

Remarks by Dr. John P. Holdren  
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Good morning everyone!

Thank you, Admiral Klunder, for that kind introduction, and thank you all for the warm welcome. As a lapsed aerospace engineer and a desk guy whose idea of an exciting flight is getting a seat in the exit row, I do want to say I stand in awe of the flying achievements of our Chief of Naval Research. While Matt is also a credentialed aerospace engineer, along the way he piloted 45 different kinds of aircraft and accumulated 21 world flying records. This is a guy who knows something about pushing the envelope, and it shows in his leadership of ONR.

And I do really appreciate the opportunity to share with this high-powered audience some of the work that we in the White House are doing to support the missions that I know all of you are engaged in — advancing the frontiers of science and technology and applying those advances to strengthen our Nation.

It certainly has been a privilege and a pleasure for me to serve as the science and technology advisor for a President who understands with crystal clarity the importance and the promise that science and technology hold—not just for our national security in the narrow sense but for our security in the broader sense that includes the economic and environmental dimensions of our well-being.

As you're all aware, I'm sure, science and technology have been very much at the heart of America's economic as well as military strength going back to World War II and even before, and they will remain front and center as drivers of our economy going forward. And science and technology will be indispensable, as well, for the crucial task of rendering our future economic growth compatible with environmental sustainability...not least with respect to climate change.

I'm especially happy to share the Administration's views on science, technology, and innovation with this audience because it's precisely the mix of industry, academia, government, and the military represented in this hall that is at the core of this Administration's strategy for strengthening our science, technology, and innovation ecosystem — including of course STEM education — that is so central for meeting all of our national goals.

Time and time again the President has talked about his “all hands on deck” approach to pursuing those goals. By that he means using the diverse resources of the military, government, industry, and academia in ways that take best advantage of what each contributor has to offer. That means:

- Government, to identify national priorities and to fund R&D on those that are public goods – such as national defense – and to fund the basic research that is ultimately the foundation of all applied advances;
- Academia, to carry out a large share of the nation’s basic research, and much applied research as well, while training the next generation of discoverers, inventors, makers, and teachers; and;
- Industry, to turn breakthroughs into marketable products (services as well as goods) and into new and better manufacturing methods and production processes.
- The military, whose needs shape a significant part of the national R&D agenda and whose warfighters rely on us to convert discovery into practical equipment that helps them protect the nation.

And it means all of these sectors working together to smooth and speed up the hand-offs between them and the interactions among them, generating the feedbacks, iteration, and cooperation that make every sector better at what it does and that create an innovation ecosystem even greater than the sum of its parts.

This collaborative approach — making the most of what government, the military, academia, and industry can do not just separately but together — is not just theoretical for the Obama Administration. We have been putting it into action with cooperative initiatives in a wide variety of domains, from energy R&D to advanced manufacturing, from the space program to STEM-education.

Let me take a few minutes to illustrate the point with some examples from these domains.

I’ll start with energy R&D and how we are drawing upon the collective talents of government, industry, and academia to help free America from its dependence on foreign oil, make this Nation of model of clean energy and energy efficiency, and have this again be the world leader in making the clean and efficient energy technologies that the whole world needs.

Among many other forms of public-private partnerships, the Department of Energy under my friend Steve Chu has been pioneering the concept of energy innovation hubs that focus the resources of leading research universities, national laboratories, and private firms and research consortia on specific big opportunities in energy technology. Three such hubs have already been formed and are operating:

- The Energy Efficient Buildings Hub in Pennsylvania, led by Penn State University, includes 10 other universities, 2 DOE laboratories, major industry partners such as IBM research, PPG industries, and United Technologies, and a variety of regional-economic development organizations.

- The Joint Center for Artificial Photosynthesis in California, led by Caltech in partnership with the Lawrence Berkeley Laboratory, includes 4 other universities, and the Stanford Linear Accelerator Center.
- The Consortium for Advanced Simulation of Light-Water Reactors, led by the Oak Ridge National Laboratory, is literally all over the map, engaging the Los Alamos, Sandia, and Idaho national labs; MIT, the University of Michigan, and North Carolina State University; the Tennessee Valley Authority; and the Westinghouse Electric Company and Electric Power Research Institute.

And the competition is underway for two further Energy Innovation Hubs, one on batteries and energy storage and one on critical materials for energy technologies.

That last focus can serve as a segue to the even wider importance of advanced materials and the closely related topic of advanced manufacturing.

I know that this audience, more than most, appreciates the importance of advanced materials with novel properties. Unfortunately, when it comes to developing new materials today, it takes on average something like 20 years to get from the early discovery phase to the commercialization phase.

To address the need to do better, President Obama announced the Materials Genome Initiative in June 2011 at Carnegie Mellon University, as part of the Administration's Advanced Manufacturing Partnership. The Materials Genome Initiative has the bold goal of cutting in half the standard time and cost of designing, developing, validating, and manufacturing advanced materials.

The Federal Government already does a lot in this arena, to the tune of more than \$60 million this year alone, including a \$17.3 million investment in basic materials research by the Department of Defense and a new grant program at the National Science Foundation called Designing Materials to Revolutionize and Engineer Our Future.

But, obviously, the Federal Government cannot launch a materials revolution on its own, so this initiative also calls upon—and provides incentives to—private research institutes, universities, national labs, and others to do their share and bring their expertise to bear.

Already, 30 companies—including 3M, Alcoa, Boeing, GE, DuPont and Deere & Co.—as well as a number of major universities, have agreed to embrace a set of principles that will advance the Initiative, including increased sharing of data about basic materials to create what is quickly becoming an encyclopedic, annotated ingredients list to help materials developers meet novel manufacturing needs.

For example, research giants like Harvard, IBM, and Wolfram have pledged to publicly release critical datasets relating to the properties of some 7 million new materials that could be used for low-cost solar cells.

Autodesk, in cooperation with the Pacific Northwest National Laboratory, the University of Illinois at Urbana-Champaign and the Oak Ridge National Laboratory, is releasing a library describing properties of more than 8,000 materials and informational resources to educate the materials workforce.

And Lockheed Martin has announced plans to establish an industry-led, multi-sector Carbon Nanostructures Consortium to accelerate the development and transition of affordable, high-performance carbon nanostructure-enhanced materials that have the potential to be transformative for energy, aerospace, and electronics.

And across the diverse realms of manufacturing where these materials will be used, there is much more to be done to bring American manufacturing back to the front of the global pack. This is the focus of the President's Advanced Manufacturing Initiative and the university-industry Advanced Manufacturing Partnership it spawned. These aim to bring industry, academia, and government closer together to overcome technical hurdles, to minimize costs, and ultimately to leapfrog past our international competitors, many of whom are already benefiting from public-private partnerships of their own.

As part of this effort, President Obama announced in March his ambitious plan to invest \$1 billion to catalyze the creation of a national network of up to 15 manufacturing innovation institutes around the country. These institutes will serve as regional hubs of manufacturing excellence that will help make our manufacturers more competitive and encourage manufacturing investment here in the United States.

The Administration is urging Congress to act on this proposal to create a National Network of Manufacturing Innovation. But we are not waiting for Capitol Hill to act. So in August, the Administration announced the launch of the first of these institutes—a pilot institute—the public-private National Additive Manufacturing Innovation Institute in Youngstown, Ohio.

This new partnership was selected through a competitive process led by the Department of Defense, which, along with the Departments of Energy and Commerce, the National Science Foundation, and NASA, have jointly committed to invest \$30 million in the project—a sum that will be more-than-matched with an additional \$40 million from the winning consortium, which includes more than 80 manufacturing firms, ten research universities, nine community colleges and 18 non-profits and professional associations, all from the Ohio-Pennsylvania-West Virginia 'Tech Belt.'

And while the potential applications of this and future manufacturing consortia are surely not limited to the military domain, I know that this audience in particular can appreciate the benefits for our war-fighters of having a network of centers like this, forming a low-cost, responsive, and innovative industrial base to support surge production of high-demand equipment, ranging from body armor and combat vehicles to biosensors and vaccines.

- As Adam Smith noted more than 200 years ago: “If any particular manufacture was necessary, indeed, for the defense of the society, it might not always be prudent to depend upon our neighbors for the supply.”

Now of course one of the domains in which we are most in need of materials with exotic properties is the domain of human spaceflight, so let me talk for a couple of minutes about this Administration’s approach to space exploration. Because here, too, the theme of partnership is central to our strategy.

When this Administration came into office, it inherited a broken space plan. The program to replace the Space Shuttle had suffered such significant underinvestment and was so far behind schedule that the first U.S. crewed flight to the space station would not occur until more than a year after that station was to have been deorbited into the ocean. Not a great plan.

Meanwhile, NASA’s capacity to do innovative research into, say, novel propulsion systems, or to develop new materials that might have the potential to protect astronauts on long voyages, had shrunk. And the aeronautics program—the first “A” in NASA—was a shadow of its former self.

Based in large part on the advice of a blue ribbon commission chaired by my friend Norm Augustine, the President took a bold step and called upon the private sector to take the lead in carrying out the relatively routine job of getting astronauts and supplies to and from low Earth orbit, where the space station resides, ultimately freeing up more of NASA’s cutting-edge technical capabilities to pursue more demanding destinations in deep space.

And look what we’ve achieved in a just a few short years. SpaceX has now had two successful supply missions to the space station—the second scheduled to return to Earth at the end of this month. And that company is making great progress toward getting its rocket and Dragon capsule certified for human flight. Meanwhile a second contractor, Orbital Sciences, is racing to its first launch from its renovated spaceport on Wallops Island. And Boeing is scaling up a new facility it took over at Kennedy Space Center.

This approach is speeding the day when we will no longer be dependent on Russian rockets to get into orbit and has allowed crucial Federal funds to be allocated to other purposes including extension of the space station’s life until at least 2020 and a stronger focus on the development of next-generation technologies that the private sector can’t be expected to invest in at this early stage.

Of course, these ambitions — and all of the rest of the aspirations for bring science, technology, and innovation more effectively to bear on our national security, economic, and environmental goals — will not be realized unless we can lift our game in the all-important effort to educate and train the discoverers, inventors, high-tech entrepreneurs, and high-skill workers of the future. (Indeed, the President has periodically said,

correctly, that lifting our game in STEM education and training is the single most important thing we can do for the future of our country.)

And that is why the President launched, in November 2009, the Educate to Innovate Initiative. Through this program, corporations, philanthropies, non-profits, and institutions of higher education have collectively committed to provide more than three-quarters of a billion in donations and in-kind contributions to strengthen America's middle-school and high-school STEM-education experience, including bringing practicing scientists, engineers, and mathematicians into classrooms and labs to help teachers bring these subjects to life and to serve as examples of the great careers that await students who get excited about STEM fields.

One of the more recent products of this initiative is "100K in 10"—a program to train 100,000 new, highly qualified STEM teachers in the next ten years. Launched in February of this year at the second White House Science Fair, the program already has commitments of more than \$20 million from more than 100 organizations to bring this goal to fruition.

These organizations are backing programs like the successful UTeach program, in which college students earn both a degree in a STEM subject and a teaching credential all within four years—to support the finding of the President's Council of Advisors on Science and Technology that the best STEM teachers have both strong content background and strong pedagogical skills.

Another great public-private initiative I want to mention in this connection is our Joining Forces program, which was launched by the First Lady and Dr. Jill Biden to help connect our servicemen and women, veterans, and military spouses with the resources they need—to find jobs at home and to get the care they need, and to make sure their children have the best shot at a good education. And that latter part is what I want to point to here.

Because here is a program that's a spectacular example of doing the right thing, and doing it well, by bringing together industry, the Department of Defense, and a range of other sponsors, all to work with local schools to improve math and science educational opportunities for military children.

Why military children in particular? Well, consider that more than a million children have had a parent deployed during the last eight years. In all, there are more than two million children of active duty, National Guard and reserve military in the United States.

Now consider as well the impacts of the long separations and the frequent transfers these children endure. It is not unusual for students in military families to be transferred six to nine times during their school career, with many getting transferred twice in high school. This loss of continuity can have real impacts on achievement, adding unnecessary challenges for these children and undermining our national effort to ensure that the next generation is prepared for the high-tech jobs of the future.

That's why the First Lady and Dr. Biden challenged Federal agencies, the private sector, non-governmental organizations, and academia to bring their combined talents to bear to address the specific challenges that military children face. And what a great job all of you who have participated in this effort have done.

Take a look at just one element of this effort—the National Math and Science Initiative for Military Families, which was launched in a few schools in 2010 with initial funding from Lockheed Martin to provide extra help for students as they work their way towards taking their Advanced Placement exams for college.

We now have a program that is expanding into 150 schools and has attracted support from the Army Education Outreach Program, BAE Systems, Boeing, the Department of Defense Education Activity, Exxon Mobil, the Jack Kent Cooke Foundation, Northrop Grumman, and—thank you very much—the Office of Naval Research.

With a participant list like that, in addition to support from local schools, this country cannot go wrong. And the results are showing up already.

- Just this month, the College Board announced that schools in the National Math and Science Initiative for Military Families program dramatically increased their performance in Advanced Placement exams in math, science and English classes during 2011-2012, most of them after just one year in the program.
- And by “dramatic” I mean by more than 60 percent—with an average increase of 85 percent in AP math and science, or about the nine times the national increase in those scores seen last year.

Now I'd like to wrap up by talking about one other important element of the Administration's focus on public-private collaboration, and that is in the domain of international science and technology cooperation.

I raise it in part because I think a lot of you here—maybe especially many of you with dot-mil email addresses—probably assume that public-private partnerships involving foreign nations must be too sensitive, or too difficult to take on. Maybe you think the potential risks almost automatically outweigh the potential benefits.

Well I am here to say that, while of course there are going to be limits on this kind of collaboration in the military domain and other sensitive domains, there is actually a lot of opportunity to advance innovation with international partners—a lot of innovation that can benefit our Nation directly.

My opinions on this come from having a front-row seat in a number of such venues: I serve as the co-chair of six bilateral S&T ministerial meetings—with Japan, Korea, Brazil, Russia, China, and India—and I can say without hesitation that the Nation has benefited enormously from those shared arrangements, through cost-sharing and by gaining access to resources that would otherwise not be available.

In addition to these high level meetings, I work closely with partners around the globe, including in the UK, Germany and South Africa. In June, I met with Admiral Klunder in Prague and we discussed ways that OSTP can support the Office of Naval Research and DoD science and technology missions. So I encourage you to keep these working relationships in mind when you are looking for ways to move your science forward.

Let me give you a few examples of the kinds of projects already underway:

- The Department of Homeland Security has a bilateral agreement with the German government to promote science and technology cooperation on security matters that covers information sharing, vulnerability and risk assessments, software beta testing, and visualizing and analyzing data for critical infrastructure protection and crisis response.
- The Department of Defense is working with German suppliers to develop lightweight armor materials for use on vehicles and body armor, and also has arrangements with German agencies in nanoelectronics, quantum computing, oceanography, and energy-dense materials, as well as lightweight ship design and unmanned vehicles.
- Since 2006, an International Technology Alliance of industrial and academic organizations from the United States and the UK, led by U.S. Army Research Laboratory and UK Defense Science and Technology Laboratory, have been jointly conducting collaborative research to enhance information-sharing and distributed, secure, and flexible decision-making to improve networked coalition operations.
- The United States and the UK are also developing a research program on the physics of novel armor materials to speed development of lighter and stronger protection systems for use on multiple warfighter platforms.
- The U.S. Office of Naval Research Global—which, by the way, has had a London office since 1946—is supporting work with Britain on graphene and other advanced materials with potential applications in defense, and on the use of data from bistatic radar trials to improve detection of small maritime targets.
- And at the last ministerial meeting with Brazil, the Brazilian Ministry of Defense and the U.S. Department of Defense signed an agreement to exchange R&D information on topics of mutual interest, including biofuels.

So I think you get the idea. With every sector of this great nation working together, we can do much more than we could with these sectors working individually.

The initiatives I've described this morning span a wide range of opportunities. In some cases they offer Federal support to achieve national priorities in ways that can benefit private-sector and academic partners who choose to help. In other cases, we are asking

you in non-governmental positions to invest in Federal priorities—not because there is an immediate return for you but because these activities are essential to educating and training the next generation of scientists, engineers, and innovators who will design and manufacture your products of tomorrow.

But in total, we have a strategy that is building this Nation and its workforce, reinvigorating our industrial base, speeding the discovery of new products and processes, and scaling up manufacturing here at home.

We are doing this as a team—as representatives of the military, government, industry, and academia. And I could not be more pleased that all of you are gathered here for a few days to talk, to learn, to share ideas, and to imagine how you can continue to put this kind of collaborative power to work for America.

Thank you very much.

*Dr. John P. Holdren is Assistant to the President for Science and Technology, Director of the White House Office of Science and Technology Policy, and Co-chair of the President's Council of Advisors on Science and Technology.*