

THE SCIENCE COALITION

The Science Coalition is a non-profit, nonpartisan organization of more than 50 of the nation's leading public and private research universities.¹ We are dedicated to sustaining strong federal funding of basic scientific research as a means to stimulate the economy, spur innovation and drive America's global competitiveness. We commend the Senate Appropriations Committee and Chairwoman Mikulski and Ranking Member Shelby for holding this hearing on "Driving Innovation through Federal Investments."

When the federal government invests in scientific research there is a tremendous return. Knowledge is gained; discoveries are made with profound implications for our health, safety and quality of life; future scientists, doctors, teachers and leaders are educated; innovations give birth to new technologies, companies and industries; and jobs are created. All of this activity advances the U.S. economy and our global competitiveness. When federal funding for research is flat-funded, reduced or subjected to the mandatory cuts of sequestration, we create an innovation deficit² that threatens our economic advancement.

In late 2013, The Science Coalition published a report that focuses on one of the ways in which the federal investment in scientific research helps stimulate the economy: the creation of new companies. "*Sparking Economic Growth 2.0: Companies created from federally funded university research, fueling American innovation and economic growth*," highlights 100 companies that trace their roots to federally funded university research.³ The 100 companies were selected by the member universities of The Science Coalition and are illustrative of the thousands of companies that exist today because of federally funded research.

We will use the bulk of our testimony to share the findings from our report and to describe how these companies – the result of federally funded basic scientific research – are contributing to the economy in significant ways. The total investment in the fundamental research that gave root to these 100 companies was approximately \$330 million. Without the federal support for this research over years and decades, these companies would not exist today.

1. Research-based companies are an innovation engine and are a crucial element of the innovation ecosystem in the United States.

"Startup companies are a critical component in bringing inventions from federally funded basic research into public use. ... In many industries, larger established companies have become dependent on partnering with startups for new product flow," Lita Nelsen, Director, MIT Technology Licensing Office.

Each year in the United States several hundred thousand new businesses are formed. Only a tiny fraction of these companies can trace their roots to discoveries from federally funded university research. Yet, these are the companies that are the driving force behind much of the innovation in the United States. If you look at rankings such as *MIT Technology Review's* "50 Disruptive Companies" or *R&D Magazine's* "100 Top Innovations," they are peppered with university research spin-offs and collaborations with federally funded national laboratories.

According to a study⁴ by scholars Fred Block and Matthew Keller published by the Information Technology and Innovation Foundation, the source of innovation in the United States has shifted in two key ways over the past four decades. First, large firms acting independently account for a much smaller share of award-winning innovations, while innovations stemming from collaborations with spin-offs

from universities and federal laboratories make up a much larger share. Second, the number of innovations that are federally funded has increased dramatically over this period.

Significantly, these research-based companies seem to be succeeding when other companies fail. While only half of all new businesses formed in the United States survive more than five years,⁵ companies grounded in federally funded university research appear to do better. A look at the 100 companies highlighted in an earlier report by The Science Coalition illustrates the relative success of research-based startups. Of the 100 companies in our 2010 *“Sparking Economic Growth”* report⁶, 89 remain in business. More significantly, of the 20 young companies (those that were less than five years old in 2010), 16 were still in business as of September 2013, beating the odds of most new businesses.

2. Research universities and their spin-off companies keep local economies humming.

“The foundation of a region’s competitiveness lies in its ability to collaborate and innovate. Healthy regional economies are where new ideas, businesses and jobs are created,” Deborah Wince-Smith, president and CEO, Council on Competitiveness.

Research universities play a vital role in their local economies. They are often the area’s largest employer and further contribute to the local economy through their purchase of goods and services. Increasingly, the communities around research universities are becoming high-tech innovation hubs, where the presence of a highly educated labor force and a strong innovation sector attracts more of the same, contributing to a robust local economy. Silicon Valley in California, Research Triangle in North Carolina and Route 128 in Boston are among the best known hubs, but this phenomenon is playing out to differing degrees in university communities across the country.

The *Sparking Economic Growth 2.0* companies are contributing to this trend. Eighty-nine of 100 companies are headquartered in the same state as the university from which they emanated. And it’s not just the newly formed companies that are staying close to their founding university. Of the 30 companies that are 10 or more years old (those formed in 2003 or earlier), all but six are located locally. The two oldest companies in the report, Integrated DNA Technologies, with 650 employees, and Myriad Genetics, with 1,169 employees — spin-offs from the University of Iowa in 1987 and the University of Utah in 1991 respectively — remain headquartered in their home states.

3. Research-based spin-off companies are job creators.

The 100 companies in *Sparking Economic Growth 2.0* collectively employ over 7,200 people. Similar to the overall U.S. economy, the large bulk of the companies in this report are small businesses with fewer than 500 employees. These are the companies that are creating the majority of new jobs in the United States today. According to the U.S. Small Business Administration, small businesses account for 64 percent of net new private-sector jobs and 49 percent of total private-sector employment.

While our 2013 report had a significant focus on relatively young spin-off companies, our 2010 report highlighted many companies that had evolved to become industry leaders. Among them are Cisco Systems, SAS, Google and Genentech. These companies — each born from federally funded university research — today collectively employ nearly 150,000 people. It’s likely that there are several ‘Ciscos’ or ‘Genentechs’ among the *Sparking Economic Growth 2.0* companies.

4. Basic scientific research occurs over the course of many years, requiring sustained support.

One of the reasons the bulk of basic science in the United States is conducted at universities is because it takes time, often a long time. Many of the companies highlighted in *Sparking Economic Growth 2.0* are based on years — even decades — of work. The researchers conducting this work were free to focus on their scientific mission. They were able to explore basic questions about life and the physical world without having to demonstrate commercial value. While commercialization was one outcome, it was not the goal of their research. This simply does not happen today in industry. Industry conducts a majority of applied research (~60 percent) and development (~90 percent), but it performs less than 20 percent of U.S. basic scientific research.⁷ Some examples of this sustained work and investment include:

- Tivorsan Pharmaceuticals, which is developing biglycan to treat serious neuromuscular disorders, including Duchenne muscular dystrophy and Becker muscular dystrophy, based on 24 years of basic science by Dr. Justin Fallon at Brown University. This research was supported by the National Institutes of Health and the National Science Foundation. Founded in 2008, Tivorsan is based in Providence, RI, and has six employees.
- OmniSpeech, which provides speech extraction technology for digital mobile devices, is based on groundbreaking research on the physiology of human speech at the University of Maryland conducted with support from the National Institutes of Health and the National Science Foundation. Founded in 2009, Maryland-based OmniSpeech has seven employees.
- Xerion Advanced Battery Corp.'s core innovation – nanotechnology with the potential to dramatically reduce charge times for electric car and cell phone batteries – results from nearly a decade of work by a team at the University of Illinois at Urbana-Champaign supported by the Department of Defense and the Department of Energy. Founded in 2010, Xerion has 11 employees.
- HaloSource is based on the research of an Auburn University professor whose work in the early 1990s supported by the Department of Defense and the Department of Agriculture led to water purification technology that is in use around the world today. Based in Washington State, HaloSource has 80 employees.
- Trak Surgical's first-of-a-kind computer-assisted system for joint replacement surgery follows 12 years of research and development at the University of Nebraska Medical Center supported by the Department of Defense. Founded in 2012, Trak Surgical is based in Omaha, NE, and has four employees.
- Humming Bird Nano is a manufacturer of ultra-small, precision-molded components for the telecommunications, biotechnology, aerospace, energy, and defense industries. It is based on research at the University of Kentucky supported by the National Science Foundation and the Department of Education. Based in Lexington, KY, the company has three employees.

5. There simply is no replacement for the type, quality or scale of federal funding for basic science.

“Eucalyptus, which began as an NSF-funded research project at University of California, Santa Barbara, would never have launched the private cloud industry without the federal investment in computer science research that made it possible.”

Dr. Rich Wolski, co-founder and board member, Eucalyptus Systems

Founded in 2009, Goleta, CA-based Eucalyptus has 60 employees.

“While working with the National Cancer Institute we identified a serious need for a new and safe way to deliver poorly water-soluble anti-cancer drugs that did not further exacerbate the toxicity of the drug itself. With the partial support from NCI, we successfully identified Captisol. To capitalize on our findings we helped create the company, CyDex, a very successful University of Kansas start-up.”

Valentino Stella, University Distinguished Professor, Department of Pharmaceutical Chemistry, School of Pharmacy, University of Kansas and founder of CyDex Pharmaceuticals. CyDex has 30 employees.

“I believe that serendipitous foundational inventions resulting from federally funded projects are a vital link in the engine driving American innovation. The reason is that as with all serendipitous inventions, including the Internet and the technologies driving LineRate Systems, one cannot predict a priori the impact of a federally funded project but the economic impact has been vital.”

John Giacomoni, co-founder and CTO of LineRate Systems, a spinout from Department of Defense-funded research at the University of Colorado Boulder. Founded in 2008, the company is based in Louisville, CO, and has 20 employees.

While there is no way to predict which piece of research will yield a discovery with enormous import for our health, safety, environment, economy, or quality of life, it is almost certain that the loss of innovation that results from the depressed science funding of the past decade and the ongoing forced cuts under sequestration will be immeasurable and impossible to recoup.

There is no better, more tangible example of the theme of this hearing – driving innovation through federal investments – than the 100 companies highlighted in *Sparking Economic Growth 2.0*. But for the federally supported basic research conducted over many years, these companies, their products and services, and the jobs and economic growth that have resulted, in all likelihood would not exist today. If America wants to maintain its innovative edge, create meaningful jobs and realize economic growth, then investment in scientific research must be given a higher priority.

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¹ A list of Science Coalition members is available here: <http://www.sciencecoalition.org/mission-and-members>

² The Science Coalition joined with more than 40 organizations to submit testimony to this Committee on the innovation deficit; more information is available at www.innovationdeficit.org

³ “Sparking Economic Growth 2.0,” published in October 2013, is available here: www.sciencecoalition.org/successstories_reports

⁴ “Where Do Innovations Come From? Transformations in the US National Innovation System, 1970-2006,” published in July 2008, is available here: www.itif.org/files/Where_do_innovations_come_from.pdf

⁵ “Frequently Asked Questions About Small Business,” Small Business Administration, September 2012

⁶ “Sparking Economic Growth: How federally funded university research creates innovation, new companies and jobs,” published in April 2010, is available here: www.sciencecoalition.org/successstories_reports

⁷ The National Science Foundation Science & Engineering Indicators 2014 Chapter 4