



Remarks



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"From Commitment to Engagement: How Industry Can Cultivate Competitiveness"
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Good afternoon.

Maintaining U.S. competitiveness is one of the greatest challenges facing industry, academe and government. The President's announcement of the American Competitiveness Initiative, better known as the ACI, brought this challenge to the national stage. Competitiveness and innovation are now, fortunately, on the minds of most of our national leaders. However, there is a lot of debate over how innovation and competitiveness relate, and how we can work together to retain U.S leadership in the global economy.

I entitled my remarks "From Commitment to Engagement" because that is the progression that we must make to maintain and strengthen U.S competitiveness. Let me begin with some context for this talk.

The connection between scientific research and economic growth was made early in the 20th century, and formed the genesis of the National Science Foundation after WWII.

World War II demonstrated the enormous contribution of science, engineering and technology to national needs. U.S. leaders were anxious to transfer these contributions to our anticipated peace-time economy.

At the behest of President Franklin Roosevelt, Vannevar Bush, Director of the Office of Scientific Research and Development, prepared the report *"Science -- the Endless Frontier."* The report began with a simple goal: to achieve full employment for Americans after the war¹.

An estimated 15 million men and women were returning from military service, only to find a shortage of jobs.

Dr. Bush observed that creating essential new jobs required the development of new industry. New industry required new products and processes, built upon new discoveries made by educated people through basic scientific research. The report asserted that, "Basic scientific research is scientific capital."²

To generate this capital, the report recommended a two-tiered approach. First, the nation must create a workforce that is highly trained in science and engineering.

Second, to develop the workforce, the government must strengthen the centers of basic research -- the nation's colleges and universities.

Based on these recommendations, the National Science Foundation was established in 1950. NSF's vision statement, "to enable America's future through discovery, learning and innovation," reflects the relationship between research, education and future competitiveness.

Fifty-six years later, this relationship is irrefutable. Economists estimate that over half of the nation's productivity growth is due to technological innovation. Technological innovation is the engine of the American economy, and advances in science and engineering provide the fuel.

Innovation is the new watchword for our nation's future. Historically, America has not measured its progress by comparison with others. Except for Japan in the 1980s, there was little comparison. We kept our eyes on the frontier -- on the unexplored territory.

Today, it is difficult to espouse that frontier vision as nations like China and India build research and educational capacity and economic momentum. There is fierce competition for ideas and talent in the global marketplace. However, the frontier -- the undiscovered territory -- is where new opportunities emerge.

The National Science Foundation remains focused on the frontier. As Vannevar Bush declared long ago, new industry, new jobs, new competitiveness and new wealth depend upon new knowledge arising from new discoveries. Transformational research and technological innovation converge on the frontier, producing revolutionary progress.

Early American explorers revealed that the frontier can yield surprising discoveries with unforeseen results. Lewis and Clark discovered new species and natural resources that we enjoy and take for granted today. Likewise, who could imagine that the discovery of a magnetic property -- a quirk -- of hydrogen atoms would lead to development of magnetic resonance imaging? NSF-sponsored scientists weren't looking for a huge medical imaging breakthrough. They were examining the basic properties of the smallest atomic element. This type of frontier exploration -- fundamental research leading to diverse development -- is a hallmark of innovation. It continues to be the key to our future.

As we explore the frontier, we hone future generations of explorers. Through cutting-edge research opportunities, students grow into world-class scientists, engineers, technologists and mathematicians, becoming the Lewis and Clark of the laboratory and the classroom.

These investigators are able to transfer new scientific and engineering concepts from universities to the industrial sector as they enter the workforce. This may be the most profound and lasting benefit of fundamental scientific research and NSF's contribution to the nation's innovation systems.

Although NSF primarily supports fundamental research, we also have direct partnerships with the private sector. NSF's research center programs, such as our Industry/University Cooperative Research Centers, Science and Technology Centers, and Engineering Research Centers, invite private sector partners to engage in or sponsor cutting-edge research that often leads to technological innovations.

NSF's Small Business Innovation Research and Small Business Technology Transfer programs support the largest source of new jobs in the country - emerging small businesses.

Our small business programs support a host of high-impact emerging technologies, including nanotechnology and information technology. Fidelity Comtech, in Longmont, Colorado, provides an excellent example³.

This company is using an NSF Small Business Innovation Research grant to develop an economical phased-array antenna system that enables "last mile" wireless communication between broadband networks and residences. The system is steerable. The signal shape can be changed dynamically, in microseconds, to increase signal range and reliability.

The company estimates that the technology will provide a 50 percent increase in wireless coverage at a cost savings of up to 55 percent compared to other wireless transmission methods. Ultimately, the technology will help achieve the greater goal of bringing broadband Internet into underserved areas.

Fidelity Comtech demonstrates the potential impact of small business upon technological innovation, which reminds me of the origins of innovation. Former Speaker of the House Tip O'Neill said, "All politics is local..."⁴ Let me paraphrase him by saying that most innovations are also local.

It often begins on a small scale. We mustn't forget that Yahoo! began as a hobby for the two Stanford University students who founded the Web powerhouse⁵.

We are obligated to support the next Web powerhouse, which is likely brewing in the campus down the road, or the elementary school across the street. To cultivate that local innovative spirit, and thus, U.S. competitiveness, we must move from commitment of resources, money and instruments, to engagement - making a personal investment of time and expertise in science and technology research and education.

I saw the value of engagement earlier this year on a visit to Greenville, South Carolina. For the past few years, the Society of Automotive Engineers, working with a local BMW manufacturing plant, has sponsored "A World in Motion" in the Greenville schools.

In this program, 5th-graders are divided into teams, with the challenge to design and build a car using recycled materials. The goal is to build a car that will travel the farthest using propulsion from an air-filled balloon.

The teams develop prototype cars, and conduct test races to evaluate their designs. The students must calculate velocity and distance, and record the results using metric units. BMW engineers regularly assist with the project; they go into the classrooms and help students refine their designs.

The teams experiment with different body shapes to reduce drag. They straighten the wheels for proper alignment, and choose different nozzles to optimize thrust from the balloon. The students run additional tests to judge the effect of their design changes.

"A World of Motion" is a great example of hands-on inquiry and active engagement. The kids are actually doing science engineering and learning science principles at the same time. They gain experience with research methods and team collaboration. Even if these students don't become scientists or engineers, their experiences in "A World of Motion" will give them a knowledge and understanding of science and engineering that will motivate them to acquire levels of STEM learning and understanding that will be of value in most 21st century careers.

The importance of engaging local schools cannot be over-stated. Last week, the *Christian Science Monitor*⁶ cited a study showing a 40 per cent drop-out rate among high-school students in the nation's 10 largest public school districts. At that rate, the study found that less than half of black and Hispanic male students will earn a diploma. The *Monitor* describes the dropout rate as a "societal crisis," which is an understatement.

The United States cannot afford this loss of intellectual resources. These high-school students are literally our future, and they live, discouraged, in our neighborhoods.

We have to find ways to show these students the value of education. We have to show them the opportunities that arise when they earn diplomas and degrees. We have to serve

as personal examples and mentors in our communities, to sustain interest in personal achievement through education.

The U.S. is falling behind other nations in the percentage of our college-age population who complete a college degree. Whereas, several nations are achieving a 50% graduate rate, the U.S. is only at approximately 33%. This should be a concern to all of us.

Many of you are already committed to local outreach and local workforce development. For instance, Sprint and Verizon, both Digital Dialogue Forum members, helped connect Fairfax County's Thomas Jefferson High School for Science and Technology to the National LambdaRail⁷. Students are getting first-hand experience with supercomputing and advanced networking - experience that will translate into tech-savvy citizens.

In conclusion, I'd like to encourage you to take the next step and move from commitment to engagement. Commitment of money and resources is essential; I don't want to diminish its importance. However, let's make the natural progression to engagement. There's no substitute for hands-on immersion in local science and math education. Your local students, your children, will benefit, and so will you, your colleagues and co-workers.

Finally, let me thank Laura Rudder for inviting me to speak today, and I thank all of you for your attention. Now, as we continue to enjoy our lunch, I'd be happy to take your questions.

¹ Bush, Vannevar, [Science -- The Endless Frontier](#), p. 6.
[Return to speech.](#)

² Ibid, p. 6.
[Return to speech.](#)

³ NSF SBIR award #0422037.
[Return to speech.](#)

⁴ O'Neill, Thomas P. (Tip) with Gary Hymel, *All Politics Is Local: And Other Rules of the Game*, 1995.
[Return to speech.](#)

⁵ Yahoo! was founded in February, 1994, by David Filo and Jerry Yang while electrical engineering students at Stanford University. Yahoo! is a member of the Digital Dialogue Forum.
[Return to speech.](#)

⁶ Simpson, John B. "A lifeline to high school dropouts," *The Christian Science Monitor*, Opinion, June 12, 2006. <http://www.csmonitor.com>.
[Return to speech.](#)

⁷ "Virginia Universities, Colleges Connect K12 Schools to Super Fast Networks," *Virginia Tech News*, May 16, 2006. <http://www.vtnews.vt.edu>.
[Return to speech.](#)



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