Testimony for Congressional Record
Senate Appropriations Committee
American Association for the Advancement of Science
The Effects of U.S. Science Funding in 2014

Science investment means growth

Chairwoman Mikulski, Ranking Member Shelby, and members of the Committee, thank you for the opportunity to provide a sense of the state of scientific research in America in 2014. AAAS is the world's largest multidisciplinary scientific society, serving an estimated 10 million individuals, and is publisher of the prestigious peer-reviewed journal *Science*.

Beyond the lives saved from cancer, the wonders and conveniences of technological innovation, and the security provided by cutting-edge defense research, investing in scientific research has a remarkable return on investment. The NIH, for instance, estimates that every federal dollar spent on basic research leads to $2.21 in economic growth in that fiscal year alone.[1]While it is difficult to identify the exact value of individual projects, scientific research is the catalyst for economic development. Economists estimate that half or more of economic growth over the past several decades is due to scientific innovation.[2]

The current cuts in discretionary spending have had a drastic effect on the state of scientific research in this country, the results of which will be felt for decades to come, as the pipeline from basic research to valuable technological development and industrial innovation dwindle. It is impossible to quantify the loss of potential breakthroughs and growth–the success stories not heard–but there are sufficient data to paint a distressing picture.

Where we are today

Federal funding for research and development has been largely flat over the past decade in regular appropriations, and more recently has experienced steep declines. In just the past four years, federal funding for nondefense research and development has declined by 3.3 percent (in constant dollars), after a largely stagnant decade.

In the President's R&D budget for the upcoming year, R&D outlays as a share of the total federal budget –mandatory and discretionary—would drop to 3.4 percent, a 50-year low.[3] The trend in the proposed House budget would be even more alarming: Total nondefense research and development could drop by as much as 14 percent below the current Budget Control Act discretionary baseline through 2024.

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[1] Families USA "In Your Own Backyard: How NIH Funding Helps Your State's Economy" (2008);*See also* Margaret Bulme-Kohout, et al. "The Impact of Federal Life Science Funding on University R&D" (RAND Working Paper 2008) p. 23 (finding a 3:1 ratio when including associated increases in non-federal research) *available at* http://www.rand.org/content/dam/rand/pubs/working_papers/2008/RAND_WR641.pdf

[2]*See, e.g.*, US Congress Joint Economic Committee "STEM Education: Preparing for the Jobs of the Future" (2012) p. 1.*Available at*http://www.jec.senate.gov/public/index.cfm?a=Files.Serve&File_id=6aaa7e1f-9586-47be-82e7-326f47658320

[3]Matt Hourihan, "The President's R&D Budget for FY 2015: A Summary and Charts" (AAAS 2014) *available at* http://www.aaas.org/news/presidents-rd-budget-fy-2015-summary-and-charts

Where we are going

In 2011, the United States ranked below nine countries, including South Korea and Switzerland, in R&D intensity – research and development spending as a percentage of GDP.[4] While our declining commitment to research may not be evident for decades, some troubling trends are already developing.

The sources of spending on R&D continue to shift. In 2009, American private industry spent $247.4 billion on R&D, or 62 percent of the U.S. total. Although this is a substantial investment, it is critical to emphasize that private research has a very different character than government-supported research: Industry is less willing to invest in high-risk, long-term research, typically spending 80% or more of its investment on technology development with shorter-term payoffs. In comparison, civilian science agencies typically spend 80% or more of *their* R&D budgets on research activities. Federal investments in research have been the foundation upon which private research can build.

Education in the United States has suffered as well. The World Economic Forum now ranks the United States 52nd in the quality of mathematics and science education, and 5th (and declining) in overall global competitiveness.[5] In 2007, China overtook the U.S. in the number of doctoral degrees awarded for natural sciences and engineering.[6]

The United States is also faltering in its production of published research. According to the NSF, America is the world's second-largest producer of scientific articles behind the EU, but our share of total science and engineering articles has dropped over the past decade, from 30% in 2001 to 26% in 2011.[7] China's share grew the fastest among larger developing economies, rising from 3% to 11%. China has become the world's third-largest producer of scientific articles, after the EU and the United States.[8]

As funding for research has decreased, opportunities in the STEM field necessarily decrease as well. The National Center for Science and Engineering Statistics found that from 2008 to 2010, the unemployment rate for doctoral degrees in science, engineering, and health went up from 1.5% to 2.4%, representing an additional 5600 PhDs out of work.[9]

Recommitting to America's global scientific leadership

For now the United States remains a leader in scientific research, but that our lead is diminishing. Part of this can be attributed to the increasingly competitive global scientific environment. But

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[4] NSF "Science and Engineering Indicators 2014" ch. 4 (20014) *available at* http://www.nsf.gov/statistics/seind14/index.cfm/chapter-4/c4h.htm

[5] Klaus Schwab, "The Global Competitiveness Report 2010-2011" (World Economic Forum 2011) *available at* http://reports.weforum.org/global-competitiveness-2011-2012/

[6] Science and Engineering Indicators 2014 ch. 2 *available at* http://www.nsf.gov/statistics/seind12/c2/c2h.htm

[7] Science and Engineering Indicators 2014 ch. 5 *available at* http://www.nsf.gov/statistics/seind12/c5/c5h.htm

[8] *Id.*

[9] *See* NSF: "Unemployment among Doctoral Scientists and Engineers Increased but Remained Below the National Average." (2014) *available at* http://www.nsf.gov/statistics/infbrief/nsf14310

our decreasing commitment to federally supported research cannot be ignored. Whether you see federal research spending as an investment, a necessity for America's continued global leadership, or an essential part of our industrial heritage, the recent cuts in research spending fail to address our budget deficits in the short-term and suppress the growth science creates in the long-term.

We in the scientific community stand ready to help the Congress in any way we can to bolster the American commitment to scientific leadership and ensure the nation's economic future and the health and welfare of its people.