

Summary: Restoring the Research Foundation

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This 152-page report (September 14, 2014) by a blue ribbon committee of the [National Academy of Arts and Sciences](#) entitled [Restoring The Foundation: The Vital Role of Research](#) is a call to action for a more strategically planned and more robust national investment in science and engineering at the level of basic research. The report calls for a re-examination and strengthening of the research partnerships among universities, federal research agencies, and industry. The report is based on the observation that the long-term robustness of the U.S. economy post-WW2 is largely based on the federal government's investment in basic research, yet that investment has declined precipitously in recent years.

The report states: "The American research enterprise is at a critical inflection point. The decisions that policy-makers and leaders in science, engineering, and technology make over the next few years will determine the trajectory of American innovation for many years to come. Recent data show that the United States has slipped to tenth place among OECD (Organization for Economic Co-operation and Development) nations in overall research and development investment as a percentage of GDP and continues to fall short of the goal of at least 3 percent adopted by several U.S. presidents. As we lose our global competitive edge, many emerging nations are increasing their research investments in order to stimulate economic growth."

Reading through the entire 152-page report is a bit of a slog, particularly since many of its recommendations call for significant change in the funding, operations, partnerships, and collaborations of the national research enterprise. To make the case, a significant portion of the report presents an historical overview of the post-WW2 U.S. research enterprise, particularly noting what worked to make the U.S. a global leader in R&D investment and innovation and hence an economic juggernaut—that is, until the U.S. arrived at the "critical inflection point" mentioned above.

The report notes that economic prosperity is an outgrowth of a nation's investment in basic research, R&D, technology transfer, and innovation. Universities play a central role in the key factors that lead to a nation's economic success. For example, Apple's current annual R&D investment now totals some \$10 billion per year, according to CEO Tim Cook in a recent interview on PBS, **more than the entire NSF annual budget of roughly \$7.4 billion**. The report cites Apple's iPhone, however, observing "that it depends on seven or eight fundamental scientific and technological breakthroughs, such as GPS, multi-touch screens, LCD displays, lithium-ion batteries, and cellular networks. How many of those discoveries were made by Apple? None. **They all came from research supported by the federal government and conducted in universities and government laboratories.**"

"Innovation relies on breakthrough discoveries that are primarily the products of fundamental, curiosity-driven research," the report argues. Yet companies in the private sector are competing in a market environment driven by short-term results, thereby lessening support from the private sector for funding long-term basic research. "It is therefore worrisome," the report notes in this context, "that federal support for basic research has dropped 13 percent

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below the level measured ten years ago as a percentage of GDP.” Moreover, the report continues: “Compounding this problem, few mechanisms currently exist at the federal level to enable policy-makers and the research community **to set long-term priorities in science and engineering research**, bring about necessary reforms of policies that impede progress, or facilitate stronger cooperation among the many funders and performers of research (including universities, corporations, federal and state government, and philanthropic and nongovernmental organizations).”

“In response to these concerns,” the report notes, “the American Academy of Arts & Sciences assembled a committee of recognized leaders from all sectors of science, engineering, and technology, including former CEOs, university presidents and deans, and government officials, to recommend policy actions to help ensure the long-term sustainability of the U.S. science and engineering research enterprise.”

“The committee based its work on three premises: first, that a strong U.S. economy is vital to the welfare and prosperity of the American people; second, that competitiveness in today’s accelerating high-tech, knowledge-based economy requires innovation and the rapid infusion of new knowledge and technologies; and third, that while applied research and applied development are both undeniably important, path breaking discoveries are most likely to come from basic research sustained over long periods of time, **which is mainly funded by the federal government and carried out in the nation’s universities and national laboratories.**”

The committee’s recommendations focus on three overarching objectives: “First, to secure America’s leadership in science and engineering research—especially basic research—by providing sustainable federal investments. Second, to ensure that the American people receive the maximum benefit from federal investments in research. Third, to regain America’s standing as an innovation leader by establishing a **more robust national government-university-industry research partnership.**”

Specific to the role of universities in the nation’s future research enterprise, the report made the following recommendations:

- Experiment with new intellectual property policies and practices that favor the creation of stronger research partnerships with companies over the maximization of revenues;
- Adopt innovative models for technology transfer that can better support universities’ mission to produce and export new knowledge and educate students;
- Enhance early exposure of graduate students (including doctoral students) to a broad range of nonresearch career options in business, industry, government, and other sectors, and ensure that they have the necessary skills to be successful;
- Expand professional master’s degree programs in science and engineering, with particular attention to students interested in nonresearch career options; and
- Increase permeability across sectors through research collaborations and faculty research leaves.

Moreover, the report recommends that “corporate boards and chief executives give higher priority to funding research in universities and work with university presidents and boards to **develop new forms of partnership**: collaborations that can justify increased company

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investments in university research, especially basic research projects that provide new concepts for translation to application and are best suited for training the next generation of scientists and engineers.”

“Universities depend on federal funding for most of the research carried out by their faculty and students,” the report notes, “thus continuing the federal government-university partnership that was established during World War II and expanded into the civilian realm thereafter. But in more recent decades, a number of policy issues have emerged that limit the effectiveness of the partnership. These issues, described in studies such as the National Academies National Research Council report [Research Universities and the Future of America](#), **include policies and practices that are viewed by university researchers and administrators as burdensome, inefficient, and costly**, and that vary without apparent justification from agency to agency. Universities also argue that the administrative overhead allowed by the OMB does not cover the cost of managing federal research grants and dealing with an ever-increasing compliance burden.”

“At the same time,” the report continues, “the nation’s universities, especially its public universities, **are facing a perfect storm of steadily decreasing state support combined with increasing requirements and expectations; pushback from parents on tuition increases; flat or decreasing federal research funding; and overhead rates that fall short of paying the full cost of federally funded research**. Increased regulations and requirements that add to the administrative workload of university staff and administrators, and often evolve into unfunded mandates, have also made it increasingly difficult for universities to work with the federal government. **On top of this, faculty are required to spend increasing amounts of time writing proposals for dwindling federal funds**, submitting progress reports, reviewing proposals of colleagues that have little chance of being funded, attending study review sections, and focusing on additional administrative tasks that take time away from both research and teaching. Though some have argued that the nation has too many researchers, it would be far more accurate to state that certain fields have more researchers than the nation has elected to support.”

“For universities, early rationales for taking on the immense task of building up internal infrastructure to support technology transfer were heavily based on the perceived potential to generate revenue for the university. In reality, this growth has presently only been experienced by a few universities, including MIT, Stanford University, University of Wisconsin, and Columbia University. In 2012, the top eight universities collected half of the total licensing income of the entire university system; the top ten took 70 percent of the total. High returns tend to be the result of one blockbuster patent. **Consequently, only 16 percent of university TTOs (Technology Transfer Offices) are currently self-sustaining**,” the report notes.

In conclusion, the report states that “Today, the United States **needs a new kind of research partnership**: a robust national effort involving government (federal and state), universities (public and private), and industry, as well as philanthropy and private foundations, in which each sector accepts and fulfills its responsibilities in support of the nation’s leadership in science and engineering research, especially basic research. Other countries recognize this need and are taking active steps to put such national government – university - industry research partnerships in place. Yet in the United States, the accumulation of decades of policies

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and practices in each sector, as well as shifting priorities of the states and unpredictable federal research funding levels, are allowing our nation to steadily fall behind. The innovation deficit looms large.”

Finally, the report recommends that “the President or Vice President convene a **‘Summit on the Future of America’s Research Enterprise’** with participation from all government, university, and industry sectors and the philanthropic community. The Summit should have the bold action agenda to: assess the current state of science and engineering research in the United States in a global twenty-first century context; review successful approaches to bringing each sector into closer collaboration; determine where further actions are needed to encourage collaboration; and form a new compact to ensure that the United States remains a leader in science, engineering, technology, and medicine in the coming decades.”

While this article represents a 3.5-page summary of the 152-page report, there is much in the report that **provides insight into where university research offices can go in the future to align with the need to reinvigorate our national basic research enterprise**, particularly as that relates to making the research development process less burdensome to faculty and in configuring strategic research collaborations and partnerships among universities, industry, and federal agencies. **It is clear here, too, that the research funding environment in the future, as envisioned in the report, will be dominated by large partnership grants.**

Since the report was published only a month ago, it will take time for its analysis and recommendations to percolate through the national research enterprise, but historically on such key reports this has always been the trajectory. Consequently, **the report gives insight into what the national research enterprise will look like in the future** if its call for action at a “national inflection point” is heeded by universities, funding agencies, and industry.