

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

HEARING CHARTER

*The Role of Research Universities in Securing America's Future Prosperity:
Challenges and Expectations*

**Wednesday, June 27, 2012
10:00 a.m. - 12:00 p.m.
2318 Rayburn House Office Building**

1. Purpose

On Wednesday, June 27, 2012, the Committee on Science, Space, and Technology Subcommittee on Research and Science Education will hold a hearing to examine the challenges faced by the Nation's research universities. The hearing will provide an opportunity to discuss the future outlook for these universities and to discuss the recently released National Academies study, *Research Universities and the Future of America*.

2. Witnesses

Mr. Chad Holliday, Jr., Chair, Committee on Research Universities, National Academies

Dr. John M. Mason, Jr., Associate Provost and Vice President for Research, Auburn University

Dr. Jeffrey R. Seemann, Vice President for Research, Texas A&M University and Chief Research Officer, The Texas A&M University System

Dr. Leslie P. Tolbert, Senior Vice President for Research, The University of Arizona

Dr. James N. Siedow, Vice Provost for Research, Duke University

3. Overview

- The Nation's research universities provide the backbone for the science, technology, engineering and mathematics workforce essential for U.S. prosperity. 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.
- Today, U.S. research universities are faced with a number of challenges including restricted budgets, rising costs, and global competition. These challenges may be hindering the work of the Nation's universities and the ability to shape the essential workforce of the future.

- In 1862, President Lincoln signed the Morrill Act (P.L. 37-108), which laid the groundwork for the development of public research universities across the Nation. The 150th anniversary of this legislation provides an opportunity to reflect on the current challenges facing such universities today and look toward the future of U.S. universities.
- 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.

4. Background

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. Today, there are a number of challenges facing U.S. research universities, including restricted budgets, rising costs, and global competition that may be affecting the way they conduct business.

Research universities play a critical role in our Nation's research and development 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.¹ However, the traditional funding model for public research universities has been under stress lately as states facing challenging fiscal climates have chosen to invest less in these institutions.

According to the 2012 NSF Science and Engineering Indicators:

- From 2002 to 2010, state funds for operating expenses of all public institutions of higher education increased by 21 percent. For major public research universities, state funds increased by only 8 percent dropping the states' share of their total operating funds from 28 percent to 19 percent.
- When adjusted for inflation, total state expenditures for public higher education were essentially flat over the decade, while the amount going to major public research universities decreased by 10 percent.
- Between 2002 and 2008, total enrollment at major public research universities increased by 8 percent and undergraduate enrollment at all public four-year institutions increased by 22 percent.
- Over the decade, per-student state support to major research universities dropped by an average of 20 percent in inflation-adjusted dollars. In ten states, the decline ranged from 30 percent to 48 percent.²

¹ National Science Board. 2012. *Science and Engineering Indicators 2012*. Arlington VA: National Science Foundation (NSB 12-01). <http://www.nsf.gov/statistics/seind12/start.htm>.

² Ibid.

According to Dr. Ray Bowen, Chairman of the National Science Board (NSB), "...the decline in support for postsecondary education, especially public research universities, is a cause for great concern as we examine the condition of U.S. global competitiveness."³ As other nations recognize the need for both a highly skilled workforce and research base in order to compete in a knowledge-based global economy, these governments have begun investing in upgrading and expanding their higher education and research enterprises. The number of students in developing countries earning science and engineering degrees has risen. In 2008, the U.S. produced only 4 percent of the world's engineering degrees while 56 percent were awarded in Asia, including a third in China.⁴

The challenges U.S. research universities are facing may inhibit their work producing the future workforce. Examining these challenges and possible measures to overcome these challenges and forge stronger universities and partnerships between these institutions, federal and state governments, industry and other key stakeholders, is an essential step on the road to recovery.

The Morrill Act

In 1857, Justin Smith Morrill, then a second term Republican Congressman from Vermont and later a Senator, introduced the first land-grant bill in the U.S. Congress. The bill passed in 1859 only to be vetoed by President James Buchanan. In 1861, Rep. Morrill introduced another land-grant bill that increased to 30,000 acres the grant for each Senator and Representative and added a requirement that recipient institutions teach military tactics. President Abraham Lincoln signed the amended legislation into law on July 2, 1862, during the heart of the Civil War.

The 1862 Morrill Act stated:

Each State which may take and claim the benefit of this act, to the endowment, support, and maintenance of at least one college where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures of the States may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life.⁵

In 1890, President Benjamin Harrison signed the Second Morrill Act to extend access to higher education by providing additional endowments for all land-grant institutions. States with dual systems of higher education were mandated to provide land-grant institutions for both systems. "As a result, 19 institutions were established as black land-grant institutions."⁶ The schools that are a part of the Second Morrill Act are known as "the 1890 land-grants" and help comprise a

³ National Science Board Press Release. January 17, 2012. *States Reduce Funding for Research Universities as Asia Produces Far More Scientists and Engineers.*

⁴ National Science Foundation, *Science and Engineering Indicators, 2012, Appendix Tables*, Table 2-32.

⁵ <http://www.loc.gov/r/program/bib/ourdocs/Morrill.html>, Thirty-Seventh Congress, Sess. II, Ch 130, 1862. p. 504.

⁶ Matthews, Christine M. *Federal Research and Development Funding at Historically Black Colleges and Universities.* Congressional Research Service. p. 5.

portion of the Nation's Historically Black Colleges and Universities. In 1994, Native American tribal colleges were granted land-grant status through passage of the Improving America's School Act of 1994 and are sometimes called the "1994 land-grants."

Currently, there is at least one land-grant institution in every state and territory of the United States, as well as the District of Columbia.⁷ They are often the largest employers in their community, if not their state, and are engines of economic activity.⁸

Research Universities and the Future of America

In May 2005, at the request of Congress, the National Academy of Sciences (NAS) began a study of "the most urgent challenges the United States faces in maintaining leadership in key areas of science and technology." NAS assembled a high-level panel of senior scientists and business and university leaders and produced a report, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*. The House Science, Space, and Technology Committee embraced a number of the recommendations in the report and included them in the 2007 *America COMPETES Act*. This Act was broadened and reauthorized in 2010. However, a number of realities raised in the report remain relevant today:

Although many people assume that the United States will always be a world leader in science and technology, this may not continue to be the case inasmuch as great minds and ideas exist throughout the world. We fear the abruptness with which a lead in science and technology can be lost—and the difficulty of recovering a lead once lost, if indeed it can be regained at all... This nation must prepare with great urgency to preserve its strategic and economic security. Because other nations have, and probably will continue to have, the competitive advantage of a low wage structure, the United States must compete by optimizing its knowledge-based resources, particularly in science and technology, and by sustaining the most fertile environment for new and revitalized industries and the well-paying jobs they bring. We have already seen that capital, factories, and laboratories readily move wherever they are thought to have the greatest promise of return to investors.⁹

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. As such, in 2009, Representatives Ralph Hall and Bart Gordon and Senators Lamar Alexander and Barbara Mikulski requested the National Academies work to produce another report, this time 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

⁷ http://www.csrees.usda.gov/qlinks/partners/state_partners.html#maps.

⁸ Examples include: California - <http://www.careerinfonet.org/oview6.asp?soccode=&stfips=06&from=State&id=11&nodeid=12>, Florida - <http://www.careerinfonet.org/oview6.asp?soccode=&stfips=12&from=State&id=11&nodeid=12>, and Minnesota - <http://www.careerinfonet.org/oview6.asp?soccode=&stfips=27&from=State&id=11&nodeid=12>.

⁹ National Academies Press, *Rising Above the Gathering Storm*, 2005, p.3-4.

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.¹⁰

The study was set up to identify the ten biggest challenges facing universities by focusing on:

Research and doctoral programs carried out by research universities and associated medical centers; Basic and applied research in research universities, along with collaborative research programs with other components of the research enterprise (e.g., national and federal laboratories, federally-funded research and development centers, and corporate research laboratories); Doctoral education and, to the extent necessary, the pathways to graduate education and research careers; and Fields of study and research that are critical to helping the United States compete, prosper, and achieve national goals for health, energy, the environment, and security, with a focus on science, engineering, and medicine.¹¹

In carrying out this charge, the study committee was, at a minimum, instructed to:

Describe and assess the historical development, current status, trends, and societal impact of research universities and the “ecosystem” of this set of institutions in the United States, placing these institutions in the context of the nation's research, innovation, and industrial enterprises and the nation's system of higher education; assess the organizational, financial, and intellectual capacity of public and private research universities in the United States, including reference to research universities internationally to the extent possible with existing data; and envision the mission and organization of these diverse institutions 10-20 years into the future and the steps needed to get there.¹²

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

¹⁰ National Academies Press, *Research Universities and the Future of America*, 2012, p.192.

¹¹ http://sites.nationalacademies.org/PGA/bhew/researchuniversities/PGA_069487.

¹² Ibid.

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.
- 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.¹³

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 government-university partnership established in the Morrill Act grew over time to include industry and philanthropy and has led to significant benefits for America's economy and quality of life. Lasers, radar, synthetic insulin, blood thinners, magnetic resonance imaging (MRI), computers, and rocket fuel are among the countless innovations in which university research has played an essential role; however, as identified above, universities are faced with significant challenges for the future.

The Report, acknowledging that balanced commitments from each partner as well as flexibility will be necessary to accomplish the necessary goals, lists ten specific actions that should be taken to secure the future for these universities. These recommendations are designed to accomplish the following three broad goals:

¹³ National Academies Press, *Research Universities and the Future of America*, 2012, p.4-5.

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, leveraging the abilities of all of its citizens and attracting the best students and scholars from around the world.¹⁴

The ten specific actions 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.¹⁵

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.¹⁶

¹⁴ National Academies Press, *Research Universities and the Future of America*, Summary, 2012, p.4.

¹⁵ National Academies Press, *Research Universities and the Future of America*, 2012, p.7.

¹⁶ National Academies Press, *Research Universities and the Future of America*, 2012, p.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.
 - 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.¹⁷

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.¹⁸

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.¹⁹

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

¹⁷ National Academies Press, *Research Universities and the Future of America*, 2012, p.11.

¹⁸ National Academies Press, *Research Universities and the Future of America*, 2012, p.12.

¹⁹ National Academies Press, *Research Universities and the Future of America*, 2012, p.13.

and cost-recovery negotiations should be developed and applied in a consistent fashion across all federal agencies and academic institutions.²⁰

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, 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.²¹
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.²²
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.²³
10. Ensure that the United States will continue to benefit strongly from the participation of international students and scholars in our research enterprise.

²⁰ National Academies Press, *Research Universities and the Future of America*, 2012, p.15.

²¹ National Academies Press, *Research Universities and the Future of America*, 2012, p.15.

²² National Academies Press, *Research Universities and the Future of America*, 2012, p.16.

²³ National Academies Press, *Research Universities and the Future of America*, 2012, p.18.

- 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.²⁴

²⁴ National Academies Press, *Research Universities and the Future of America*, 2012, p.19.