**U.S. HOUSE OF REPRESENTATIVES**
**COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY**
**SUBCOMMITTEE ON RESEARCH AND SCIENCE EDUCATION**

# HEARING CHARTER

*The Relationship Between Business and Research Universities: Collaborations Fueling American Innovation and Job Creation*

**Wednesday, August 1, 2012**
**10:00 a.m. - 12:00 p.m.**
**2318 Rayburn House Office Building**

## 1. Purpose

On Wednesday, August 1, 2012, the Committee on Science, Space, and Technology Subcommittee on Research and Science Education will hold a hearing to examine partnerships and collaborations between industry and research universities, as a follow-up to the June 27, 2012 hearing, *The Role of Research Universities in Securing America's Future Prosperity: Challenges and Expectations*. The hearing will provide an opportunity to explore the necessary relationships between industry and research universities. It will examine the challenges and opportunities they face in fueling the research necessary for American economic prosperity and ensuring that universities are adequately preparing the future workforce to meet the needs of industry.

## 2. Witnesses

**Mr. William D. Green**, Executive Chairman, Accenture, Boston, Massachusetts

**Dr. Ray O. Johnson**, Senior Vice President and Chief Technology Officer, Lockheed Martin Corporation, Bethesda, Maryland

**Dr. John S. Hickman**, Director, Global University Relations and Life Sciences, Deere and Company, Moline, Illinois

**Dr. Lou Graziano**, Director, University R&D Strategy, Sustainable Technologies & Innovation Sourcing, The Dow Chemical Company, Spring House, Pennsylvania

**Ms. Jilda Diehl Garton**, Vice President for Research and General Manager, Georgia Tech Research Corporation, Georgia Institute of Technology, Atlanta, Georgia

## 3. Overview

- U.S. businesses and industry have moved away from conducting fundamental, or basic, scientific research and development in-house. This shift has led to a greater reliance on the

Nation's research universities for this research and to provide the backbone for the science, technology, engineering and mathematics workforce essential for U.S. prosperity.

- Today, collaborations between industry and universities take a number of diverse forms and exist for a number of reasons, including conducting basic research, transferring this research into applied technologies, and growing and supporting a qualified workforce.

- On June 14, 2012, the National Academies released *Research Universities and the Future of America*, a report detailing ten recommendations for key stakeholders to ensure U.S. research universities maintain their capabilities and grow their strengths. Included as part of these recommendations was the need to strengthen partnerships between businesses and academia.

**4. Background**

On June 27, 2012, the Subcommittee on Research and Science Education held a hearing to examine the challenges faced by the Nation's research universities. As the 150th anniversary of the Morrill Act was celebrated across the country, the hearing provided Members of the Subcommittee an opportunity to reflect on the important role U.S. research universities play in educating the science, technology, engineering and mathematics workforce essential for U.S. prosperity and to review the National Academies report, *Research Universities and the Future of America*. These universities not only contribute to the academic researchers who work to move basic scientific research forward but also those who comprise the STEM related workforce in the country. At the hearing, witnesses and Members discussed the challenges facing these universities, including restricted budgets, rising costs, over-regulation or regulatory burden, and global competition. Today's hearing brings additional stakeholders to the table to discuss the recommendations as they relate to industry and how they affect the future of U.S. research universities.

The National Academies' Committee on Research Universities reconfirmed that a gap exists in industry research needs. Industry is shifting away from conducting its own transformational and translational research and development (R&D), that research which couples fundamental scientific breakthroughs with technological innovation, and is turning to relationships with academic institutions for this R&D support.

> Corporate practices for the funding and performance of basic research have shifted. Financial pressures have led to the disappearance of large industrial laboratories in many industries and, therefore, to new strategies for obtaining the productive knowledge that allows for the innovation and development of new processes and products. Industry funding and performance of basic research has recently been wildly erratic, but over the long term, essentially flat. Meanwhile university-performed research and industry-funded university research have grown. Corporate funding for basic research has increased on campuses creating both new opportunities for research and commercialization and challenges such as the management of conflict of interest.[1]

[1] *Research Universities and the Future of America*, National Academies Press, 2012, p.94-95.

In order to sustain U.S. growth in these areas, industry and academia are finding more ways to partner in both transformational and translational R&D. The Nation's research universities work to sustain the science, technology, engineering and mathematics workforce essential for U.S. prosperity. These universities produce not only the academic researchers who work to move basic scientific research forward but also those trained to transition from basic to applied technologies and the overall STEM-related workforce for the country.

Research universities play a critical role in our Nation's R&D enterprise. In 2009, academic institutions performed over half (53 percent) of the Nation's total basic research, a percent that has risen steadily in recent decades. [2]

According to the 2012 NSF Science and Engineering Indicators:

- In 2010, four percent of the U.S. workforce (about 5.5 million people) worked in occupations classified as science and engineering (S&E). This is an increase from the five million S&E workers in 2003.
  - 1.55 million individuals were employed in engineering occupations in 2010, an increase from 1.49 million engineers employed in 2004;
  - Nearly 629,000 individuals were employed as life and physical scientists in 2010, an increase from the 549,000 life and physical scientists employed in 2004;
  - 3.11 million individuals were employed as computer specialists in 2010, an increase from the 2.81 million computer specialists employed in 2004; and
  - Nearly 1.9 million individuals were employed as technical workers in 2010, an increase from the 1.5 million technical workers employed in 2004.

- In 2008, just over 33,000 S&E doctorates were awarded by U.S. academic institutions, approximately 26 percent more than in 1997. The number of employed S&E doctorate holders rose from 517,000 in 1997 to 648,000 in 2008, an increase of 25 percent.

- Expenditures for research performed in academic institutions have almost doubled in the decade, rising from $30 billion in 2000 to almost $55 billion in 2009 in current dollars.

- The amount of R&D performed by business rose from nearly $192 billion in 2000 to nearly $267 billion in 2008, an increase of 39 percent in current dollars. [3]

Industry-academic relationships may include support for students and a future workforce, collaborations on basic fundamental questions, or coordination transitioning an idea or technology from the laboratory. These partnerships are motivated by the objectives and restrictions of both the industry and university involved. The University-Industry Demonstration Partnership (UIDP), convened by the National Academies, evaluated the different types of partnerships that occur between industry and universities and categorized the relationships into several areas: student-oriented engagement; involvement with researchers; access to resources; involvement with centers of expertise and schools; or economic development. According to

[2] *Science and Engineering Indicators 2012*. National Science Board. Arlington VA: National Science Foundation (NSB 12-01). 2012. http://www.nsf.gov/statistics/seind12/start.htm. p.4-4.
[3] Ibid. p.8-78, 80-86, 104, 78, 102, and 100

UIDP, "Partnerships within these categories can be strategic, to some degree, and where there is a particularly deep relationship between parties, participation across all categories may occur concurrently."[4]

*Research Universities and the Future of America*

The ability of the United States to remain a world leader in science and technology relies greatly on the strength and success of our universities. In 2009, Representatives Ralph Hall and Bart Gordon and Senators Lamar Alexander and Barbara Mikulski requested the National Academies work to produce a report identifying the top ten actions needed to be taken in order to maintain the excellence of U.S. research and doctoral education. The request expressed concern that America's research universities were "at risk" and asked the National Academies to assess the future of research universities by asking what Congress, the federal government, state governments, research universities and others can do to ensure future success of these institutions, which now face an array of challenges, from unstable revenue streams and antiquated policies and practices to increasing competition from universities abroad. In response, the National Research Council convened a committee of leaders from academia, industry, government and national labs to draft the report which outlines various findings and recommends ten specific actions.[5]

The report identifies a set of specific challenges:

- Federal funding for university research has been unstable and, in real terms, declining at a time when other countries have increased funding for research and development (R&D).

- State funding for higher education, already eroding in real terms for more than two decades, has been cut further during the recent recession.

- Business and industry have largely dismantled the large corporate research laboratories that drove American industrial leadership in the 20th century (e.g., Bell Labs), but have not yet fully partnered with research universities to fill the gap at a time when the new knowledge and ideas emerging from university research are needed by society more than ever.

- Research universities must improve management, productivity, and cost efficiency in both administration and academics.

- Young faculty have insufficient opportunities to launch academic careers and research programs.

[4] *Partnership Continuum: Understanding & Developing the Pathways for Beneficial University-Industry Engagement.* University-Industry Demonstration Partnership. http://sites.nationalacademies.org/xpedio/groups/pgasite/documents/webpage/pga_069334.pdf. p. 7

[5] *Research Universities and the Future of America.* National Academies Press. 2012, p.192.

- There has been an underinvestment in campus infrastructure, particularly in cyberinfrastructure that could lead to long-term increases in productivity, cost-effectiveness, and innovation in research, education, and administration.

- The cost of sponsored research is not fully covered by those who procure it, which means that universities have to cross-subsidize sponsored research from other sources.

- A burdensome accumulation of federal and state regulatory and reporting requirements increases costs and sometimes challenges academic freedom and integrity.

- Doctoral and postdoctoral preparation could be enhanced by shortening time-to-degree, raising completion rates, and enhancing programs' effectiveness in providing training for highly productive careers.

- Demographic change in the U.S. population necessitates strategies for increasing the success of female and underrepresented minority students.

- Institutions abroad are increasingly competing for international students, researchers, and scholars. [6]

According to the Report, America's research universities have emerged as a major national asset in light of the Nation's economic goals among other things. The Report lists ten specific actions that should be taken to secure the future for these universities, several of which relate to industry and its role. Of particular note is the recommendation that specifically encourages the relationship between industry and universities (Recommendation 3); the recommendations that require industry engagement for implementation (Recommendations 8 and 9); and the recommendations that may affect the way industry conducts its business (Recommendations 4 and 10).

All ten of the recommendations are designed to accomplish the following three broad goals:

- *Revitalize the partnership.* The first four actions will strengthen the partnership among universities, federal and state governments, philanthropy, and the business community in order to revitalize university research and speed its translation into innovative products and services.

- *Strengthen institutions.* The next three actions will streamline and improve the productivity of research operations within universities.

- *Build talent.* The final three actions will ensure that America's pipeline of future talent in science, engineering, and other research areas remains creative and vital,

[6] Ibid. p.4-5.

leveraging the abilities of all of its citizens and attracting the best students and scholars from around the world. [7]

The ten specific actions recommended to achieve the above goals are:

1. Within the broader framework of U.S. innovation and R&D strategies, the federal government should adopt stable and effective policies, practices, and funding for university-performed R&D and graduate education so that the nation will have a stream of new knowledge and educated people to power our future, helping us meet national goals and ensure prosperity and security.
   - The federal government should work to review and modify burdensome and inefficient policies and practices governing university research and graduate education.
   - As the economy improves over the next ten years, the federal government should invest in basic research and graduate education sufficient to produce the new knowledge and educated citizens the Nation needs to reach its goals.
   - In the President's annual budget request, OMB and OSTP should develop and present a federal science and technology budget that addresses priorities for sustaining a world-class U.S. science and technology enterprise. [8]

2. Provide greater autonomy for public research universities so that these institutions may leverage local and regional strengths to compete strategically and respond with agility to new opportunities. At the same time, restore state appropriations for higher education, including graduate education and research, to levels that allow public research universities to operate at world-class levels.
   - State governments should provide their public research universities with sufficient autonomy and agility to navigate an extended period with limited state support.
   - As state budgets recover from the current recession, states should work to restore and maintain per-student funding for higher education.
   - Federal programs designed to stimulate innovation and workforce development at the state level should be accompanied by incentives to stimulate and sustain state support for their public universities. [9]

3. Strengthen the business role in the research partnership, facilitating the transfer of knowledge, ideas, and technology to society, and accelerate "time-to-innovation" in order to achieve our national goals.
   - The federal government should continue to fund and expand research support mechanisms that promote collaboration and innovation
   - The federal government should make the R&D tax credit permanent and implement new tax policies that incentivize business to develop partnerships with universities.
   - The relationship between business and higher education should become more peer-to-peer in nature.

[7] Ibid. p.4.
[8] Ibid. p.7.
[9] Ibid. p.9.

- Businesses and universities should work closely together to develop new graduate degree programs that address strategic workforce gaps for science-based employers.
- Collaboration among national laboratories, the business community, and universities should be encouraged.
- Universities should improve management of intellectual property to improve technology transfer. [10]

4. Increase university cost-effectiveness and productivity in order to provide a greater return on investment for taxpayers, philanthropists, corporations, foundations, and other research sponsors.
   - The Nation's research universities should set and achieve bold goals in cost containment, efficiency, and productivity in business operations and academic programs. Universities should strive to limit the cost escalation of all ongoing activities — academic and auxiliary.
   - University associations should develop and make available more powerful and strategic tools for financial management and cost accounting.
   - Working together with key stakeholders, universities should intensify efforts to educate key audiences about the unique character of U.S. research universities and their importance to state, regional, and national goals. [11]

5. Create a Strategic Investment Program that funds initiatives at research universities critical to advancing education and research in areas of key national priority.
   - The federal government should create a new Strategic Investment Program to support initiatives that advance education and research at the Nation's research universities.
   - Universities should compete for funding under these initiatives, bringing in partners that will support projects by providing required matching funds. [12]

6. The federal government and other research sponsors should strive to cover the full costs of research projects and other activities they procure from research universities in a consistent and transparent manner.
   - The federal government and other research sponsors should strive to support the full cost of research so that it is no longer necessary to subsidize sponsored grants by drawing on resources intended to support other university missions. Both sponsored research policies and cost-recovery negotiations should be developed and applied in a consistent fashion across all federal agencies and academic institutions. [13]

7. Reduce or eliminate regulations that increase administrative costs, impede research productivity, and deflect creative energy without substantially improving the research environment.
   - Federal policymakers and regulators (OMB, Congress, agencies) and their state counterparts should review the costs and benefits of federal and state regulations,

[10] Ibid. p.11.
[11] Ibid. p.12.
[12] Ibid. p.13.
[13] Ibid. p.15.

eliminating those that are redundant, ineffective, inappropriately applied to the higher education sector, or that impose costs that outweigh the benefits to society.
- The federal government should make regulations and reporting requirements more consistent across federal agencies. [14]

8. Improve the capacity of graduate programs to attract talented students by addressing issues such as attrition rates, time-to-degree, funding, and alignment with both student career opportunities and national interests.
   - Research universities should restructure doctoral education to enhance pathways for talented undergraduates.
   - Research universities and federal agencies should ensure that they improve education across the full spectrum of research university graduate programs.
   - The federal government should significantly increase its support for graduate education through balanced programs of fellowships, traineeships, and research assistantships provided by all science agencies that depend upon individuals with advanced training.
   - Employers that hire master's and doctorate level graduates should engage more deeply in research university programs by providing advice on needed curriculum and utilizing tools like internships and student projects. [15]

9. Secure for the United States the full benefits of education for all Americans, including women and underrepresented minorities, in science, mathematics, engineering, and technology.
   - Research universities should engage in efforts to improve education for all students at all levels in the United States.
   - Research universities should assist efforts to improve the education and preparation of those who teach science, technology, engineering, and mathematics (STEM) subjects in grades K-12 and strive to improve undergraduate education.
   - All stakeholders (federal government states, local school districts, industry, philanthropy, universities) should take urgent, sustained, and intensive action to increase the participation and success of women and underrepresented minorities across all academic and professional disciplines. [16]

10. Ensure that the United States will continue to benefit strongly from the participation of international students and scholars in our research enterprise.
    - Federal agencies should ensure that visa processing for international students and scholars who wish to study or conduct research in the United States is as efficient and effective as possible, consistent with homeland security considerations.
    - To ensure that a high proportion of non-U.S. doctoral researchers remain in the country, the federal government should streamline the processes for these researchers to obtain permanent residency or U.S. citizenship.
    - The federal government should proactively recruit international students and scholars. [17]

[14] Ibid. p.15.
[15] Ibid. p.16.
[16] Ibid. p.18.
[17] Ibid. p.19.