position on government regulation and funding of stem cell research?

Stem cell research holds the promise of improving our lives in at least three ways—by substituting normal cells for damaged cells to treat diabetes, Parkinson’s disease, spinal cord injury, heart failure and other disorders; by providing scientists with safe and convenient models of disease for drug development; and by helping to understand fundamental aspects of normal development and cell dysfunction.

For these reasons, I strongly support expanding research on stem cells. I believe that the restrictions that President Bush has placed on funding of human embryonic stem cell research have handcuffed our scientists and hindered our ability to compete with other nations. As president, I

While I support federal funding for embryonic stem cell research, I believe clear lines should be drawn that reflect a refusal to sacrifice moral values and ethical principles for the sake of scientific progress. Moreover, I believe that recent scientific breakthroughs raise the hope that one day this debate will be rendered academic. I also support funding for other research programs, including amniotic fluid and adult stem cell research which hold much scientific promise and do not involve the use of embryos. I oppose the intentional creation of human embryos for research purposes and I voted to ban the practice of “fetal farming,” making it a federal crime for researchers to use cells or fetal tissue from an embryo created for

will lift the current administration's ban on federal funding of research on embryonic stem cell lines created after August 9, 2001 through executive order, and I will ensure that all research on stem cells is conducted ethically and with rigorous oversight.

research purposes.

I recognize that some people object to government support of research that requires cells to be harvested from human embryos.

However, hundreds of thousands of embryos stored in the U.S. in in-vitro fertilization clinics will not be used for reproductive purposes, and will eventually be destroyed. I believe that it is ethical to use these extra embryos for research that could save lives when they are freely donated for that express purpose.

I am also aware that there have been suggestions that human stem cells of various types, derived from sources other than embryos, make the use of embryonic stem cells unnecessary. I don't

agree. While adult stem cells, such as those harvested from blood or bone marrow, are already used for treatment of some diseases, they do not have the versatility of embryonic stem cells and cannot replace them. Recent discoveries indicate that adult skin cells can be reprogrammed to behave like stem cells; these are exciting findings that might in the future lead to an alternate source of highly versatile stem cells. However, embryonic stem cells remain the “gold standard,” and studies of all types of stem cells should continue in parallel for the foreseeable future.

Rather than restrict the funding of such research, I favor responsible oversight of it, in accord with recent reports from the National Research Council.

Recommendations from the NRC reports are already being followed by institutions that conduct human embryonic stem cell research with funds from a variety of sources. An expanded, federally-

supported stem cell research program will encourage talented U.S. scientists to engage in this important new field, will allow more effective oversight, and will signal to other countries our commitment to compete in this exciting area of medical research.

**9. Ocean Health.** Scientists estimate that some 75 percent of the world's fisheries are in serious decline and habitats around the world like coral reefs are seriously threatened. What steps, if any, should the United States take during your presidency to protect ocean health?

Oceans are crucial to the earth's ecosystem and to all Americans because they drive global weather patterns, feed our people and are a major source of employment for fisheries and recreation. As president, I will commit my administration to develop the kind of strong, integrated, well-managed program of ocean stewardship that is essential to sustain a healthy marine environment.

Global climate change could have catastrophic effects on ocean ecologies. Protection of the oceans is one of the

As a former Navy officer I was constantly reminded of the power, wonder and complexity of our world's oceans. As Americans we are blessed by our location, surrounded by two of the world's great Oceans, along with the magnificent Great Lakes along our Northern border. Oceans and coastal waters provide us with critical resources, hours of recreation and protection. The environmental health of the oceans and the Great Lakes is a complex, multi-faceted issue requiring attention and action from numerous perspectives. It requires effective

many reasons I have developed an ambitious plan to reduce U.S. emissions of greenhouse gases 80 percent below 1990 by 2050. We need to enhance our understanding of the effect of climate change on oceans and the effect of acidification on marine life through expanded research programs at NASA, the National Oceanic and Atmospheric Administration (NOAA), the National Science Foundation (NSF), and the U.S. Geological Survey (USGS). I will propel the U.S. into a leadership position in marine stewardship and climate change research. Stronger collaboration across U.S. scientific agencies and internationally is needed in basic research and for designing mitigation strategies to reverse or offset the damage being done to oceans and coastal areas.

The oceans are a global resource and a global responsibility for which the U.S. can and should take a more active role. I will work actively to ensure that the U.S.

coastal zone and watershed management, both point and non-point water pollution management, and more effective fisheries management. It requires coordination and action by local, state and federal government agencies, by addressing issues like invasive aquatic species to agricultural runoff. It is one of the more complex management challenges facing the environment because the ocean ecosystem is affected by so many different activities and sources under so many different management jurisdictions – from sewage discharge treatment facilities, to air pollution depositions, to climate change. For example, the “dead zone” in the Gulf of Mexico which appears every summer does not result from human activities in the Gulf of Mexico, but from human activities across the Mid-West. The U.S. Commission on Ocean Policy has provided government leaders with an “Ocean Blueprint for the 21st Century” that has many good ideas; however, even it struggled with the

ratifies the Law of the Sea Convention – an agreement supported by more than 150 countries that will protect our economic and security interests while providing an important international collaboration to protect the oceans and its resources. My administration will also strengthen regional and bilateral research and oceans preservation efforts with other Gulf Coast nations.

Our coastal areas and beaches are American treasures and are among our favorite places to live and visit. I will work to reauthorize the Coastal Zone Management Act in ways that strengthen the collaboration between federal agencies and state and local organizations. The National Marine Sanctuaries and the Oceans and Human Health Acts provide essential protection for ocean resources and support the research needed to implement a comprehensive ocean policy. These programs will be strengthened and reauthorized.

enormity of the management challenge that lies before us, and recognized that there are no easy answers. This is at least partly due to the fact that so many of the human activities that adversely affect ocean health are not “ocean activities”, but are landside activities. Regional and ecosystem management concepts are easy to talk about, but are complicated to implement effectively, and they depend of obtaining a commitment from various necessary stakeholders.

Ocean health and policy requires better management focus; however, we also need a better scientific understanding of the oceans. In no area is this truer than in obtaining a better understanding of the interaction of climate change and the oceans. We need to better understand the ocean’s role in the carbon cycle, in the effects of the massive amount of fresh water resulting from the melting of polar ice, which could dramatically affect global weather patterns,

and in the effects of warmer ocean waters on weather – especially coastal storms - and on marine life. Ocean science and engineering is a field that deserves greater attention and focus.

Although I have served the State of Arizona in the United States Senate, I have always had an enormous attraction to and appreciation for our oceans. Their health requires an increased focus and commitment from all Americans, not just from those who derive their livelihood from them or live on their shores.

**10. Water.** Thirty-nine states expect some level of water shortage over the next decade, and scientific studies suggest that a majority of our water resources are at risk. What policies would you support to meet demand for water resources?

Solutions to this critical problem will require close collaboration between federal, state, and local governments and the people and businesses affected. First, prices and policies must be set in a ways that give everyone a clear incentive to use water efficiently and

As a westerner, I understand the vital role that water plays in the development of western economies and to maintaining a high quality of life. Water is truly our lifeblood. I believe that we must develop, manage, and use our limited water supplies wisely and with a

avoid waste. Regulations affecting water use in appliances and incentives to shift from irrigated lawns to "water smart" landscapes are examples. Second, information, training, and, in some cases, economic assistance should be provided to farms and businesses that will need to shift to more efficient water practices. Many communities are offering kits to help businesses and homeowners audit their water use and find ways to reduce use. These should be evaluated, with the most successful programs expanded to other states and regions. I will establish a national plan to help high-growth regions with the challenges of managing their water supplies.

In addition, it is also critical that we undertake a concerted program of research, development, and testing of new technologies that can reduce water use.

conservation ethic to ensure that we have sufficient supplies to meet municipal, tribal, industrial, agricultural, recreational, and environmental needs. I believe that water rights must be respected, and that disputes are better resolved not in the courts but through negotiations that build consensus, and provide justly for the needs of the west's diverse interests and needs. I understand the importance of state law and local prerogatives in the allocation of water resources, and that all levels of government must work together with stakeholders to ensure that our lifeblood is protected, managed, and utilized in a wise, just, and sustainable manner.

I support constructive, continuing cooperation and dialogue among the states and the water users in a manner that is fully consistent with existing compacts and agreements. This is an approach that is forward looking, and ensures cooperation in achieving implementation of water agreements among the

states and the Department of the Interior and is mindful of potential technological developments that could potentially reduce water demands in certain areas.

**11. Space.** The study of Earth from space can yield important information about climate change; focus on the cosmos can advance our understanding of the universe; and manned space travel can help us inspire new generations of youth to go into science. Can we afford all of them? How would you prioritize space in your administration?

As president, I will establish a robust and balanced civilian space program. Under my administration, NASA not only will inspire the world with both human and robotic space exploration, but also will again lead in confronting the challenges we face here on Earth, including global climate change, energy independence, and aeronautics research. In achieving this vision, I will reach out to include international partners and to engage the private sector to amplify NASA's reach. I believe that a revitalized NASA can help America maintain its innovation edge and contribute to American economic growth.

The real question is whether we can afford not to. We must ensure that we have a balanced approach to our space investments along with proper management controls. Today, we rely more upon our space based assets than at any other time in history. We need the technological advances of these systems to effectively address tremendous challenges such as climate change. Failure to properly address these problems will have devastating effects on the future of the planet.

For the past 50 years, space activities have contributed greatly to US scientific discovery,

There is currently no organizational authority in the federal government with a sufficiently broad mandate to oversee a comprehensive and integrated strategy and policy dealing with all aspects of the government's space-related programs, including those being managed by NASA, the Department of Defense, the National Reconnaissance Office, the Department of Commerce, the Department of Transportation, and other federal agencies. This wasn't always the case. Between 1958 and 1973, the National Aeronautics and Space Council oversaw the entire space arena for four presidents; the Council was briefly revived from 1989 to 1992. I will re-establish this Council reporting to the president. It will oversee and coordinate civilian, military, commercial, and national security space activities. It will solicit public participation, engage the international community, and work toward a 21st century vision of space

national security, economic development, and national innovation, pride and power (the ultimate example of which was the U.S. victory over the Soviets in the race to the moon). Spurred on by the Soviet Union's launch of Sputnik, the world's first satellite, and the concern that the U.S. was falling behind in science and technology, U.S. policymakers enacted several policy actions to firmly establish the U.S. dominance in science and technology. Among them were the establishment of the National Aeronautics and Space Administration (NASA) and the national Defense Advanced Research Projects Agency (DARPA), increased research funding, and a reformulation of the nation's science and technology education system.

Today, more than 50 years after Sputnik, the US faces a very different world. The end of the Cold War and the space race has greatly reduced the profile of space exploration as a point of

that constantly pushes the envelope on new technologies as it pursues a balanced national portfolio that expands our reach into the heavens and improves life here on Earth.

national pride and an emblem of U.S. power and thus created some degree of "mission-rut" for NASA. At the same time, the scientific community views the use of space as an important observation platform for advancing science by increasing our understanding of the solar system and the universe. In addition, our recent comprehension of the Earth's changing climate is based on data that we have received from our weather and Earth observation satellites. Much of our communications infrastructure is dependent upon space based assets that are essential to the quality of our everyday lives and the economy.

China, Russia, India, Japan and Europe are all active players in space exploration. Both Japan and China launched robotic lunar orbiters in 2007. India is planning to launch a lunar orbiter later this year. The European Space Agency (ESA) is looking into a moon-lander, but is more focused on Mars. China

also is actively pursuing a manned space program and, in 2003, became only the third country after the USSR and the US to demonstrate the capability to send man to space. China is developing plans for a manned lunar mission in the next decade and the establishment of a lunar base after 2020.

Activity within the commercial sector continues to increase beyond the traditional role of launching satellites. In 2007, the X-Prize Foundation announced a prize of \$30 million in a global competition to build the first robotic rover capable of landing on the Moon. Several companies are planning to develop and build spacecraft for space tourism.

I understand the importance of investments in key industries such as space to the future of our national security, environmental sustainability, economic competitiveness, and national pride as a technological leader.

Although the general view in the research community is that human exploration is not an efficient way to increase scientific discoveries given the expense and logistical limitations, the role of manned space flight goes well beyond the issue of scientific discovery and is reflection of national power and pride.

History provides some guide to this. In 1971, when the Nixon Administration was looking at canceling the Apollo program and not approving the development of the Space Shuttle - then Office of Management and Budget Deputy Director Casper Weinberger stated that such a policy: "would be confirming in some respects a belief that I fear is gaining credence at home and abroad: That our best years are behind us, that we are turning inward, reducing our defense commitments, and voluntarily starting to give up our super-power status and our desire to maintain world superiority." Three and a

half decades later this seems equally valid, if not more so given the increased number of countries that are making significant investments in space.

I have been involved in a number of efforts to improve America's scientific prowess within the space arena. As Chairman of the U.S. Senate Committee on Commerce, Science, and Transportation, I played a major role in legislation to provide funding for space exploration (manned and unmanned), space science, Earth science, and aeronautics research. I also sponsored legislation to support the up and coming commercial space industry, and led the Senate's efforts to implement improvements to NASA after the Columbia accident. I also spearheaded efforts to control costs at NASA and promote a space exploration agenda based on sound management, safe practices, and fiscal responsibility.

Current U.S. space operations policy commits

the U.S. to completing the International Space Station (ISS) by 2010 and then terminating the Space Shuttle flights, with the completion of the ISS. I have called on the Bush Administration to suspend its decommissioning of the shuttle until the next President is in office, and to retain the option of continuing shuttle flights to the ISS in the interim period until the Ares/Orion vehicle is in service.

As President, I will --

- Ensure that space exploration is top priority and that the U.S. remains a leader;

- Commit to funding the NASA Constellation program to ensure it has the resources it needs to begin a new era of human space exploration.

- Review and explore all options to ensure U.S. access to space by minimizing the gap between the termination of the Space Shuttle and the availability of its replacement vehicle;

- Ensure the national

space workforce is maintained and fully utilized; Complete construction of the ISS National Laboratory;

- Seek to maximize the research capability and commercialization possibilities of the ISS National Laboratory;

- Maintain infrastructure investments in Earth-monitoring satellites and support systems;

- Seek to maintain the nation's space infrastructure;

- Prevent wasteful earmarks from diverting precious resources from critical scientific research;

- and ensure adequate investments in aeronautics research.

**12. Scientific Integrity.** Many government scientists report political interference in their job. Is it acceptable for elected officials to hold back or alter scientific reports if they conflict with their own views, and how will you balance scientific information with politics and personal beliefs in your decision-making?

Scientific and technological information is of growing importance to a range of issues. I

We have invested huge amounts of public funds in scientific research. The public deserves to have

believe such information must be expert and uncolored by ideology.

I will restore the basic principle that government decisions should be based on the best-available, scientifically-valid evidence and not on the ideological predispositions of agency officials or political appointees. More broadly, I am committed to creating a transparent and connected democracy, using cutting-edge technologies to provide a new level of transparency, accountability, and participation for America's citizens. Policies must be determined using a process that builds on the long tradition of open debate that has characterized progress in science, including review by individuals who might bring new information or contrasting views. I have already established an impressive team of science advisors, including several Nobel Laureates, who are helping me to shape a robust science agenda for my administration.

the results of that research. Our job as elected officials is to develop the policies in response to those research results. Many times our research results have identified critical problems for our country. Denial of the facts will not solve any of these problems. Solutions can only come about as a result of a complete understanding of the problem. I believe policy should be based upon sound science. Good policy development will make for good politics. I support having a science and technology advisor within the White House staff and restoring the credibility and role of OSTP as an office within the White House structure. I will work to fill early in my Administration both the position of Science Adviser and at least four assistant directors within OSTP. I am committed to asking the most qualified scientists and engineers to join not only my OSTP, but all of the key technical positions in my Administration.

Integrity is critical in

In addition I will:

- Appoint individuals with strong science and technology backgrounds and unquestioned reputations for integrity and objectivity to the growing number of senior management positions where decisions must incorporate science and technology advice. These positions will be filled promptly with ethical, highly qualified individuals on a non-partisan basis;

- Establish the nation's first Chief Technology Officer (CTO) to ensure that our government and all its agencies have the right infrastructure, policies and services for the 21st century. The CTO will lead an interagency effort on best-in-class technologies, sharing of best practices, and safeguarding of our networks;

- Strengthen the role of the President's Council of Advisors on Science and Technology (PCAST) by appointing experts who are charged to provide independent advice on

scientific research.

Scientific research cannot succeed without integrity and trust. My own record speaks for integrity and putting the country first, not political agendas.

critical issues of science and technology. The PCAST will once again be advisory to the president; and

- Restore the science integrity of government and restore transparency of decision-making by issuing an Executive Order establishing clear guidelines for the review and release of government publications, guaranteeing that results are released in a timely manner and not distorted by the ideological biases of political appointees. I will strengthen protection for “whistle blowers” who report abuses of these processes.

**13. Research.** For many years, Congress has recognized the importance of science and engineering research to realizing our national goals. Given that the next Congress will likely face spending constraints, what priority would you give to investment in basic research in upcoming budgets?

Federally supported basic research, aimed at understanding many features of nature—from the size of the universe to subatomic particles, from the chemical reactions that support a living cell to interactions that sustain ecosystems—has

With spending constraints, it will be more important than ever to ensure we are maximizing our investments in basic research and minimizing the bureaucratic requirements that eat away at the money

been an essential feature of American life for over fifty years. While the outcomes of specific projects are never predictable, basic research has been a reliable source of new knowledge that has fueled important developments in fields ranging from telecommunications to medicine, yielding remarkable rates of economic return and ensuring American leadership in industry, military power, and higher education. I believe that continued investment in fundamental research is essential for ensuring healthier lives, better sources of energy, superior military capacity, and high-wage jobs for our nation's future.

Yet, today, we are clearly under-investing in research across the spectrum of scientific and engineering disciplines. Federal support for the physical sciences and engineering has been declining as a fraction of GDP for decades, and, after a period of growth of the life sciences, the NIH budget has been steadily

designed for funding scientists and science. Basic research serves as the foundation for many new discoveries and represents a critical investment for the future of the country and the innovations that drive our economy and protect our people. I have supported significant increases in basic research at the National Science Foundation. I also called for a plan developed by our top scientists on how the funding should be utilized. We must ensure that our research is addressing our national needs and taking advantage of new areas of opportunities and that the results of this research can enter the marketplace. We must also ensure that basic research money is allocated to the best science based on quality and peer review, not politics and earmarks.

I am committed to reinvigorating America's commitment to basic research, and will ensure my administration funds research activities accordingly. I have supported increased

losing buying power for the past six years. As a result, our science agencies are often able to support no more than one in ten proposals that they receive, arresting the careers of our young scientists and blocking our ability to pursue many remarkable recent advances. Furthermore, in this environment, scientists are less likely to pursue the risky research that may lead to the most important breakthroughs. Finally, we are reducing support for science at a time when many other nations are increasing it, a situation that already threatens our leadership in many critical areas of science.

This situation is unacceptable. As president, I will increase funding for basic research in physical and life sciences, mathematics, and engineering at a rate that would double basic research budgets over the next decade.

Sustained and predictable increases in research funding will allow the United States to accomplish a great deal.

funding at DOE, NSF, and NIH for years and will continue to do so. I will continue my commitment to ensure that the funding is properly managed and that the nation's research needs are adequately addressed.

First, we can expand the frontiers of human knowledge. Second, we can provide greater support for high-risk, high-return research and for young scientists at the beginning of their careers. Third, we can harness science and technology to address the “grand challenges” of the 21st century: energy, health, food and water, national security, information technology, and manufacturing capacity.

**14. Health.** Americans are increasingly concerned with the cost, quality and availability of health care. How do you see science, research and technology contributing to improved health and quality of life?

Americans have good reasons to be proud of the extraordinary role that medical science has had in combating disease, here and throughout the world, over the past century. Work sponsored by the National Institutes of Health (NIH), other government agencies, and our pharmaceutical and biotechnology industries has produced many vaccines, drugs, and hormones that have improved the quality of life, extended life

Each one of us who has been to the doctor in recent years has benefited greatly by the scientific and technological developments that have come from our nation's commitment to biomedical research. With every passing day our researchers are one day closer to finding potential cures to some of the most devastating diseases. Our engineers and technicians are developing new

expectancy, and reduced the dire consequences of many serious illnesses and disabilities. These advances include methods for preventing and treating coronary artery disease and stroke, which have reduced mortality rates by two-thirds; new drugs and antibodies that allow us to effectively treat certain cancers; anti-viral agents that allow most patients with AIDS to control their disease; drugs that often help make severe psychiatric illnesses manageable; and new vaccines that are reducing the incidence of virus-related cancers; and minimally invasive surgery techniques that reduce hospitalizations, complications, and costs. We can expect much more from the exciting biomedical research now underway. For example, we can foresee medical care that will allow physicians to tailor care to individual patients, matching therapies to those most likely to benefit.

However, today our citizens have understandable concerns

technologies and tests to discover health problems earlier and earlier, increasing the likelihood and effectiveness of intervention. When we understand the science of our illnesses because of the extensive research that we have conducted, we are in a better position to develop treatment technologies. With this additional knowledge, we are also able to do a better evaluation of the effectiveness of our treatment plans.

As in many other areas, science, research, and technology offer many opportunities to improve productivity and reduce cost. For instance, we are just beginning to realize the vast potential of telemedicine. It allows doctors to be able to reach more patients, especially those located in remote areas. In many cases, telemedicine is the only means by which some patients would ever be able receive treatment for their illnesses. Applications such as this leads to an improved health and quality of life for those affected patients. Ultimately,

about their ability to afford the care they need, especially when our underlying system of paying for health care is broken. We spend more on health care per capita than people of other countries, yet lower income groups continue to suffer significant disparities in both access to care and health outcomes. Without major changes, costs will continue to increase. Our population is aging, many cancers and chronic disorders remain difficult to treat, and there are continuing threats of new and re-emerging infectious diseases.

It's wrong that America's health care system works better for insurance and drug companies than it does for average Americans, who face skyrocketing health care costs. My plan makes health care more secure and affordable by strengthening employer-based coverage, protecting patients' ability to choose their own doctors, and saving families \$2,500 dollars by requiring insurance companies to cover

improved quality of life is the purpose of any technology.

And while technologies and the latest research can go a long way toward finding new treatments and reducing costs, government policies must increase the availability of these to the American people. The biggest concern with the American health care system is that it costs too much. Small businesses and families pay more and more every year to get what they often consider to be inadequate attention or poor care. And those who want to buy insurance are often unable to afford health insurance because of the high cost. By promoting research and development of new treatment models, promoting wellness, investing in technology and empowering Americans with better information on quality, we can make health care more affordable.

prevention and limiting excessive insurance company charges. My plan covers everybody by requiring insurance companies to cover pre-existing conditions, providing tax credits to small businesses and working families, and covering all uninsured children.

These are difficult problems, and science and technology can solve only some of them. The effectiveness of medical care can be improved, and its costs can be reduced, by greater emphasis on best practices, electronic medical records, hospital safety, preventive strategies, and improved public health surveillance. The increased investments I support for medical research at the NIH may yield discoveries that reduce the cost of drug development, and we may produce new methods to prevent diseases that are costly to treat. But efforts to control costs also should make greater use of the tools for prevention and clinical management that already exist; enlist more

effective participation of the Centers for Disease Control (CDC) and the Food and Drug Administration (FDA), as well as the NIH; and encourage investments in healthcare and health research by the private and not-for-profit sectors.

Overall, I am committed to three major tasks that will be necessary to confront widespread concerns about the nation's health: provision of healthcare plans to all of our citizens; comprehensive efforts to make our health care system more cost-efficient; and continued biomedical research to understand diseases more thoroughly and find better ways to prevent and treat them.