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October 4, 2007

SCIENTIFIC INTEGRITY AND INNOVATION: Remarks at the Carnegie Institution for Science

The Carnegie Institution for Science, as President Meserve just briefly recounted, has such a distinguished history. It has a record of supporting groundbreaking discoveries from Edwin Hubble's work in astronomy to more recent breakthroughs in our understanding of genetics and the function of RNA and as part of that work was honored with a Nobel Prize just a few years ago.

[Click here to read Hillary's plan to end the war on science.](#)

I could not imagine a more appropriate place to discuss our nation's commitment to scientific discovery and innovation. Nor could I imagine a more appropriate day. It is not a coincidence that we are doing this today. Fifty years ago today, in a remote, sparsely inhabited region of the former Soviet Union the world's first artificial satellite took flight. This hollow aluminum sphere named Sputnik -- which contained little more than a battery, radio transmitters, and an internal cooling system -- caught America off guard and changed the course of history. Sputnik transmitted a signal from orbit and through it the Soviet Union sent a signal to the world. Even ham radio operators could hear it: the Soviets had won the first leg of the space race.

Now many of you have probably known before you came today that this is the anniversary of Sputnik and I bet none of you bought an anniversary card. But I have been fascinated by Sputnik ever since I was a little girl and as I have moved on in life and become involved in the public service and public office holding of our nation, I have spent time reflecting on what Sputnik meant and what our nation did in response. Historic decisions were made in the days, months, and years following Sputnik and I think we had a great response as a nation. Less than two weeks after news of Sputnik swept the globe, President Eisenhower called a meeting of his Science Advisory Committee and asked for recommendations. He would come to rely on that panel for unvarnished, evidence-based scientific advice. Shortly after that first meeting, President Eisenhower addressed the nation. It was a sober yet optimistic assessment. Yes, the Soviets had made gains which carried implications for our security and our economy. Yes, we had work to do. But there was no reason to fear, because America, he said, stood at the ready to draw on our "voluntary heroism, sacrifice, and accomplishment when the chips are down." Then we set about proving it.

In February of 1958, four months after Sputnik's launch, America launched DARPA, the Defense Advanced Research Projects Agency. By July of that year, Congress passed the National Aeronautics and Space Act, creating NASA and ushering in the missions that would define the space race: Mercury and Gemini. In September 1958, President Eisenhower signed into law the National Defense Education Act to advance at every level our ability to compete and innovate: math and science education in primary and secondary schools, college loans, graduate fellowships, vocational training.

I remember as though it were yesterday when my 5th grade teacher Mrs. Kraus came into our classroom and told us we had to study math and science because the President said so. I was convinced President Eisenhower had called up Mrs. Kraus and

told her "you tell those children and particularly that Hillary, who doesn't really like math that much, that her country needs her."

In 1961, President Kennedy created the Apollo project, and declared that our nation would land a man on the moon and return him safely to the earth by the end of the decade. By 1969 we had done it. By 1972, we had done it 12 times over. It was a national, bipartisan effort. It was a public, private partnership. We bolstered investment in research -- and encouraged children to learn math and science. We asked young people to become scientists and engineers -- and helped them pay for their degrees with new National Science Foundation fellowships. We believed that we could, by rolling up our sleeves and getting to work, do what we all knew we had to. Begin to demonstrate that America still was the leader in science and innovation. We set big goals. We didn't give in to our fears, we confronted them. We didn't deny tough facts, we responded to them. We didn't ignore big challenges, we met them. Once again, we proved, as President Eisenhower had predicted, that when the chips are down it is always a mistake to bet against America.

Fifty years ago, Sputnik marked the dawn of the Space Age and the beginning of a new era filled with new challenges. Fifty years later, there is no single, galvanizing event to steel our resolve and to lift our eyes to the heavens. The challenges we face are more complex and interconnected. From the rise of globalization to the threat of global warming. These challenges require big ideas and bold thinking.

But instead of fostering a climate of discovery and innovation, the Bush administration has declared war on science. The record is breathtaking: banning the most promising kinds of stem cell research, allowing political appointees to censor studies on climate change, muzzling global warming experts like Dr. James Hansen, overruling doctors and the FDA on emergency contraception, suppressing and manipulating data on mercury pollution, even delaying one report which found that 8 percent of women between 16 and 49 years of age have mercury levels in their blood that could harm future children, denying the risks of toxins like asbestos in the air after the 9/11 attacks, overruling scientists who sought to protect animals under the Endangered Species Act, eliminating scientific committees at the Department of Health and Human Services that did not parrot the politically accepted ideology -- or packing those committees with industry insiders, altering scientific tests on the lead content of children's lunch boxes -- and appointing a lead industry consultant to a key panel formed by the Centers for Disease Control, barring a USDA researcher from publishing or even discussing his work on antibiotic resistant bacteria, censoring government websites on breast cancer research, contraception, climate change, and so much else.

To paraphrase Stephen Colbert, this administration doesn't make decisions on facts. It makes facts based on decisions. And to further paraphrase - my predecessor, the extraordinary late Senator Daniel Patrick Moynahan, everyone is entitled to his own opinion but no one is entitled to his own facts. For six and half years under President Bush, it has been open season on open inquiry. They've tried to turn Washington into an evidence-free zone. And by ignoring or manipulating science, the Bush administration is putting our future at risk and letting our economic competitors get an edge in the global economy. Well, when I am President, I will end this assault on science. [Applause]

I will reaffirm our commitment to basic research, invest in clean energy, combat global warming, create the millions of jobs that I think come from doing both of those, reemphasize math and science education, and ensure that America is training the future innovators of our country. America will once again be the innovation nation.

What America achieved after Sputnik is a symbol of what Americans can do now as we confront a new global economy, new environmental challenges, and the promise of new discoveries in medicine. America led in the 20th century, and we saw the benefits of that. As Richard referenced, probably half of our Gross Domestic Product increase since the end of World War II can be traced to investments in science and research in both the public and the private sector, of course fueled by non profit organizations like the Carnegie Institution. With a renewed commitment to scientific

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integrity and innovation, I know we can lead in the 21st century.

First, when I am President, I will lift the current ban on ethical stem cell research. [Applause] In 2001, President Bush issued an Executive Order banning federal funding for some of the most promising avenues of stem cell research. And this year - yet again -- he vetoed legislation to open up new lines of embryonic stem cells for federal funding. Every day, we are learning more about the opportunities this kind of research offers. Within these cells may lie the cures for Parkinson's disease, Alzheimer's, spinal cord injuries, diabetes, Huntington's and more. 100 million Americans live with these conditions -- and their families live with them too. The President's ban on stem cell funding amounts to a ban on hope. It's as if these families are invisible to their President. Meanwhile, our scientists and world class research institutions are hamstrung. One report found that researchers have had to set up duplicate systems and equipment to keep federally approved stem cell research efforts separate from the kind that the President has banned by Executive Order. In one lab, researchers use one kind of pen for federally funded research, and another for privately funded research.

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One stem cell scientist at University of California at San Francisco was conducting research when the power went out -- including the power to the freezers that held the stem cells on which she has spent two years working. There was no back up power and the only freezers cold enough were federally funded. The result? Two years of research literally melting away. States have tried to pick up the slack, as have private individuals. But because states and private institutions are prohibited from doing this research in labs funded by federal dollars, even a penny of federal money disqualifies the labs. They've been forced to build new labs and buy new equipment. So instead of forging ahead on the science, we have spent money on redundancy and duplication. So far they've only been able to spend 15 percent of their funding on actual research. And some of our brightest minds are forced to head overseas to do their research.

Two renowned cancer researchers, for example, a husband and wife team, decided to leave the National Cancer Institute right here in our country for the Institute of Molecular and Cell Biology in Singapore. One half of the pair said this: "We wanted to be in a place where they are excited by science and things are moving upward." That should be America -- and it can be again. But today, countries from Singapore to the United Kingdom are filling the biotech gap that the President has created. One report recently found that the percentage of research papers on embryonic stem cell science authored by researchers in the United States has dropped from more than a third of all published to roughly one quarter in just three years. And that negative trend may continue.

When I'm President, therefore, one of my first acts will be to lift the ban on federal funding of embryonic stem cell research. But we have to go much further than that if we expect to restore scientific integrity.

Secondly, I will end the politicization of scientific research that has marked the Bush Administration and restore a climate of scientific integrity and innovation. We will no longer place ideology ahead of evidence. I'll reverse President Bush's recent directive which expands the power of political appointees in agencies and reduces the role of experts. I'll stop political appointees from manipulating scientific conclusions in government publications and prevent the suppression of public statements by government scientists. We'll commit to a national assessment on climate change that goes above and beyond any requirement in the law. And I'll demand that all agencies prevent political pressure from affecting scientific research and the free and open exchange of ideas.

As part of this effort, I will restore the integrity and independence of advisory committees and strengthen whistleblower protections for those who expose potential political interference. When I'm President, scientific integrity will not be the exception -- it will be the rule. That's why I've been fighting for these issues in the Senate. One particular battle that I led involved emergency contraception, known as Plan B, which can prevent unintended pregnancies. Two FDA commissioners -- both appointed by President Bush -- blocked Plan B from being sold over-the-counter for years, overruling the FDA's medical experts, advisors, and the recommendation of the

American Medical Association. And so, teaming up with Senator Patty Murray, we blocked two successive Bush appointees for a new FDA commissioner until science not politics was allowed to guide decision making. I made it very clear I was not in any way dictating, suggesting, expecting any particular outcome, but I did not want the FDA politicized to achieve an outcome that was not based on the best that science and evidence had to offer. It should not take an act of Congress or an act of a Senator to get the President to listen to health experts on a matter of women's health.

I will also have an advisor for science in the White House who reports directly to the President. [Applause] And I will work to restore the Office of Technology Assessment in Congress. Back in the 1990s, this office was charged with just one task: tell us the truth about science. For decades, they cut through the myths and the spin on everything from Star Wars to AIDS prevention to solar technology. It's time we put them back in business. Third, when I'm President, we will again invest in research. That's a key to creating the jobs of the future, rebuilding the middle class, and meeting the challenges of the global economy. Here too, however, we're falling behind. Over the past twelve years, American investment in research and development has remained relatively static. China has doubled the share of its national wealth invested in R&D. The education pipeline, the source of future innovators, reveals the same trend. Between 1970 and 2000, America's global share of PhDs in science and engineering declined from 40 percent to 20 percent. The rate is expected to drop to 15 percent in the next 3 years.

At the same time, under the Bush administration, spending on basic and applied research has declined in real terms four years in a row. DARPA -- where basic research led to the precursors of the internet, the computer mouse, stealth technology, and so much more -- is putting less and less of its resources into truly revolutionary, ground-breaking research.

I've become troubled by this because, of course, we have very specific issues we have to address. The search for some technology to disable these horrific explosive devices that cause so much damage for our young men and women in uniform and innocent Iraqis and people in Afghanistan is a very important project but I think we can do both. We can do the more applied, specific research to try to solve a problem and we can continue to fund the more visionary research that we don't know where it will lead, but who knows, the next internet may come out of it. The private sector devotes only 5 percent of all its resources to basic research. And that is a change from 50 years ago and the years after that. Some of the great research breakthroughs came through private labs like Bell Labs and others and we have not only cut back on government funding but because of the pressures of the global market place, the pressures for quarterly returns, we have seen a cutback in research in the private sector as well.

The NIH budget was doubled between 1998 and 2003 and universities and researchers had high hopes for continued funding. In the years since, the rug has been pulled out from under them. The president's budget for 2008 actually cut funding for several departments. The consequences of unpredictable and declining resources are halted construction on new laboratories, fewer grants, uncertainty in current projects, and less support for the creative ideas of younger researchers. Nobel Prize winning biochemist Roger Kornberg recently said, "In the present climate especially, the funding decisions are ultraconservative. If the work that you propose to do isn't virtually certain of success, then it won't be funded. And of course, the kind of work that we would most like to see take place, which is groundbreaking and innovative, lies at the other extreme."

I visited Memorial Sloane Kettering about a year and half ago to meet with Dr. Harold E. Varmus another Nobel prize winner who led NIH with such distinction and his top staff. And at that time he very clearly said that the way that the grants and now being issued by the NIH means that it's less and less likely that young researchers like he was when he did the work that eventually won him the Nobel prize, could be funded. And since that time I've heard this across the country. I will increase support for basic and applied research by increasing the research budgets at the National Science Foundation, the Department of Energy's Office of Science, and the Department of

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Defense. We'll significantly increase funding over 10 years, with a greater emphasis on high-risk, high-return investments. That combined with the increases again in the NIH to kick start our innovative engine.

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We'll invest more in multidisciplinary research, where the United States has a built-in advantage. No one commands the breadth and depth of excellence across different fields that we do. For instance, we should increase investments in non-health applications of bio-technology. One example: bacteria that could dramatically reduce the costs of cleaning up Superfund sites. I recently saw Craig Venter, who many of you know of or know, and his latest project is trying to create bacteria that will lead to a substitute for petroleum. Well, we don't know where this research will lead. That's the whole point and the excitement is letting loose our best minds.

The failure to modernize our health care system is also holding back research. I have proposed creating a health information technology infrastructure as part of my health care plan, the American Health Choices Plan. I think we can lower costs for everyone, and improve quality for everyone, and cover everyone. A health information technology infrastructure is estimated by the Rand Corporation to save us seventy-seven billion dollars a year. It will prevent errors, it will stop waste, it will cut costs, and it will save lives because it will create billions of new digital data points from which we can glean new observations.

I've also called for competitive prizes to encourage innovation. Back in 1957, President Eisenhower, when he met with his Scientific Advisory Committee again, wondered if there were a way to keep people as excited about science as they were about sports and competition. And this was back when reality entertainment meant playing in the neighborhood park. Why not encourage people to innovate through healthy competition?

We've also seen a decline in American leadership in space exploration and science. A recent survey by the National Academy of Sciences found that "the nation's Earth observation satellite programs, once the envy of the world, are in disarray." The National Oceanic and Atmospheric Administration has been forced to delay the launch of important climate and weather-monitoring satellites. These technologies are critical tools to study climate change: measuring the rates of melting ice, temperature and humidity changes, sea level variations. Meanwhile, NASA's budget for earth sciences has been cut by 30 percent and NASA climate scientists have been muzzled. Last year, the Bush administration went so far as to remove the following phrase, and I quote, "to understand and protect the home planet," end quote, from NASA's mission statement. It's no wonder, the Bush administration has shown little interest in the earth sciences mission of NASA -- and a hostile approach toward the study of climate change.

As President, part of my mission will be to reclaim our role as the innovation leader. I will pursue an ambitious agenda in space exploration and earth sciences. I'll fully fund NASA's earth sciences program, launch a new, comprehensive space-based study of climate change, and reverse the deep funding cuts that NASA's and FAA's aeronautics research and development budgets have endured in the last few years.

You know, this is personal for me because when I was in junior high school, I was just captivated by the space program. It caught my imagination. There was such a great burst of interest. I did my 8th grade science project on space medicine. Some of you know that I even wrote to NASA asking how I could apply to be an astronaut and got back an answer saying that they weren't taking women. (Laughter) I have lived long enough to see that change! (Applause)

But that great burst of activity led to so many people who are the PhDs, who are the scientific leaders, who have made such a difference to our public life and our private sector. A lot of them are reaching retirement age. They came into school in the 60's and the 70's motivated by this desire to innovate and in our government we're not finding the replacement for a lot of people. I know that at the Nuclear Regulatory Commission the workforce issue going forward is a very big one. So this is not just about let's have more scientists. This is how we run our economy and how our government retains or should I say regains competence to do what it needs to do for

all of us. I think that we've got to make science research, technology, mathematics a career in those fields, exciting again.

I think it's possible to do that and I think the President, even a President who doesn't know very much herself can ignite that interest with other people who are playing the lead roles in demonstrating what it means for us to be the leaders again. We really need a television series about scientists, you know, the study of forensic science skyrocketed after all these CSI programs, so I'd like all of the scientists in this auditorium to start thinking. Make up a character that can light the same excitement in young people because lightbulb moments require electricity and we've got to look at this challenge comprehensively.

We still have a problem in women and minorities to enter science and engineering. And let's do a better job of replicating educational excellence in math and science from school to school. Congress recently passed into law the America Competes Act which contains two of my proposals. One would study promising practices in math and science education. We have to quit reinventing the wheel -- if something works in a school, especially where children come from disadvantaged backgrounds, to light their faces up, get them involved, let's replicate it. Let's work to do what we can to make sure that something happening in New York or Los Angeles is followed in Houston or Miami. [Applause]

And I think that one way we can help this is to create new fellowships at the National Science Foundation to allow math and science professionals to become teachers in high-need schools. A lot of people who as they are retiring or are mid-career are looking for some way to keep giving and they face the array of difficulties and obstacles to becoming teachers and I think we have to break through that barrier and give more people a chance to share their enthusiasm, their life's work with our young people.

I've also proposed tripling the number of National Science Foundation fellowships and increasing the size of each award. NSF fellowships were created in response to the space race. In the decades since, the number of grants has remained largely unchanged despite a three-fold increase from that time until now in the number of college students graduating with science and engineering degrees. We also, as we move toward comprehensive immigration reform have to once again open our colleges and universities to students from abroad who wish to study here and then hopefully stay here as part of the American innovation agenda. What is happening now is we're not accepting them and if we do accept them, we're not allowing them to stay and work. So we need to get the best minds from the world once again coming to America.

Fifth, we need an Apollo-like effort in clean, renewable energy. Last week, the President gave a speech in which he decided to address global warming -- seven years into his presidency. And what he found, unfortunately, is that the rest of the world has passed him by. He spoke of aspirational goals to reduce green house gas emissions while people around the world including right here in America actually aspire to tackle the problem.

For nearly seven years, the administration has dodged, denied, and dissembled on climate change. Scientists muzzled. Reports censored. According to a survey of the Union of Concerned Scientists from last year, nearly three quarters of climate scientists felt inappropriate interference with their research was going on. One particularly egregious example is that of Philip A. Cooney, the former chief of staff at the White House Council on Environmental Quality. A lawyer previously employed by the American Petroleum Institute, he had no scientific background. Nonetheless, he insisted on editing scientific documents on climate change to cast doubt and greater uncertainty than the experts felt warranted.

Meanwhile, the evidence has mounted. I traveled to the Alaskan Arctic as well as to the European Arctic with Senator McCain on two occasions over the last several years. We found ourselves in the northernmost inhabited place on earth, the island of Svalbard, in Norway. We met with scientists who'd been studying the Arctic and we listened to what they had to say. They are seeing first hand the impact of changing

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climates -- from invasive species to shifting weather patterns to melting polar ice. And then at Point Barrow in our most northern part of America in Alaska, we heard from the scientists who have been studying climate change there for 30 years. As the evidence mounts -- other countries are mounting a lead in the race to develop the next generation of energy technologies. Nations in Europe and elsewhere are working to meet the standards set by Kyoto and to create jobs in the process.

Germany, for example, has made major commitments to renewable energy, recently upping their targets to produce more than one quarter of their energy from renewable sources by 2030. Their approach has already paid dividends. In the last two years, employment in the German renewables sector rose by 50 percent to 235,000 jobs. They expect to create more than 400,000 jobs in renewables by 2020. As a German official recently told Congress, "solar power installations and wind turbines made in Germany are an export hit all over the world."

I believe America can retake the lead. Energy dependence and climate change represent the greatest innovation challenge and opportunity that Americans have faced in a generation -- we can create millions of green collar jobs. I have proposed a \$50 billion Strategic Energy Fund, paid for in part by closing the tax subsidies and loopholes for the oil companies. [Applause]

It is almost impossible to imagine but you and I and all the taxpayers in America are still subsidizing companies that have made the largest profits in the history of the world. [Applause] And that no longer makes sense, and we've got to move now to take our resources and put them where we create a new market. It might have made sense when oil was ten dollars a barrel because it's expensive to explore, it's expensive to extract, but that no longer is needed. If we have smart legislative policy, we would have triggers on a lot of this. If the price of oil ever did fall again dramatically, and we did have to provide incentives, we could do so. But now what we are missing by failing to provide incentives for solar and wind and geothermal and hydrogen and bio-fuels and the whole array of renewable resources means that we are falling further and further behind.

The fund I have proposed would invest in technologies available right now to promote conservation, combat global warming, and end our dependence on foreign oil. It also funds an energy initiative modeled on DARPA, the Energy Advanced Research Projects Agency to bring together the best minds in the public and the private sectors to think outside the box -- and the tank -- to imagine new solutions. Winning the 21st century energy race is as important and potentially profitable as winning the 20th century space race. We can do this. [Applause]

The Strategic Energy Fund is only the beginning. In the coming weeks, I will outline in more detail my plans as President to move toward energy independence. Instead of leading the world in oil imports, we can lead in green technology exports. The country that split the atom can end our dependence on foreign oil and launch an energy revolution. We can call it Energy 2.0 because we've got everything it takes except we have not organized ourselves to make it happen.

When science is politicized, when the truth is subjugated by ideology, it's worse than wrong -- it's dangerous. Ending the war on science and once again valuing the ever-skeptical but always hopeful scientific enterprise is about more than our economy. It's about more than our security. It is about our democracy.

Vannevar Bush, no relation, among his many accomplishments as an advisor to Presidents beginning with Franklin Delano Roosevelt, as a pioneering scientist, as a leader who helped shape decades of science policy for our nation, also served as President of this institution. He authored a report at the close of World War II, requested by President Roosevelt but delivered to President Truman. In that report, Dr. Bush laid out his vision for the future of scientific progress in America proposing, for example, the National Science Foundation. He described science as the "endless frontier." What could be more American than that?

I was heartened to learn that after Sputnik went up sales of telescopes and binoculars shot up as well. Actually in my house, my father went out and bought some binoculars, so we could be on the lookout for Sputnik. And my memory of that, of

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peering into the sky in our backyard in a suburb of Chicago, I don't think we ever saw it although my friends claim that they had seen it, was so exciting that somehow we were connected to what that meant. And it was not only a thrill for a young girl, but it really did start me thinking.

Fear is no match for the human desire to reach for the stars. And with the right leadership fear gives way to fortitude, to resolve, and to evidence-based action. The free and open exchange of ideas in America, along with our entrepreneurial spirit, our work ethic, and our values, has always been the wind against our backs. It was true in the space race for the 20th century. And it will be true again in the global innovation race of the 21st century. Thank you all very much. Thank you.

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