

**Testimony for the Record**  
**Submitted to the United States Senate Committee on Appropriations**  
**Hearing on “Driving Innovation Through Federal Investments”**  
**April 29, 2014**  
**By**

**Ad Hoc Group for Medical Research**  
**Aerospace Industries Association**  
**American Anthropological Association**  
**American Association for the Advancement  
of Science**  
**American Astronomical Society**  
**American Cancer Society Cancer Action  
Network**  
**American Council on Education**  
**American Heart Association**  
**American Institute for Medical and  
Biological Engineering**  
**American Institute for Biological Sciences**  
**American Mathematical Society**  
**American Physical Society**  
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**American Society for Microbiology**  
**American Society of Plant Biologists**  
**American Statistical Association**  
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**Association of American Geographers**  
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**Association of American Universities**  
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**Coalition for National Science Funding**  
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**Computing Research Association**  
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**Council of Graduate Schools**  
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**Energy Science Coalition**  
**Entomological Society of America**  
**Federation of American Societies for  
Experimental Biology**  
**Federation of Associations in Behavioral &  
Brain Sciences**  
**Human Factors and Ergonomics Society**  
**Industrial Research Institute**  
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**Materials Research Society**  
**Mathematical Association of America**  
**Semiconductor Industry Association**  
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**Society for Industrial and Applied  
Mathematics**  
**Society for Industrial and Organizational  
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**Stand With Science**  
**Task Force on American Innovation**  
**The Ecological Society of America**  
**The Optical Society**  
**The Science Coalition**  
**United for Medical Research**

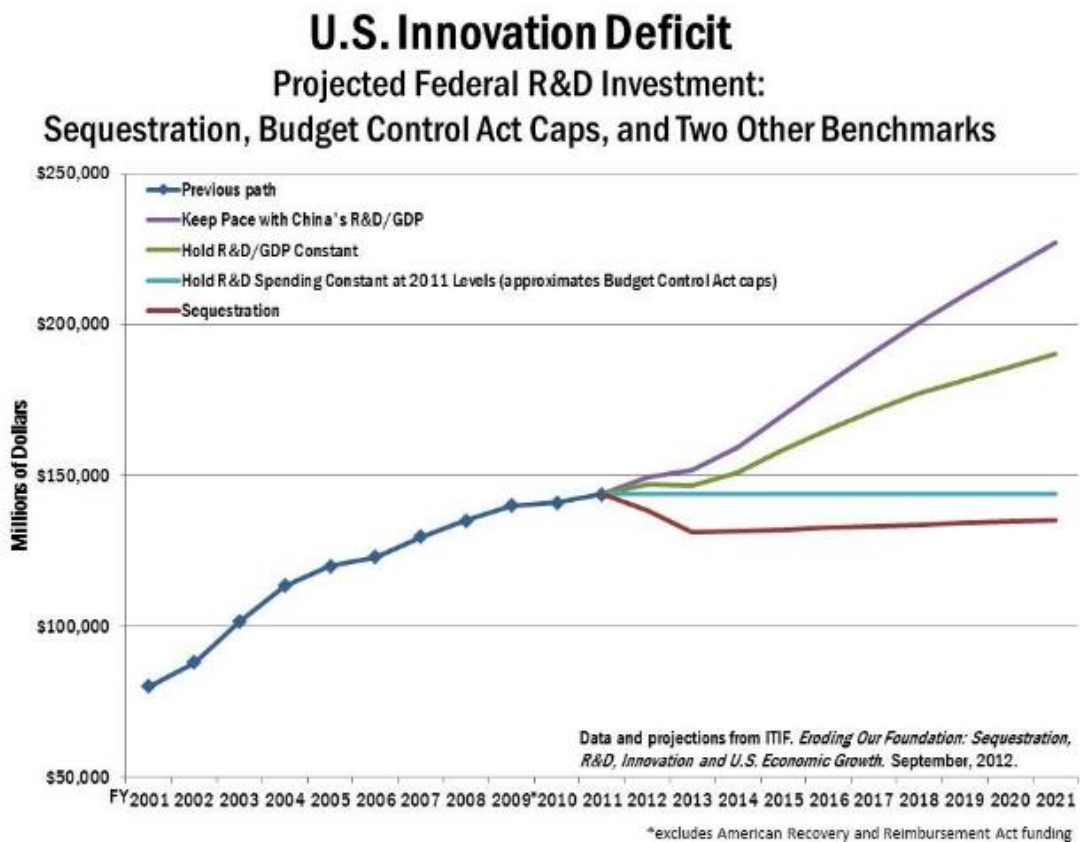
Chairwoman Mikulski and Vice Chairman Shelby, this coalition of business, higher education, scientific, patient, and other organizations thanks the Committee for holding today’s hearing on how federal investments in scientific research and engineering drive innovation and how recent discretionary spending cuts are affecting our nation’s innovation capacity. We also wish to thank the Executive Branch witnesses, whose research agencies have done so much to move this country forward but will find it difficult to sustain such progress in the face of sequestration and constrained budgets that will not allow for the investment needed to maintain our nation’s global leadership in innovation.

Madam Chairwoman, in announcing this hearing, you said that just as we need to be concerned about the federal budget deficit, we need to be concerned about the nation’s growing innovation deficit. Many of us were involved in launching a video that describes this problem (which can be seen at [www.innovationdeficit.org](http://www.innovationdeficit.org)). We share your concern and wish to take this opportunity to discuss the innovation deficit and what we believe Congress and the President need to do to close it.

A year ago, some 200 university presidents and chancellors wrote an open letter to the President and Congress calling attention to the innovation deficit. That letter urged Congress to close the innovation deficit by rejecting unsound budget cuts and recommitting to “strong and sustained investments in research and education.” The business community, as represented by organizations in this coalition, the scientific community, and many others are now part of a growing coalition that strongly supports this initiative. Members of Congress from both Houses and political parties are also expressing the need to address the innovation deficit, and we are grateful for that as well.

**In this testimony, we will ask and answer four questions. 1) What is the innovation deficit? 2) What has created the innovation deficit? 3) Why is the innovation deficit a serious problem for our country? 4) What do we need to do to close the innovation deficit?**

**1) What is the innovation deficit?** Put simply, it is the widening gap between the actual level of federal government funding for research and higher education and what the investment needs to be if the United States is to remain the world’s innovation leader. As the global innovation leader, we produce more discoveries and patents, and more technological and health advances, than any other nation. Economists have made very clear that these science- and engineering-driven advances have fueled most of our nation’s economic growth in the decades since World War II. Yet today, our leadership faces a serious challenge from other nations that are *rapidly* increasing their investments in these critical areas while our own spending lags. This chart illustrates the nature of the challenge. While U.S. federal R&D investment was once on a consistent growth path, we are today coming nowhere close to that. Projected U.S. investments fall far short of GDP growth and even further below China’s rate of investment.



**2) What has created the innovation deficit?** This answer requires some history. Not long after World War II, policymakers made a fundamental decision to establish a partnership with the nation's research universities. The launch of Sputnik solidified the partnership, and bipartisan support for it, based on a consensus that (1) the nation needs to invest its resources in curiosity-driven, competitively awarded basic research, and (2) basic research is best conducted at universities as well as national laboratories. As a result of that partnership, universities today perform more than half of the nation's basic research, 60 percent of which is supported by the federal government.

Along with creating new knowledge, universities use their research activities to educate students who will become the next generation's scientists and engineers in academia, industry, and government. This fusion of education and research has been a unique feature of U.S. research universities and has served the nation well for more than a half century. In addition, the national laboratories provide scientists with the cutting-edge facilities and instruments many need to conduct the most advanced research.

Our successful model is now widely emulated by other nations seeking to build their innovation capabilities. And they are making progress. Over the past decade, while R&D expenditures as a share of GDP remained nearly flat in the United States, they increased by nearly 50 percent in South Korea and nearly 90 percent in China. Today, the major Asian economies collectively perform a larger share of global R&D than the United States. Since 2001, the share of worldwide R&D performed by Asian countries has grown from 25 percent to 34 percent. China's global share grew from just 4 percent to 15 percent during this period. Consequently, China alone now performs nearly as much of the world's high-tech manufacturing as we do here.

In contrast, U.S. investment over the past decade has essentially flattened out and is no longer keeping up with inflation, much less the costs of conducting cutting-edge research. To provide an example, the National Institutes of Health (NIH) budget in constant dollars in FY13 was 22.4 percent less than it was in FY03. This contributed to a full one-third decrease in NIH R01 grants during that period, threatening, among other things, extraordinary research on treatments for cardiovascular disease, which will afflict nearly 44 percent of Americans by 2030.

While the lag in federal research funding did not begin with sequestration, it was seriously exacerbated by it. Even with last year's budget agreement, the extremely tight discretionary spending caps are having a major impact on both nondefense and defense basic research, and both face the prospect of even deeper cuts when sequestration resumes in FY16. Some in Congress are suggesting even deeper discretionary spending cuts. To put it plainly, this would be disastrous for the nation's scientific research and engineering workforce and enterprise, for American industry, which depends on this pipeline, and for all who benefit from research discoveries.

The fact that other nations are building up their research and innovation capabilities is not a bad thing. The world benefits from stronger research and education in other countries as well as our own. It's the fact that they are doing this while the United States is essentially standing still that we need to be worried about. This poses a serious challenge to U.S. leadership and the economic and national security benefits that flow from our position as the world's innovation leader. This is a race, and we cannot win it by standing still. The then-CEO of Accenture, Bill Green, perhaps said it best upon the release of the 2012 National Academies report, *Research Universities and the Future of America*: "All these other countries—India, China, Russia, you name it—they aspire to be like us because they realize how we got where we got. It's because of the national research infrastructure and ecosystem we have. They aspire to that and they're going to have that. But we've got to be gone when they get there." Which leads to our third question:

**3) Why is the innovation deficit a serious problem for our country?** Research and education drive discovery and innovation, which fuel our economy. A primary reason that the biotech, information technology, and semiconductor industries grew up here is because they were born from federally funded basic scientific and engineering research conducted at America's research universities and national labs. There is no doubt that these innovations have touched and improved countless lives here in the United States and around the world. There is also no doubt that the initial federal investment that led to these innovations has been repaid many, many times over. Take the Human Genome Project and related federal research, which has spurred \$965 billion in economic activity, more than 53,000 direct genomics-related jobs and \$293 billion in personal income.

Less obvious is how global leadership builds upon itself. Research funding, the extraordinary universities that have been fueled by that funding, the research and educational opportunities provided by those universities, and innovative manufacturers and businesses have served as powerful magnets for the brightest talent from both here and overseas. But a subtle shift is taking place. As we shut exceptional scientists and engineers out of careers in scientific research due to a lack of research funding, the brightest American students will avoid these fields. And as other countries become more attractive, we will no longer draw the best talent, and our innovation system will be severely weakened. American industry, American jobs, American security, and the American economy will suffer. Other countries will overtake us. The era of American primacy in research and innovation will end, and with it will go our nation's economic leadership.

In that original open letter a year ago, those university leaders wrote: "Failing to deal with the innovation deficit will pass to future generations the burdens of lost leadership in innovation, economic decline, and limited job opportunities." Even if this generation of Americans feels relatively small effects of the innovation deficit, future generations – our grandchildren and great-grandchildren – will face it full on – and with limited capacity to do anything about it.

**4) What do we need to do to close the innovation deficit?** While many actors play key roles in the nation's innovation enterprise, only the federal government can close the innovation deficit by supporting research on the scale, scope, and time horizon necessary to maintain our edge. The private sector and universities themselves are important funders of research. Indeed, industry funds about 21% of the nation's basic research, and is the biggest funder after the federal government. But industry will never replace the federal role. Because of its nature, the benefits of basic research generally flow to society at large. It is a public good. Many companies spend robustly on R&D, but they generally focus their resources later in the R&D process, applying basic research discoveries to actual products and processes, where they can reap the returns on their investments.

The simple answer is that the federal government must make sustained investments in scientific research that meet or exceed annual inflation in the cost of doing research. To help make this possible, Congress and the President must stop sequestration, reduce long-term budget deficits, and stabilize the long-term national debt, using a sensible approach that allows wise investments in research and education and creates economic and job growth. To do less is to fall behind.

We close by asking two additional questions. First, will the United States create the next information technology industry or biotechnology revolution? Second, will we continue to be the world's innovation leader, or will we be just another competitor? To help ensure that the answer to both of these questions is "yes," we urge you to close the nation's innovation deficit.

Again, we thank you for holding this hearing and for the opportunity to submit testimony.