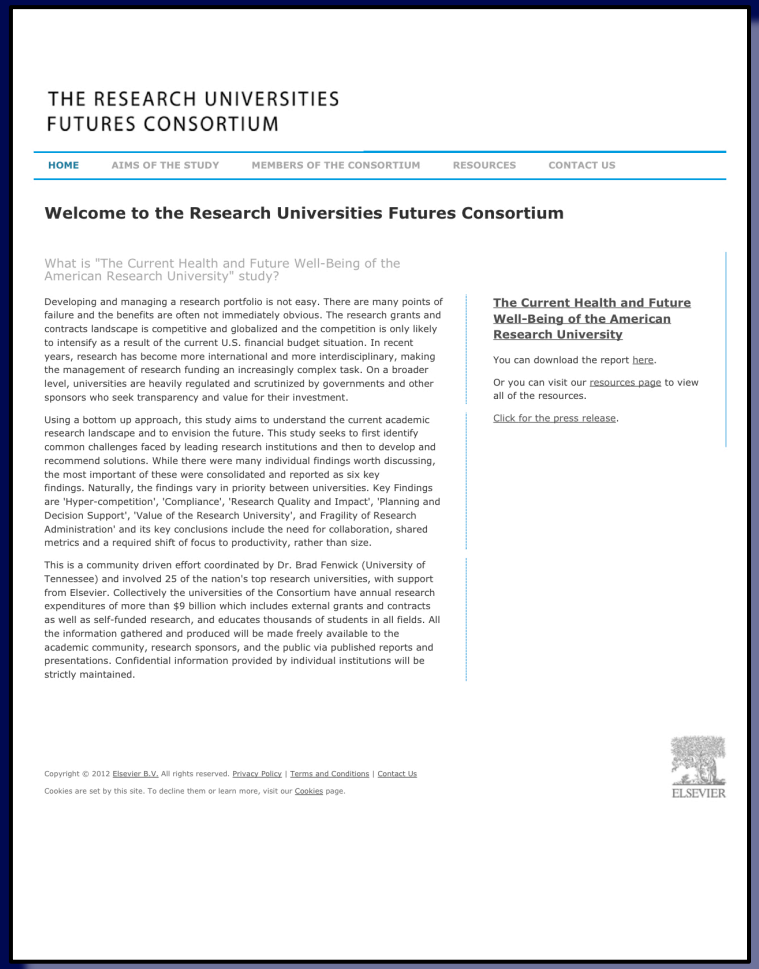
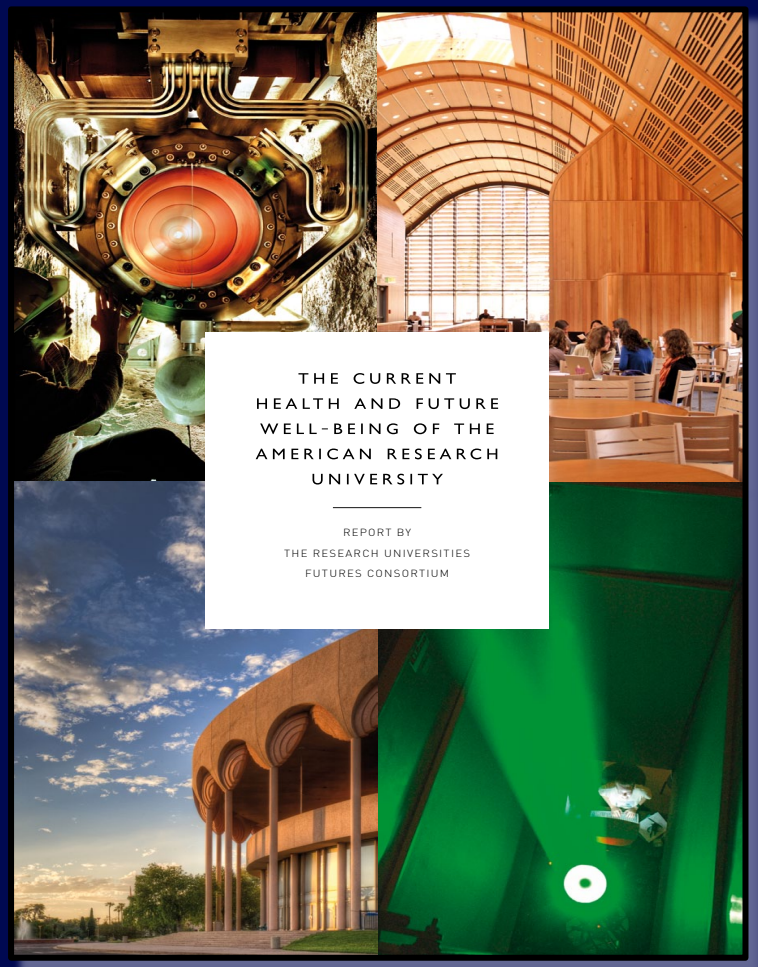
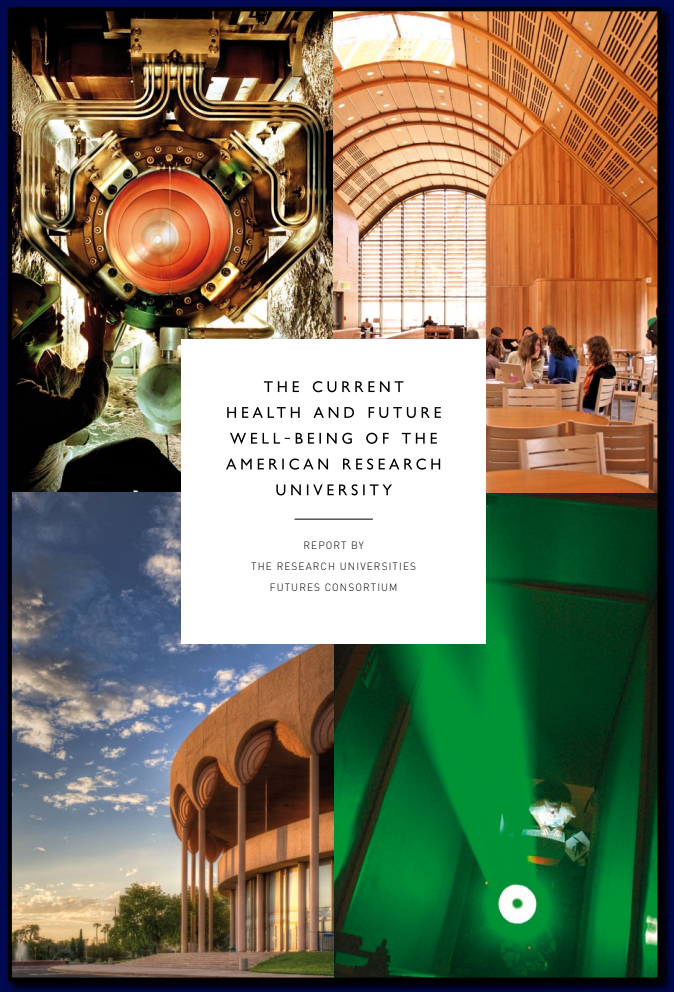
Current Health and Future Wellbeing of the American Research University

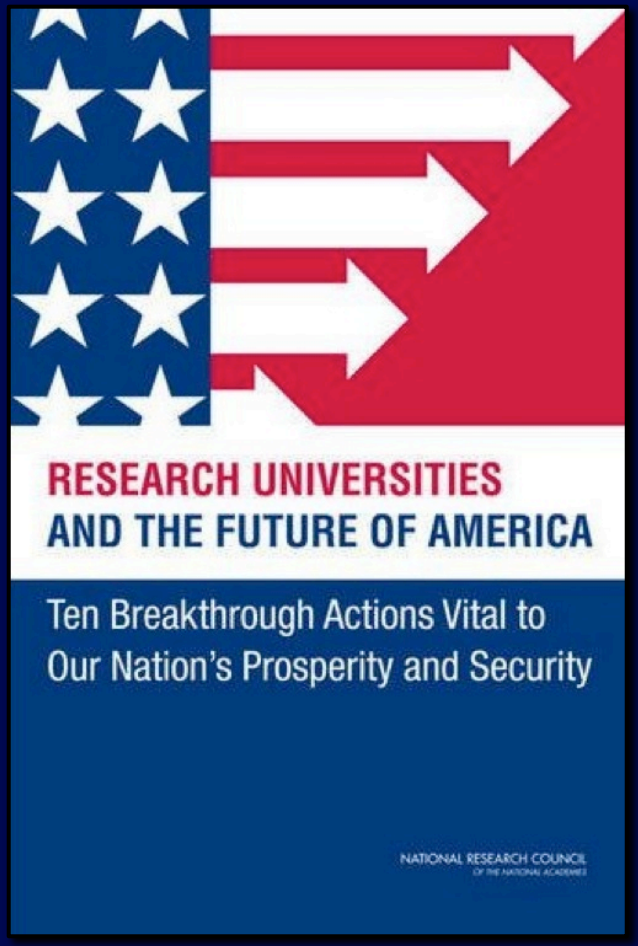
Research University Futures Consortium





www.ResearchUniversitiesFuture.org

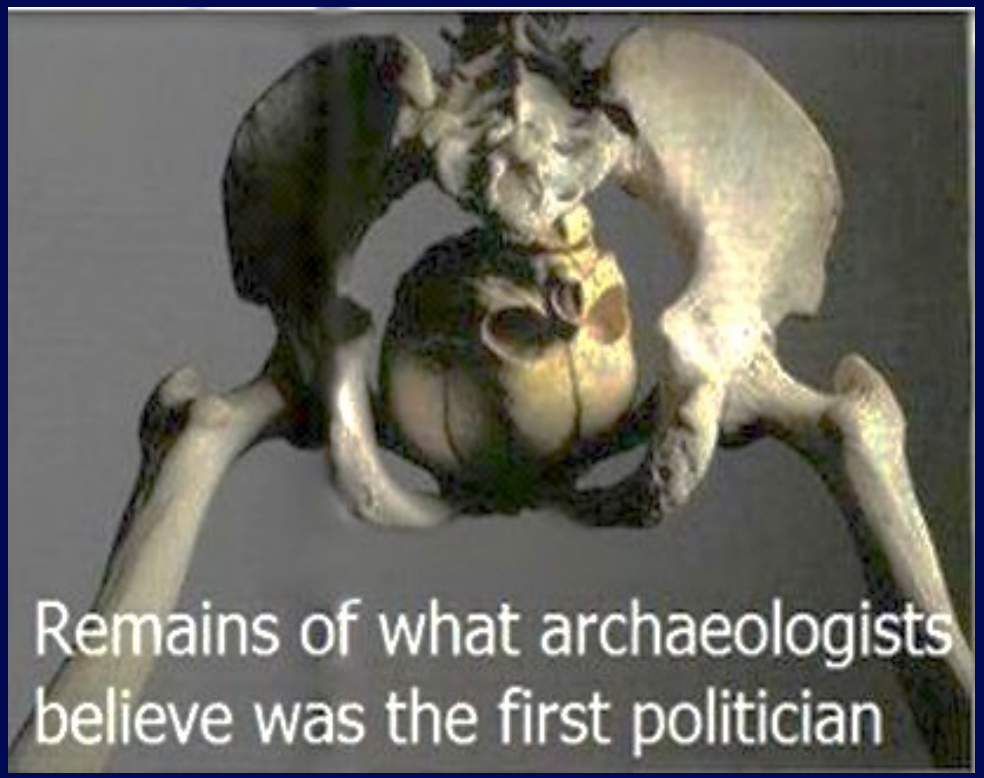

THE CURRENT
HEALTH AND FUTURE
WELL-BEING OF THE
AMERICAN RESEARCH
UNIVERSITY
REPORT BY
THE RESEARCH UNIVERSITIES
FUTURES CONSORTIUM


RESEARCH UNIVERSITIES
AND THE FUTURE OF AMERICA
Ten Breakthrough Actions Vital to
Our Nation's Prosperity and Security
NATIONAL RESEARCH COUNCIL

Current Health and the Future Well-Being of the American Research University

(Research University Futures Consortium)

- Background, Context, Motivation
- Project Overview and Methods
- First Phase: Key Findings
- Next Steps – Second Phase


Remains of what archaeologists
believe was the first politician


What i'm about to tell you is gonna change your life forever. Are you really sure you want to know it?

"Academic Research is going through a lasting transformational change of historic scope and scale."



The American Research University

- ✓ Current and Future Environment
- ✓ Changes and Challenges
- ✓ Solution-Based Opportunities
- ✓ Tactics and Strategies

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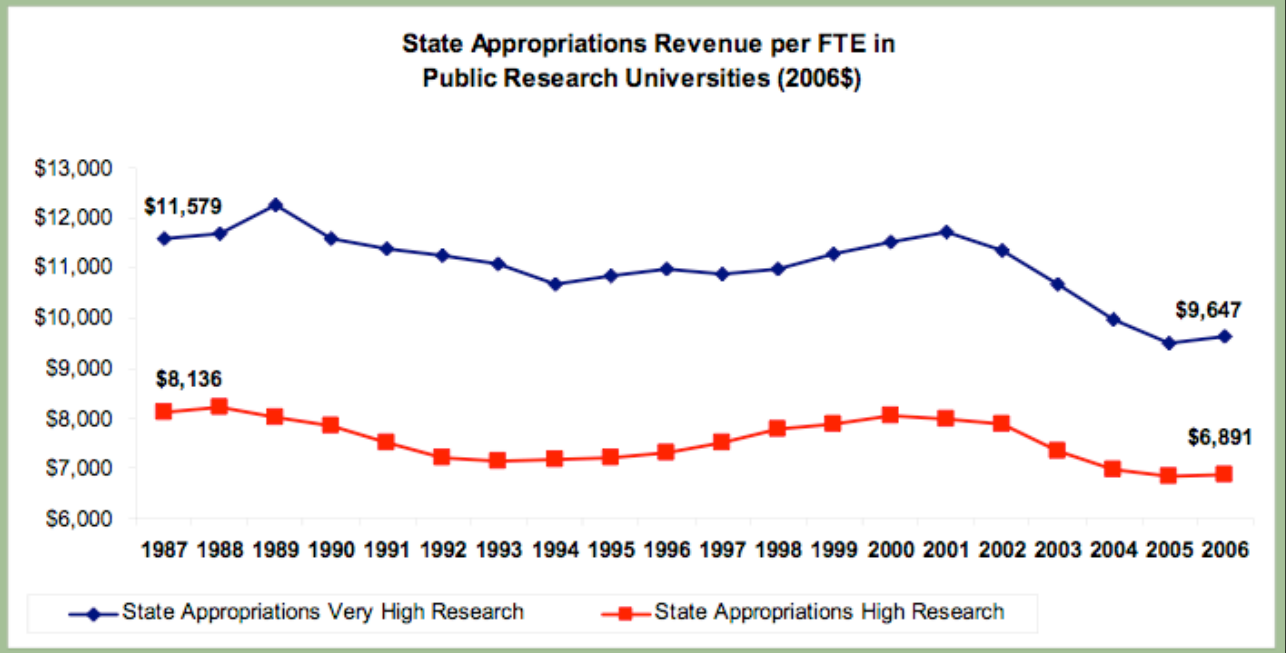
Research University Futures Consortium




Real Per Student State Appropriations Keep Dropping



Association of Public and Land-grant Universities

7

2001-2011 State/Local funding per student declined by 24%
Fed, State, Local spending per student at 25-yr low (inflation adjusted)
$1-Trillion in outstanding student loans (94% students borrow)

Sept 2, 2010

The Economist

Schumpeter
"*Declining by degree*"

"This luxury model is unlikely to survive what is turning into a prolonged economic downturn. Parents are much less willing to take on debt than they were..."

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Will America's universities go the way of its car companies?

"State of the Industry"

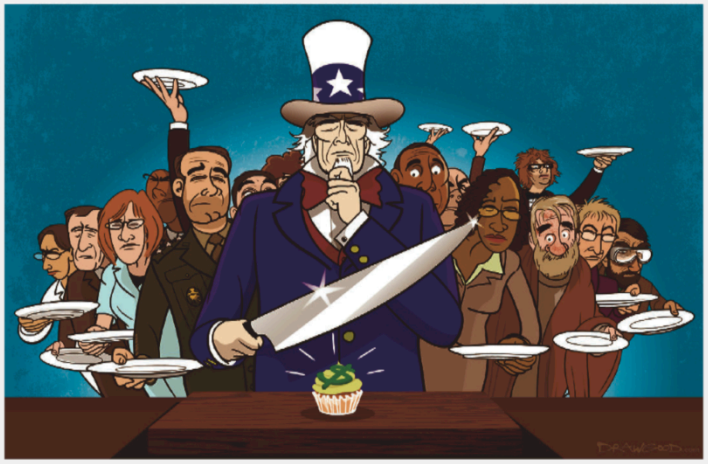
Kimberly Tuby, VP Moody's Investor Services

"…revised outlook to stable from negative only for the diversified market-leading colleges and universities in the public and private sectors. Market leaders have global reputations, multiple revenue-generating sources, strong student demand that justifies higher tuition, *strong competitive and diversified externally funded research*, and philanthropic support."

"The large majority have negative ratings and typically have a more regional student draw, weaker pricing power, *limited ability to compete for external research* and philanthropic/foundation funding."

What science is really worth

Spending on science is one of the best ways to generate jobs and economic growth, say research advocates. But as **Colin Macilwain** reports, the evidence behind such claims is patchy.



ILLUSTRATIONS BY PETE ELIS @SHARKGOOD.COM

Crunch time for US science

Researchers must make a stronger case for funding in the face of a perfect storm of budget cuts and eroding political support, says **Jay Gulledge**.

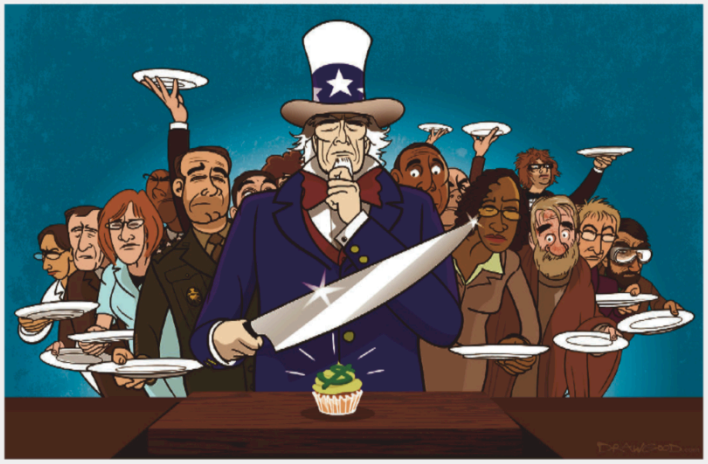
The current US debt crisis sets the stage for a potential tipping point in federal science spending. The ideology that government-sponsored science is crucial to the well-being of society has eroded along with the cold-war security agenda, which embraced and fortified science for decades. Meanwhile, science has been pulled repeatedly into political clashes on cultural issues. Against this backdrop, the global economic crisis portends a decade-long reduction in federal budgets. To avoid a permanent retraction of government support for research, the science community must be more strategic and aggressive in conveying the value of its work to society and in gaining robust support from politicians.

US federal science spending has long been rooted in the national security agenda. The National Science Foundation (NSF) was established shortly after the Second World War "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense". NASA was established less than 10 months after the Soviets launched Sputnik 1 in 1957, in a frenzied response to the Soviets' early lead in developing ballistic missiles. Through the decades of the cold war, support for science straddled party lines.

But, after the fall of the Berlin wall, the United States stood as the sole great power and shifted its strategic emphasis from establishing scientific superiority to cultivating democratic movements in the developing world. The 11 September 2001 terrorist attacks reinforced this shift: security analysts believed that Al Qaeda and the Taliban, the main US enemies, would be defeated by winning hearts and minds, not by building a better mouse trap.

The erosion of the cold-war security doctrine therefore removed the bipartisan backstop to science funding. The quest for economic competitiveness might reasonably have replaced it, but has not done so. For example, the America COMPETES Act, passed in 2007 and reauthorized in 2010 by Democrat-run Congresses, planned to expand the NSF's budget from US$6.6 billion in 2008 to $8.1 billion in 2010, but appropriators froze NSF budgets in response to the economic crisis. The current Republican-led House of Representatives is unlikely to support the increase of science budgets. Representative Ralph Hall (Republican, Texas), the recently installed chair of the House Committee on Science, Space and Technology, has said that the ▸

COMMENT



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The Competitiveness and Innovative Capacity of the United States

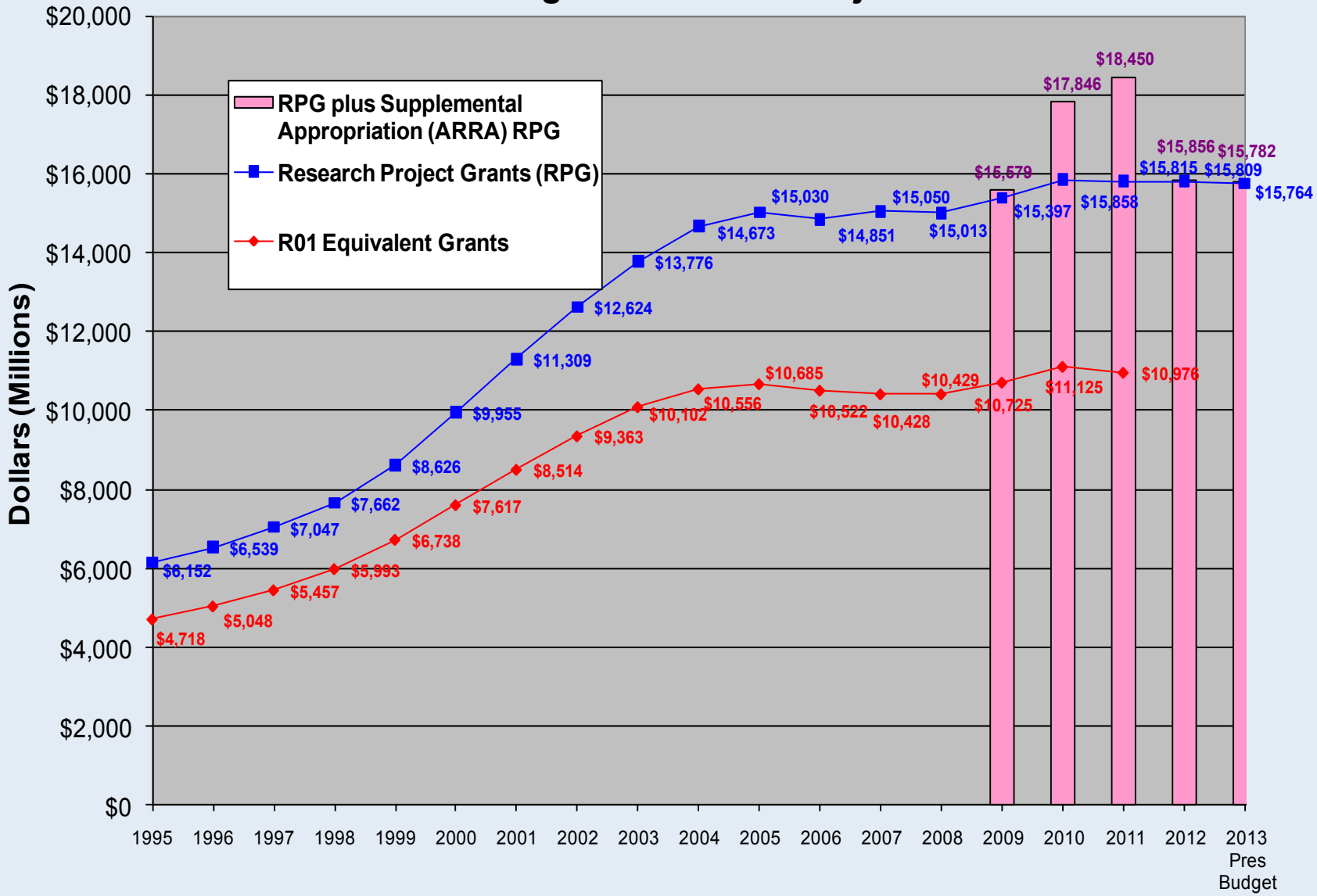
Prepared by the
U. S. DEPARTMENT OF COMMERCE

In consultation with the
NATIONAL ECONOMIC COUNCIL

JANUARY 2012

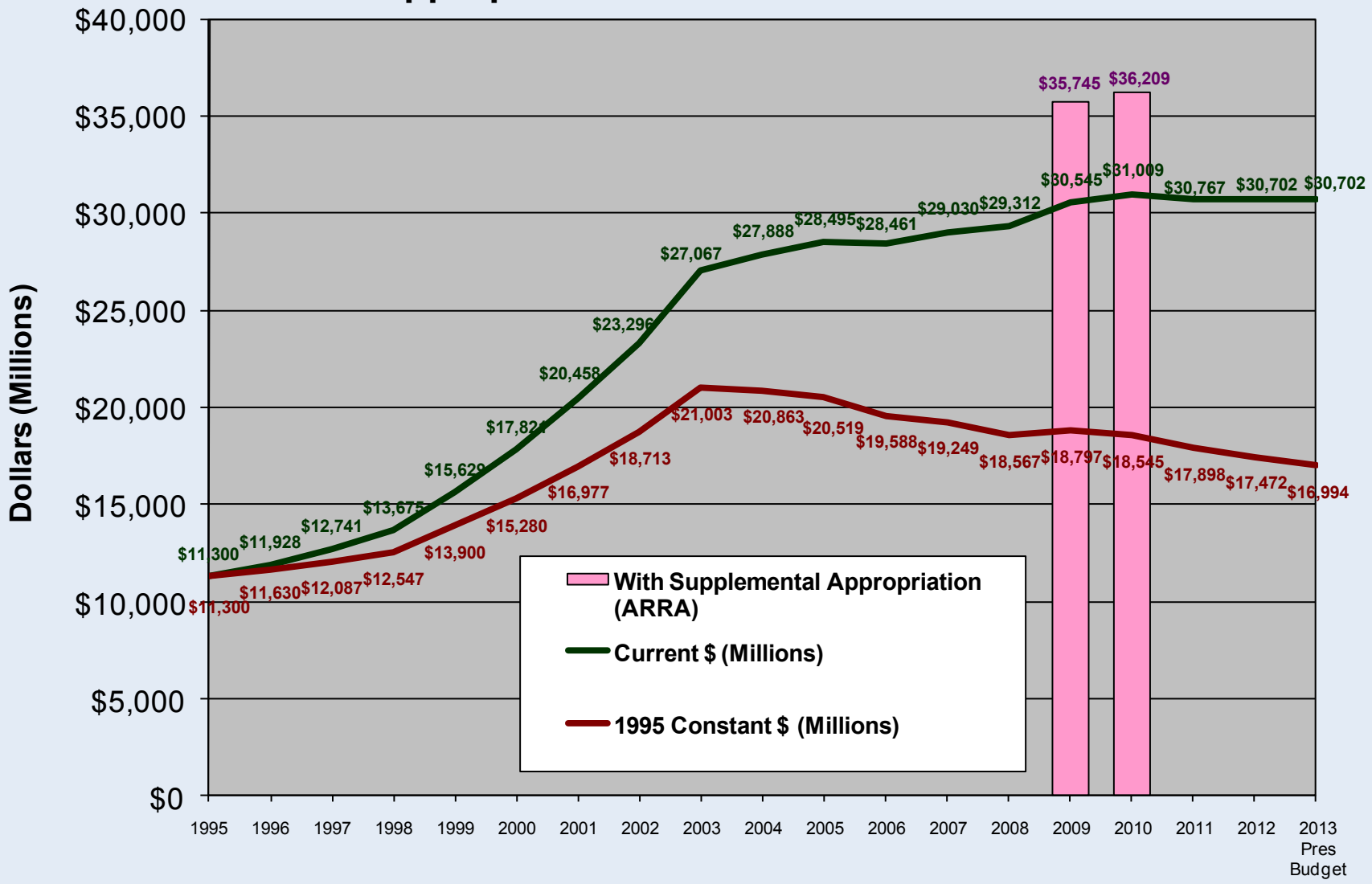

KANSAS STATE
COX
pepsi
verizon

Funding for Research Project Grants



FASEB
Federation of American Societies for Experimental Biology

NIH Appropriation in Current and Constant Dollars



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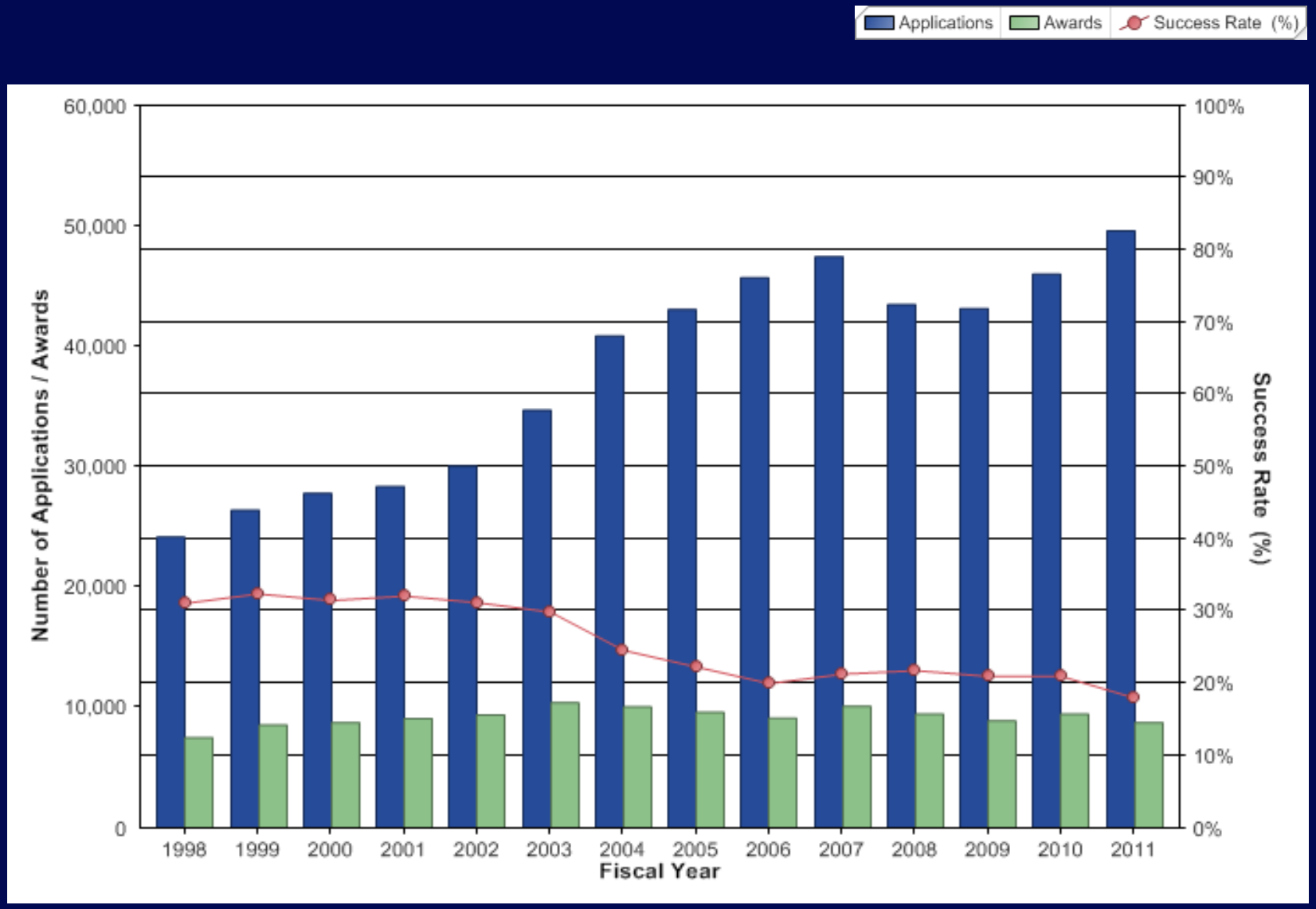
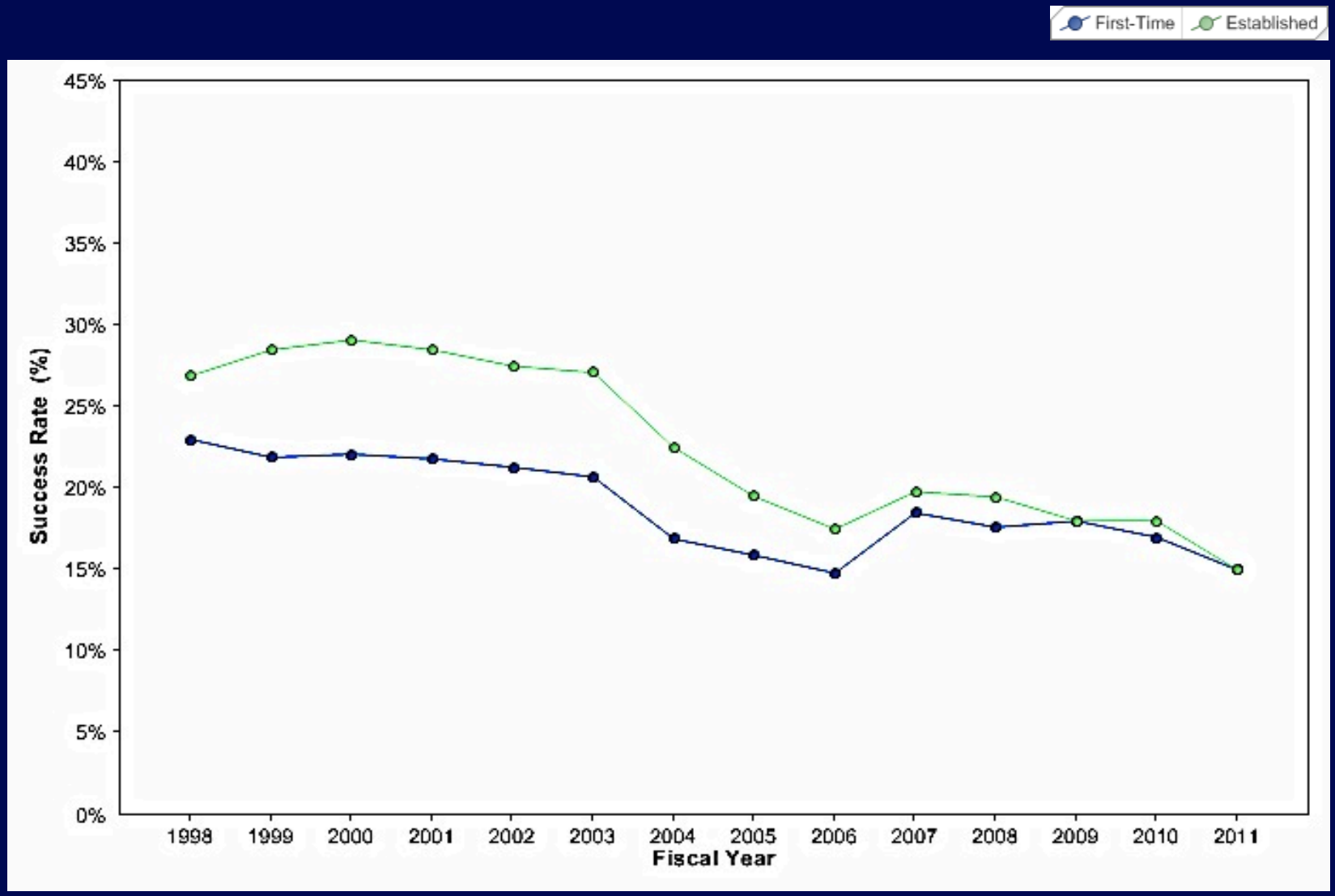
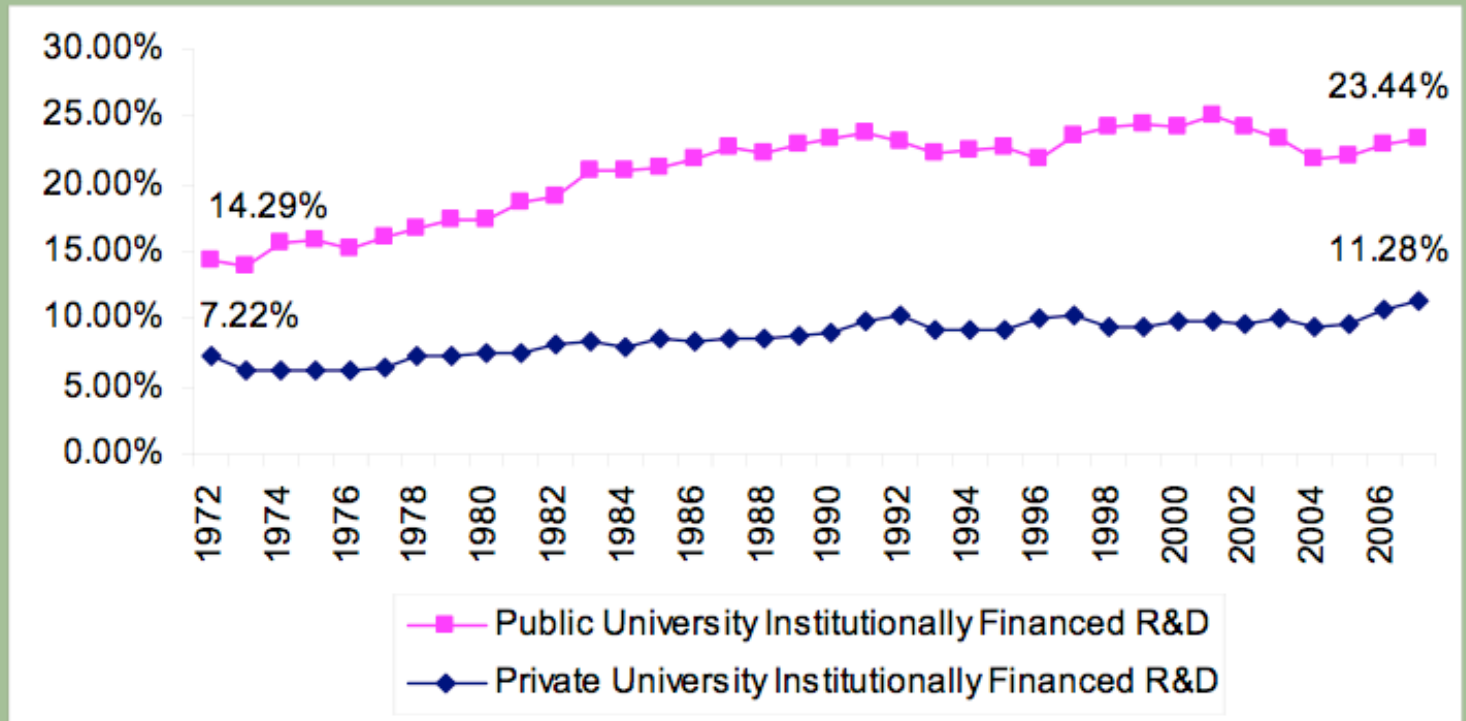
Research Project Grants
Competing applications, awards, and success rates



R01-Equivalent grants, New (Type 1)
Success rates, by career stage of investigator

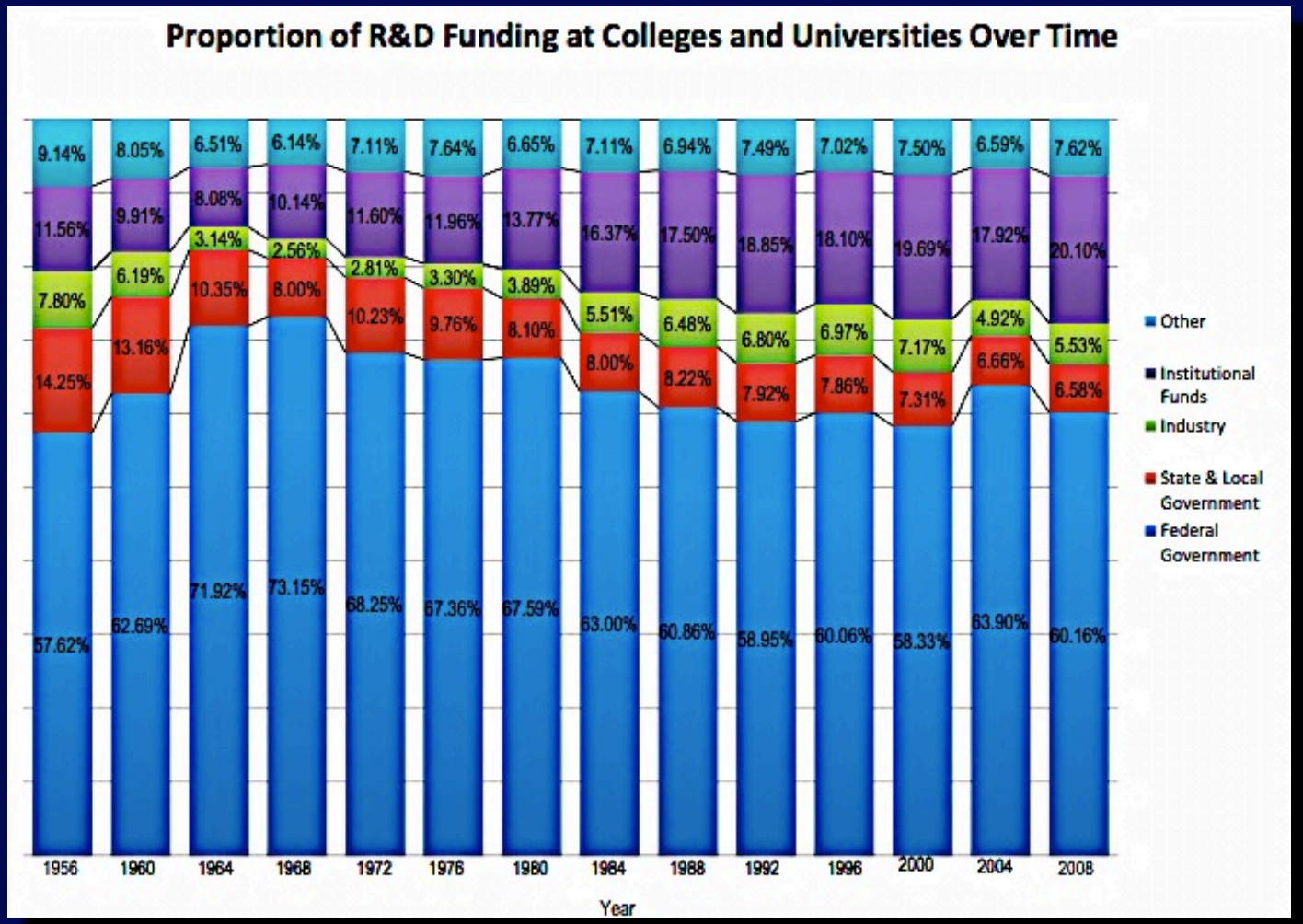


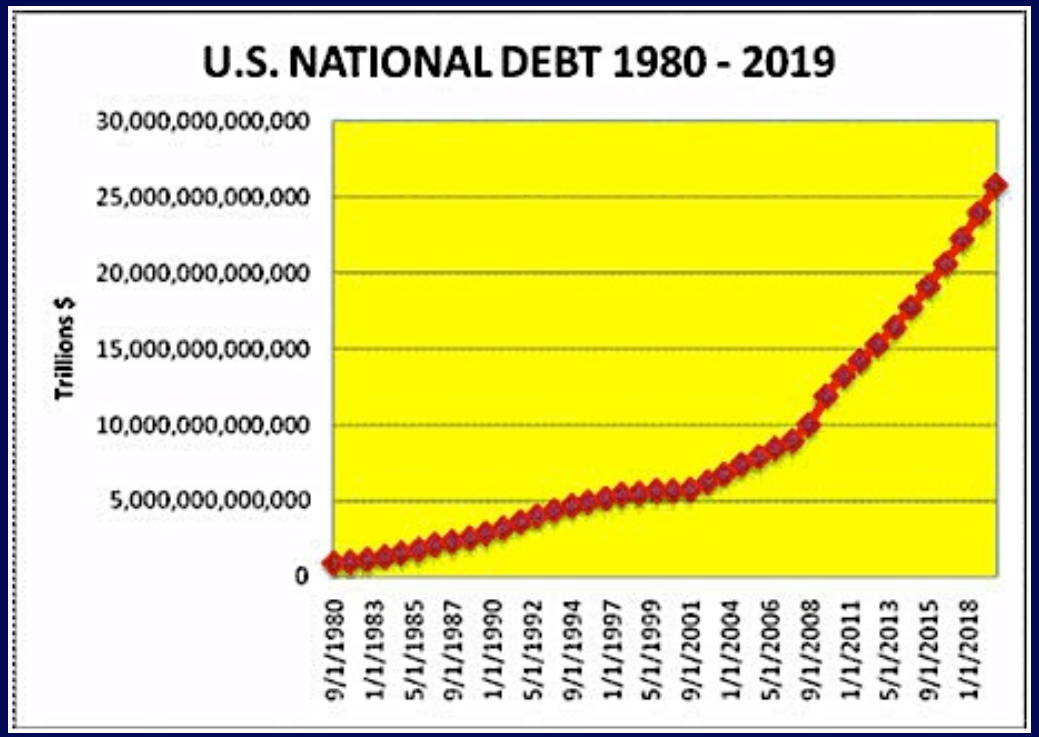
Percent of Academic R&D Financed with Institutional Funds



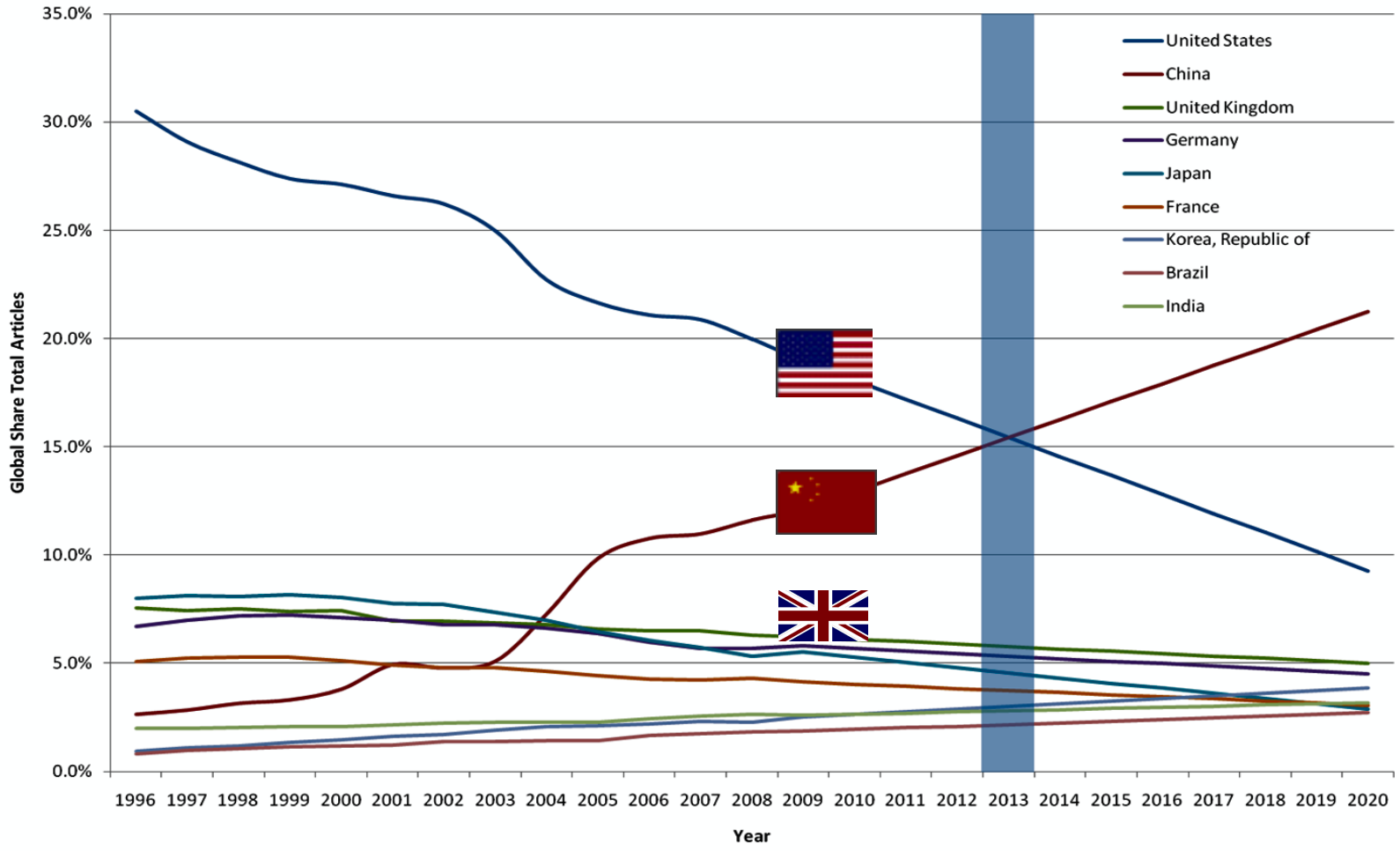
Association of Public and Land-grant Universities

“Research Arms Race”




U.S. NATIONAL DEBT 1980 - 2019
Trillions $
30,000,000,000,000
25,000,000,000,000
20,000,000,000,000
15,000,000,000,000
10,000,000,000,000
5,000,000,000,000
0
9/1/1980
1/1/1983
5/1/1985
9/1/1987
1/1/1990
5/1/1992
9/1/1994
1/1/1997
5/1/1999
9/1/2001
1/1/2004
5/1/2006
9/1/2008
1/1/2011
5/1/2013
9/1/2015
1/1/2018

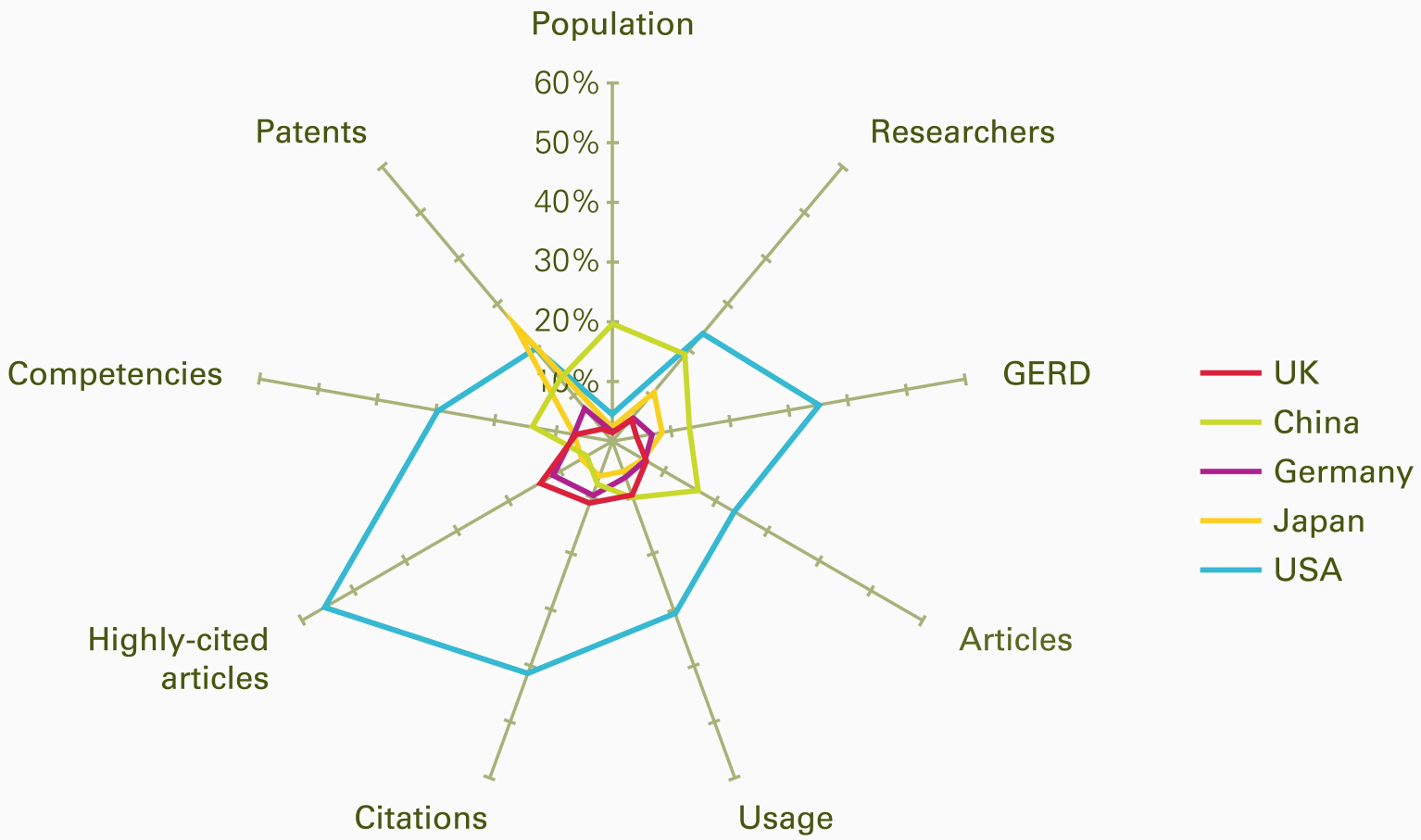
Share of published journal articles, 1996-2020 (projected)



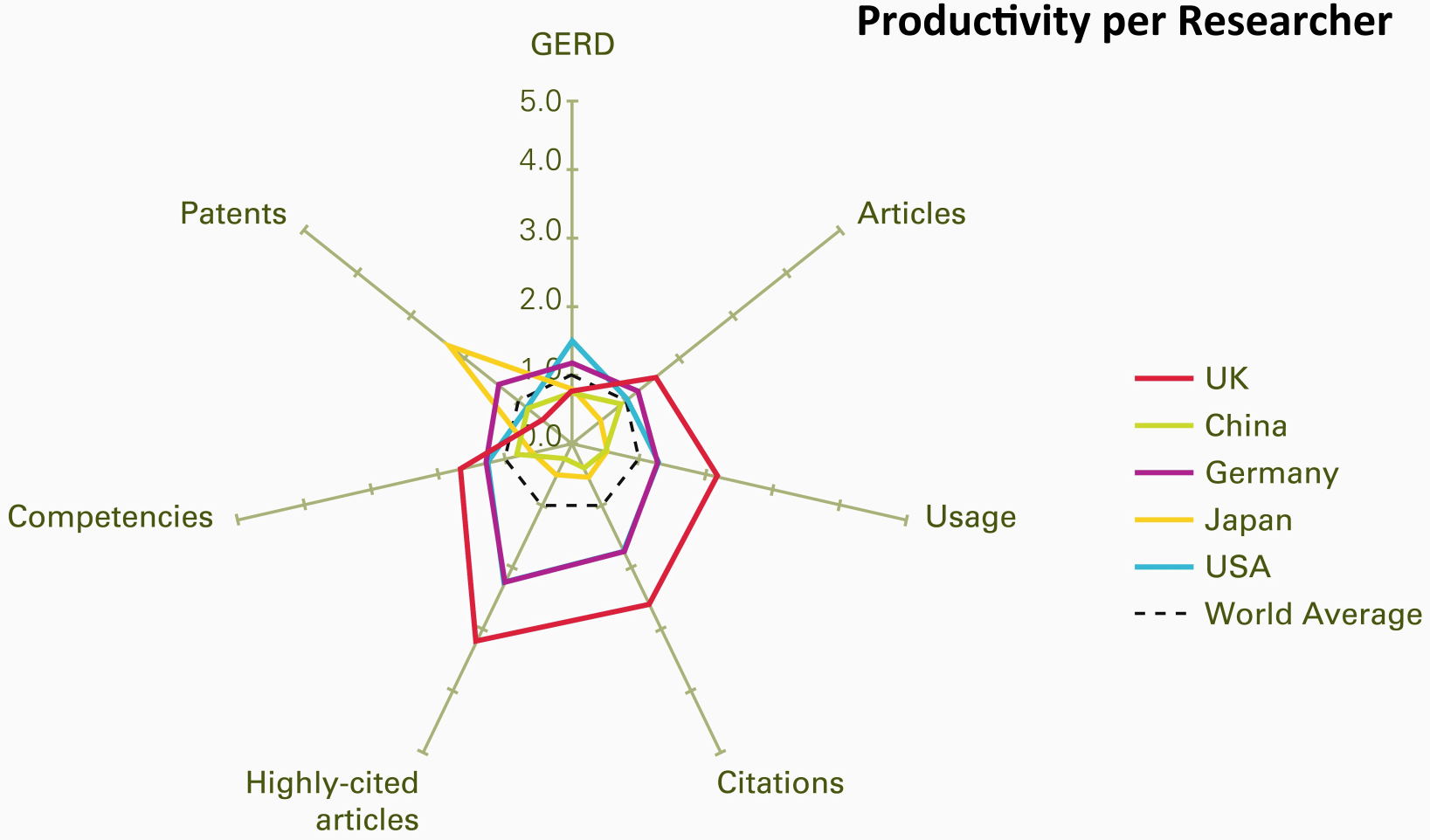
From Outputs to Productivity

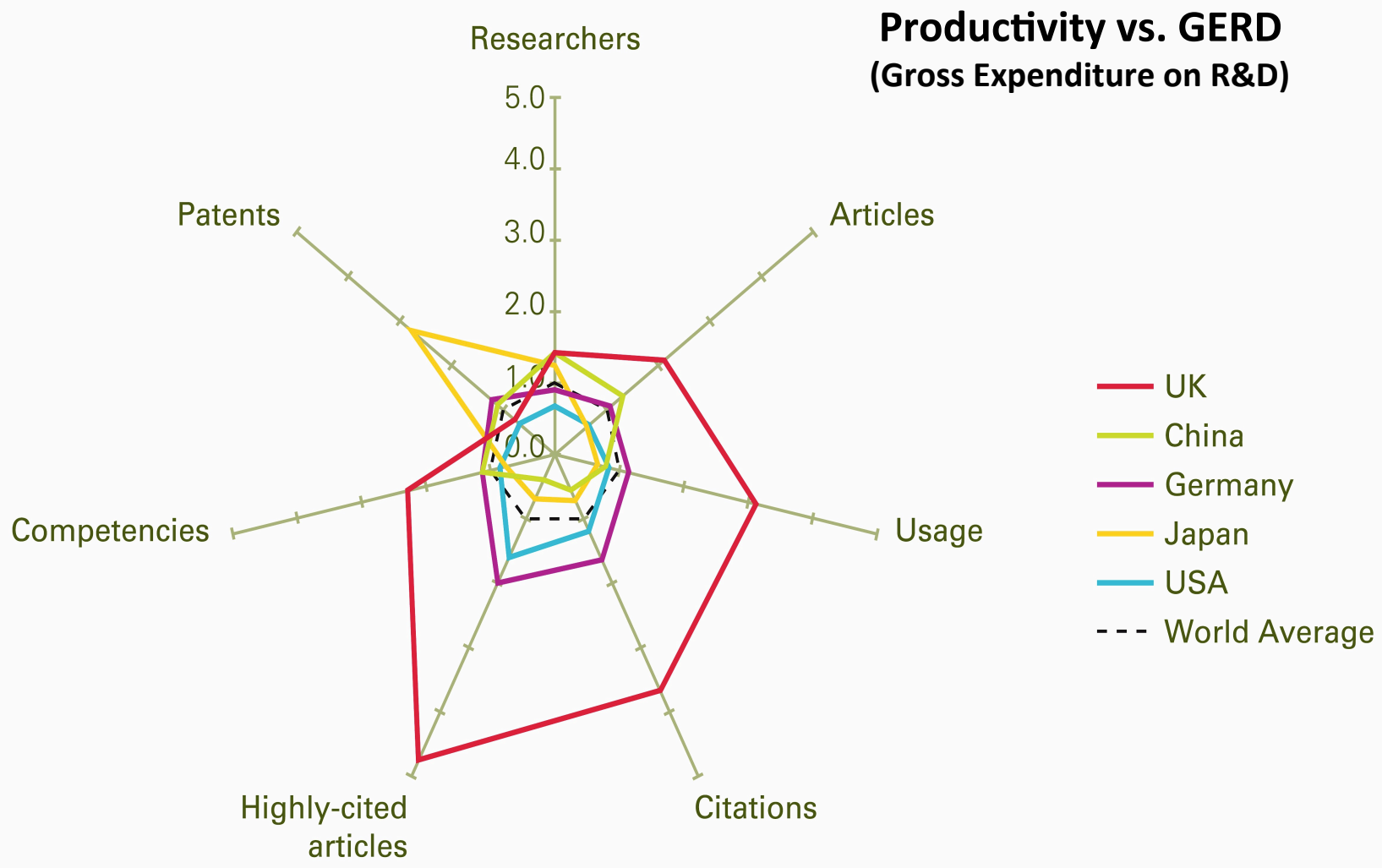
Charles Holliday, former chief executive of DuPont Chemical and President of the Board of City Bank, chairs the National Research Council – Committee on Research (a panel of 22 university and corporate leaders).

When pushed to support continued, if not additional Federal and State funding, his response, *"**I want ways of measuring the productivity of research universities**."*


Population
60%
50%
40%
30%
20%
Researchers
GERD
Articles
Usage
Citations
Highly-cited articles
Competencies
Patents
UK
China
Germany
Japan
USA

Productivity per Researcher




Productivity vs. GERD
(Gross Expenditure on R&D)
Researchers
5.0
4.0
3.0
2.0
1.0
0.0
Articles
Usage
Citations
Highly-cited articles
Competencies
Patents
UK
China
Germany
Japan
USA
World Average

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The issue is not whether universities are of value, but are they operating at *"maximum productivity"*?

"Control your own destiny or someone else will." *Jack Welch*

The Challenge/Problem is Painfully Clear

The "Standard Solution" has Worked Before…

Greater Challenge – Bigger Problem

Same Solution – Once Again


MICHAEL LONG
TRUCK & CRANE HIRE
REDMOND BROS


MICHAEL LONG
TRUCK & CRANE HIRE

“A smooth sea never made for a skillful sailor”

Research Program Development and Administration

"An Increasingly Complex Business"

- Hypercompetitive, Interdisciplinary, Globalized
- Increasing Institutional Expectations
- Multiple Points of Failure (known and unknown)
- Regulated and Scrutinized (compliance)
- Increasing Reporting (ARRA)
- Underappreciated Management / Leadership Challenges
- Growing Levels of Frustration
- No Easy Solutions

http://www.researchdatatools.com

UK Study: Exploratory
21 Universities (54% of funding)
"Semi-structured" Confidential Interviews
Workshops

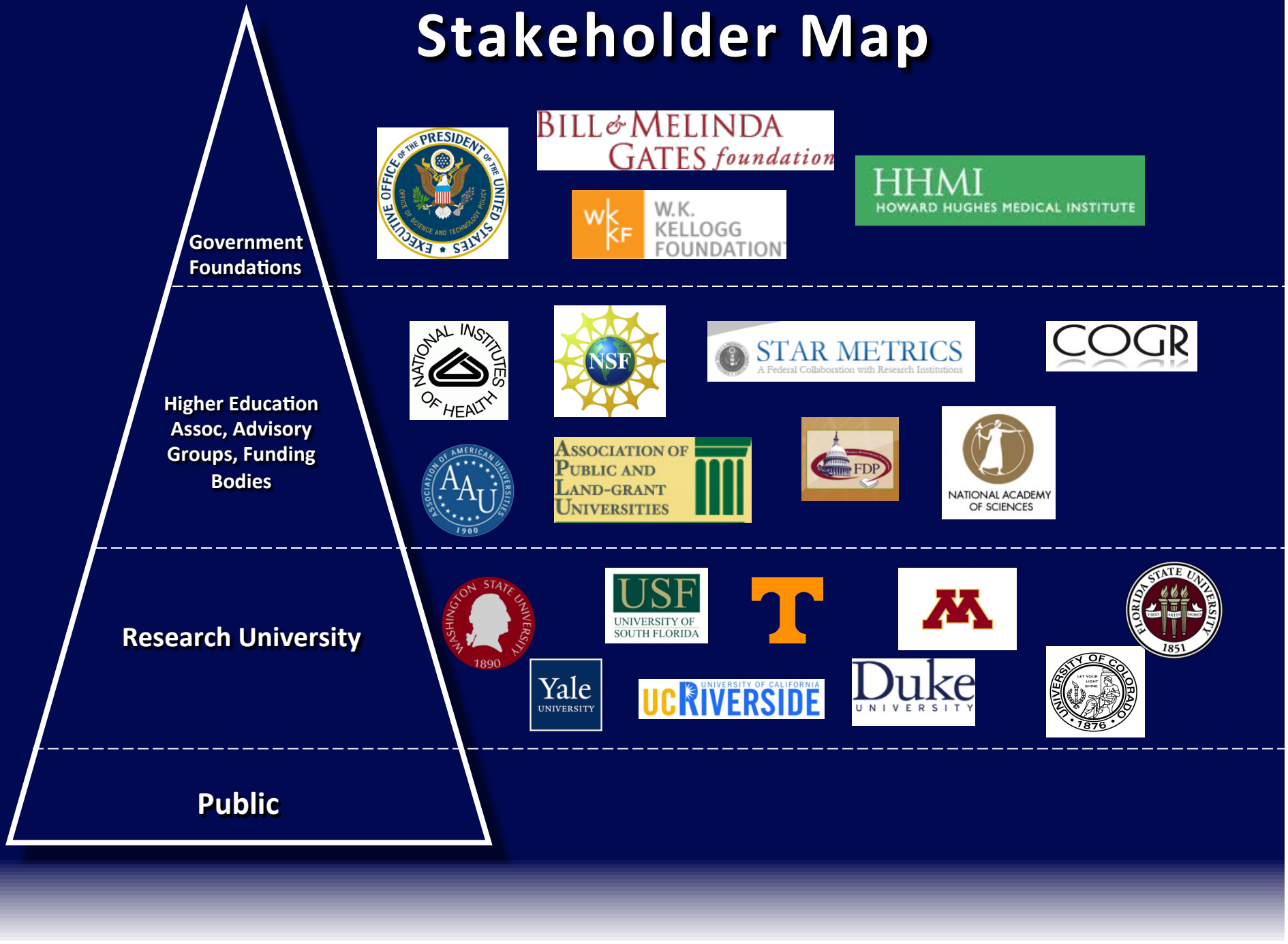
Findings:

- ✓ Identified common set of information needs.
- ✓ Identified key performance indicators.
- ✓ Need for high level frameworks regarding data collection and sharing.
- ✓ Lack of uniformity in data collection and reporting (collecting and measuring because we can, not because it is important).
- ✓ No IT strategy or one that is owned and guarded by the IT department.
- ✓ Historical and reactive data rather than information that anticipates change and informs decisions.

Value: Exceptionally well received by the academic community, funders, and suppliers.

Follow-up: Second "Solution-Driven" Project

Stakeholder Map



1). American higher education has a history of incremental evolution; demographic, economic, social and political influences are the basis of the current and lasting revolution…"in every revolution there are winners and losers."

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2). Acceleration of the differentiation, segmentation, and consolidation as well as greater competition driven innovation is redefining the "Great American University."

3). Most universities are not well prepared to successfully undertake this transition by themselves. They understand the need for self-generated revenue, and they are interest in increasing efficiency and effectiveness (productivity). While game changing ideas are emerging but only a few universities have ability to execute (particularly related to research).

4). Increasing the *efficiency and effectiveness* of the primary "unit of production" (faculty) is the fundamental differentiator between universities that will thrive and those that will be marginalized or even fail in their research mission.

"Futures" Project Goals

- Initiate and contribute to a discussion on a national academic research & graduate education strategy.
- Phase I: Assess the current and future challenges and barriers to sustain and enhance university based research and training.
- Phase II: Develop solutions and pathways for their implementation.
- Find a Sponsor.

Phase I: Purpose and Objectives

- ✓ Not a system, solution-driven, or problem specific study (Exploratory).




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- ✓ A broader understanding and wider appreciation of the challenges related to research program development and administration.
- ✓ A bottom-ups understanding of current research management systems and the leadership landscape and challenges.
- ✓ Focus on how management and performance data is being gathered and used to inform strategic decisions and evaluate success (rankings) .




Sponsor

- **The world's leading publisher of science and health information, serving more than 30 million scientists, students and health and information professionals worldwide.**
- **Global community of 7,000 journal editors; 70,000 editorial board members; 300,000 reviewers and 600,000 authors.**
- **Publishes around 2,000 journals and close to 20,000 books and major reference works.**

Why would they do this?

Study Design and Implementation

- ✓ University visits (25, public and private).




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- ✓ Next steps?




Research University Futures Consortium

Private:

- Emory
- Vanderbilt
- Yale
- Rochester
- Carnegie Mellon
- Wash U St. Louis
- Duke

Large Public:

- Georgia Tech
- Ohio State
- Penn State
- Maryland
- Minnesota
- Texas
- UCOP

Public:

- Arizona State
- Colorado State
- Florida State
- UC Riverside
- Kansas
- Kentucky
- South Florida
- Wash. State
- Utah
- Georgia
- Tennessee

25 Universities (Research > $9B+)

“Selected” Emerging Findings - Themes

“Selected” Emerging Findings - Themes

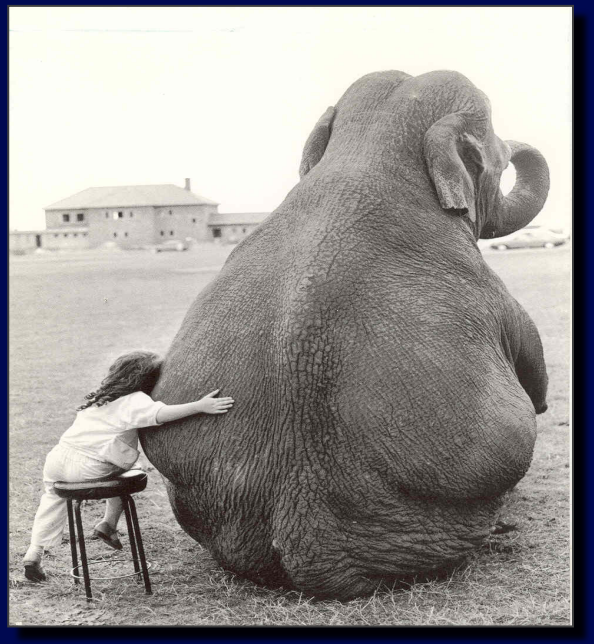
Difference in the Levels
of Concern and Urgency

“Selected” Emerging Findings - Themes

Growing Administrative / Management Stress

“Selected” Emerging Findings - Themes

Growing Administrative / Management Stress



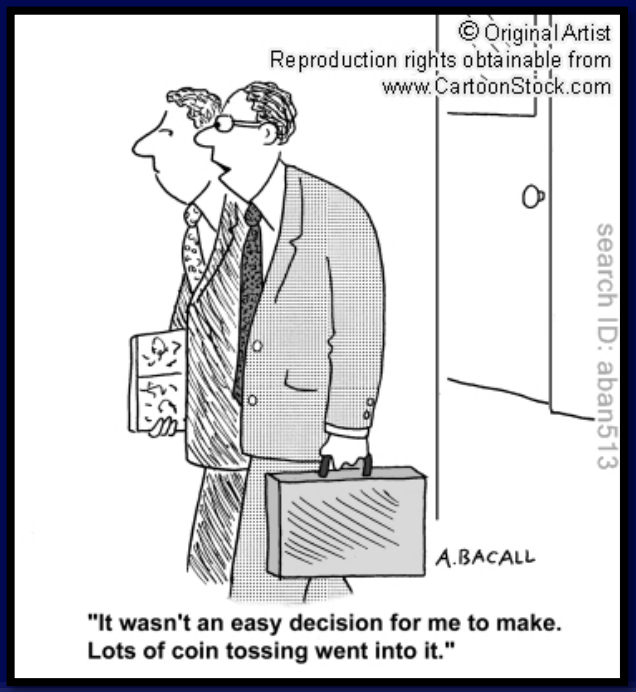
Poor Understanding and Appreciation

“Selected” Emerging Findings - Themes

Ranking / Measurement Systems

“Selected” Emerging Findings - Themes

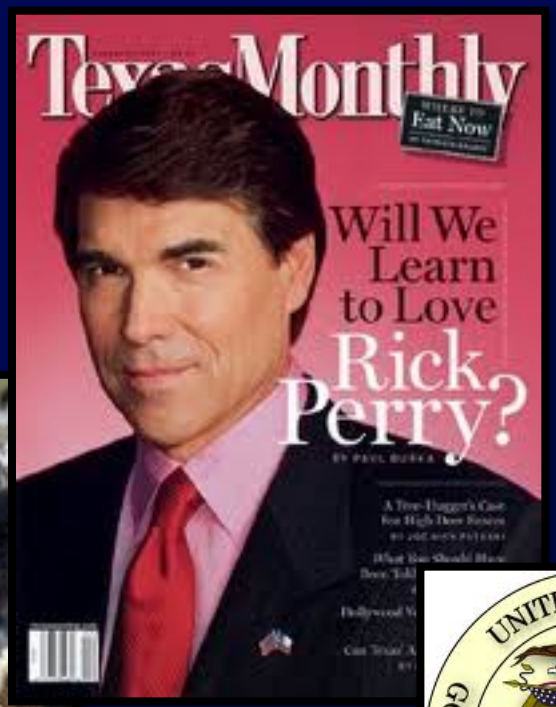
Ranking / Measurement Systems



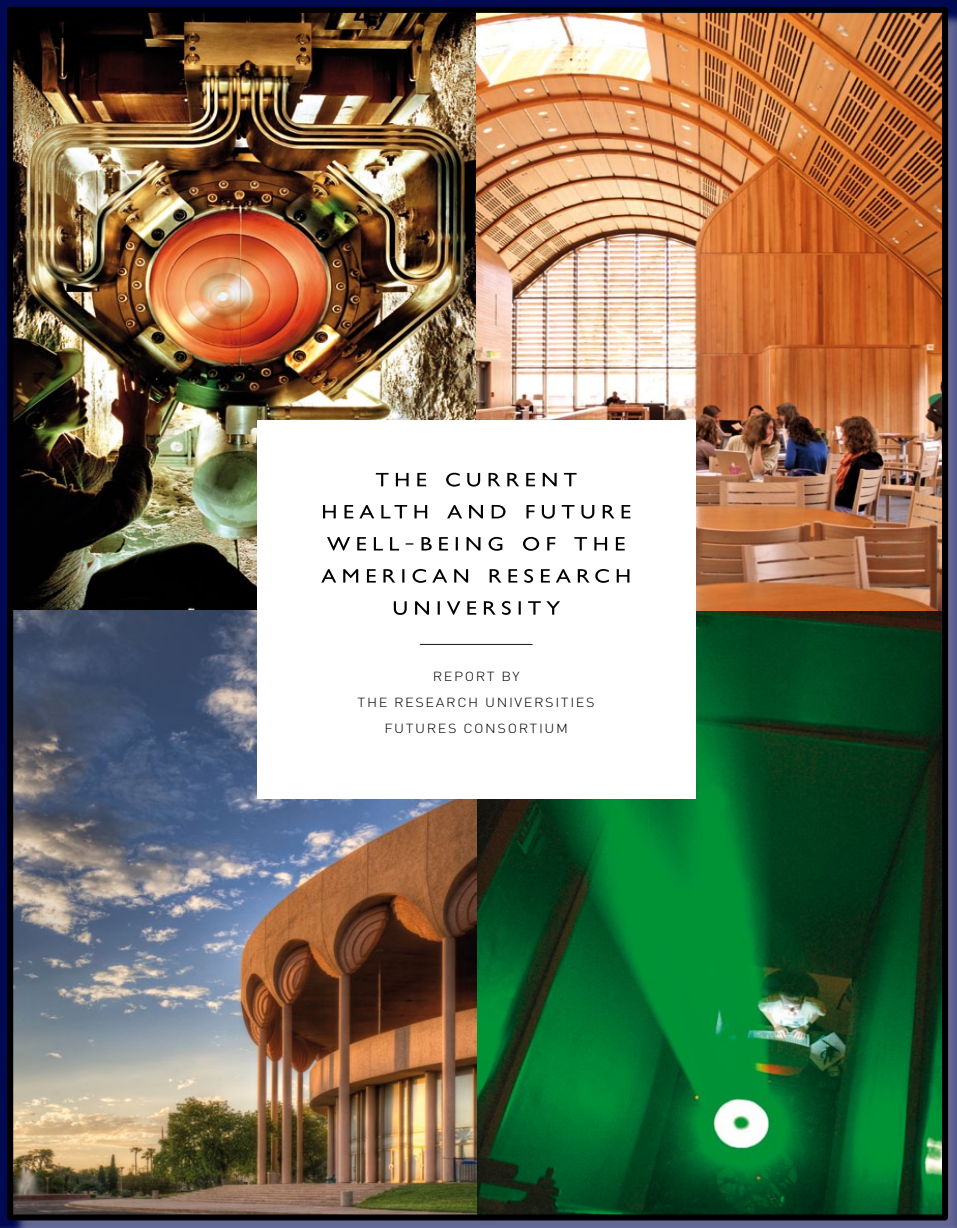
Information / Decision Support Systems

“Selected” Emerging Findings - Themes

Political and Sponsor Priorities



UNITED STATES GOVERNMENT ACCOUNTABILITY OFFICE



THE CURRENT HEALTH AND FUTURE WELL-BEING OF THE AMERICAN RESEARCH UNIVERSITY

REPORT BY
THE RESEARCH UNIVERSITIES
FUTURES CONSORTIUM

The report outlines 6 overarching themes that provide a framework for understanding the current conditions faced by American research institutions and threaten the future of many.

1. Scarcity of resources has led to a hypercompetitive environment and increased the complexity of managing academic research activities.
2. Growth of government regulation and reporting requirements have diverted faculty from research activities and compounded institutional financial stress.
3. Assessment and impact analysis relies on departments or colleges/centers rather than being done in a systematic fashion at the institutional level.
4. Enabling the highest impact research requires current and predictive data to assess programs and evaluate key opportunities in a resource constrained environment. While universities have developed a range of systems and processes to collect and evaluate research information, most of these efforts are deemed inadequate or insufficiently credible to support well-informed strategic decisions.
5. A better story for translating the value of the research university is needed to articulate how research conducted at academic institutions serves society, contributes to local and regional economies, and promotes national innovation and security.
6. The fragility of research administration (management) and leadership is not fully understood within the university community or by sponsors and stakeholders. As the number and complexity of research programs increase, the capacity of systems and operational support often lag, putting the research enterprise for the institution as a whole at risk.

Key Finding 1:

Scarcity of resources has led to a hypercompetitive environment and increased the complexity of managing academic research activities.

"*Winner-take-all*" - Arms Race

Small difference in performance translates into large difference in rewards. Unsuccessful competitors have little to show from the investment.

"An auction where everyone pays, but only the winner benefits."

Economics of Higher Education

"The Red Queen"

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Through the Looking Glass, Lewis Carroll

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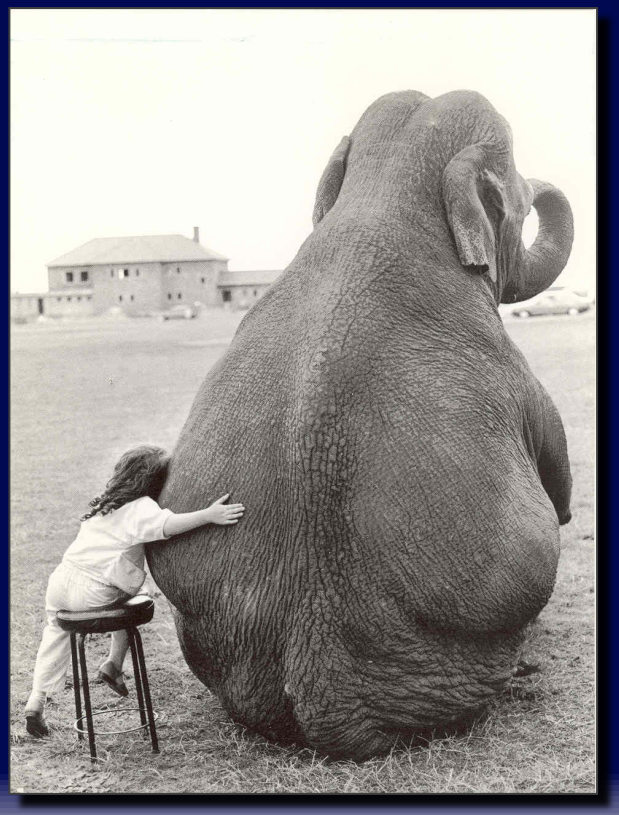
Run Smarter – Not Harder

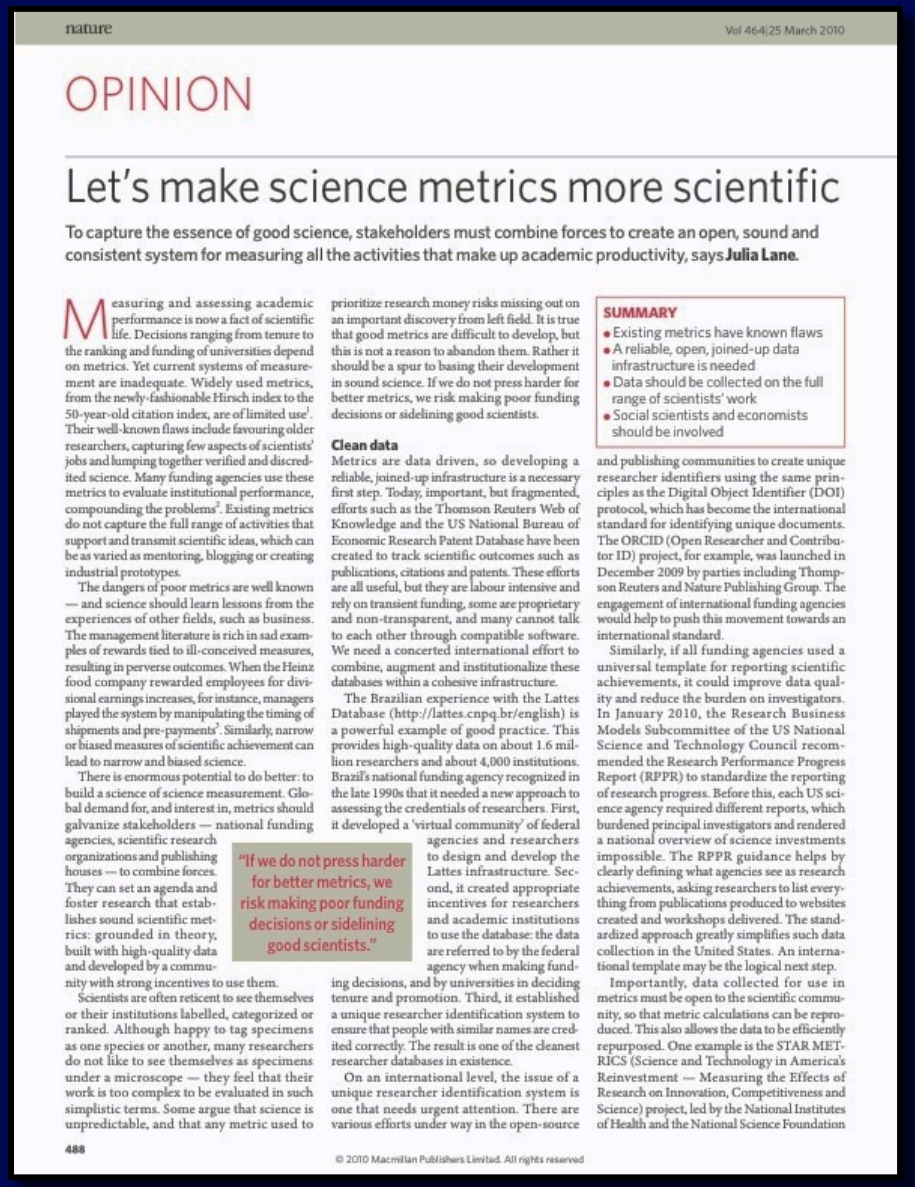
Key Finding 2:

Growth of government regulation and reporting requirements have diverted faculty from research activities and compounded institutional financial stress.

Key Finding 3:

Assessment and impact analysis relies on departments or colleges/ centers rather than being done in a systematic fashion at the institutional level.





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OPINION

Let's make science metrics more scientific

To capture the essence of good science, stakeholders must combine forces to create an open, sound and consistent system for measuring all the activities that make up academic productivity, says **Julia Lane.**

Measuring and assessing academic performance is now a fact of scientific life. Decisions ranging from tenure to the ranking and funding of universities depend on metrics. Yet current systems of measurement are inadequate. Widely used metrics, from the newly-fashionable Hirsch index to the 50-year-old citation index, are of limited use[1]. Their well-known flaws include favouring older researchers, capturing few aspects of scientists' jobs and lumping together verified and discredited science. Many funding agencies use these metrics to evaluate institutional performance, compounding the problems[2]. Existing metrics do not capture the full range of activities that support and transmit scientific ideas, which can be as varied as mentoring, blogging or creating industrial prototypes.

The dangers of poor metrics are well known — and science should learn lessons from the experiences of other fields, such as business. The management literature is rich in sad examples of rewards tied to ill-conceived measures, resulting in perverse outcomes. When the Heinz food company rewarded employees for divisional earnings increases, for instance, managers played the system by manipulating the timing of shipments and pre-payments[3]. Similarly, narrow or biased measures of scientific achievement can lead to narrow and biased science.

There is enormous potential to do better: to build a science of science measurement. Global demand for, and interest in, metrics should galvanize stakeholders — national funding agencies, scientific research organizations and publishing houses — to combine forces. They can set an agenda and foster research that establishes sound scientific metrics: grounded in theory, built with high-quality data and developed by a community with strong incentives to use them.

Scientists are often reticent to see themselves or their institutions labelled, categorized or ranked. Although happy to tag specimens as one species or another, many researchers do not like to see themselves as specimens under a microscope — they feel that their work is too complex to be evaluated in such simplistic terms. Some argue that science is unpredictable, and that any metric used to prioritize research money risks missing out on an important discovery from left field. It is true that good metrics are difficult to develop, but this is not a reason to abandon them. Rather it should be a spur to basing their development in sound science. If we do not press harder for better metrics, we risk making poor funding decisions or sidelining good scientists.

SUMMARY
- Existing metrics have known flaws
- A reliable, open, joined-up data infrastructure is needed
- Data should be collected on the full range of scientists' work
- Social scientists and economists should be involved

Clean data

Metrics are data driven, so developing a reliable, joined-up infrastructure is a necessary first step. Today, important, but fragmented, efforts such as the Thomson Reuters Web of Knowledge and the US National Bureau of Economic Research Patent Database have been created to track scientific outcomes such as publications, citations and patents. These efforts are all useful, but they are labour intensive and rely on transient funding, some are proprietary and non-transparent, and many cannot talk to each other through compatible software. We need a concerted international effort to combine, augment and institutionalize these databases within a cohesive infrastructure.

The Brazilian experience with the Lattes Database (http://lattes.cnpq.br/english) is a powerful example of good practice. This provides high-quality data on about 1.6 million researchers and about 4,000 institutions. Brazil's national funding agency recognized in the late 1990s that it needed a new approach to assessing the credentials of researchers. First, it developed a 'virtual community' of federal agencies and researchers to design and develop the Lattes infrastructure. Second, it created appropriate incentives for researchers and academic institutions to use the database: the data are referred to by the federal agency when making funding decisions, and by universities in deciding tenure and promotion. Third, it established a unique researcher identification system to ensure that people with similar names are credited correctly. The result is one of the cleanest researcher databases in existence.

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On an international level, the issue of a unique researcher identification system is one that needs urgent attention. There are various efforts under way in the open-source and publishing communities to create unique researcher identifiers using the same principles as the Digital Object Identifier (DOI) protocol, which has become the international standard for identifying unique documents. The ORCID (Open Researcher and Contributor ID) project, for example, was launched in December 2009 by parties including Thompson Reuters and Nature Publishing Group. The engagement of international funding agencies would help to push this movement towards an international standard.

Similarly, if all funding agencies used a universal template for reporting scientific achievements, it could improve data quality and reduce the burden on investigators. In January 2010, the Research Business Models Subcommittee of the US National Science and Technology Council recommended the Research Performance Progress Report (RPPR) to standardize the reporting of research progress. Before this, each US science agency required different reports, which burdened principal investigators and rendered a national overview of science investments impossible. The RPPR guidance helps by clearly defining what agencies see as research achievements, asking researchers to list everything from publications produced to websites created and workshops delivered. The standardized approach greatly simplifies such data collection in the United States. An international template may be the logical next step.

Importantly, data collected for use in metrics must be open to the scientific community, so that metric calculations can be reproduced. This also allows the data to be efficiently repurposed. One example is the STAR METRICS (Science and Technology in America's Reinvestment — Measuring the Effects of Research on Innovation, Competitiveness and Science) project, led by the National Institutes of Health and the National Science Foundation

"STAR METRICS"

Science and **T**echnology for **A**merica's **R**einvestment

Measuring the **E**ffec**T**s of **R**esearch on **I**nnovation **C**ompetitiveness and **S**cience

Develop ways to measure the value and effectiveness of research investment.

"In order to ensure that R&D funding is being spent wisely, it is crucial that meaningful measurement tools are developed to track the effectiveness of this spending. Currently, such measures generally do not exist or are not collected on a regular, systematic basis."

Key Finding 4:

Enabling the highest impact research requires current and predictive data to assess programs and evaluate key opportunities in a resource constrained environment.

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While universities have developed a range of systems and processes to collect and evaluate research information, most of these efforts are deemed inadequate or insufficiently credible to support well-informed strategic decisions.

Key Finding 5:

A better story for translating the value of the research university is needed to articulate how research conducted at academic institutions serves society, contributes to local and regional economies, and promotes national innovation and security.

Key Finding 6:

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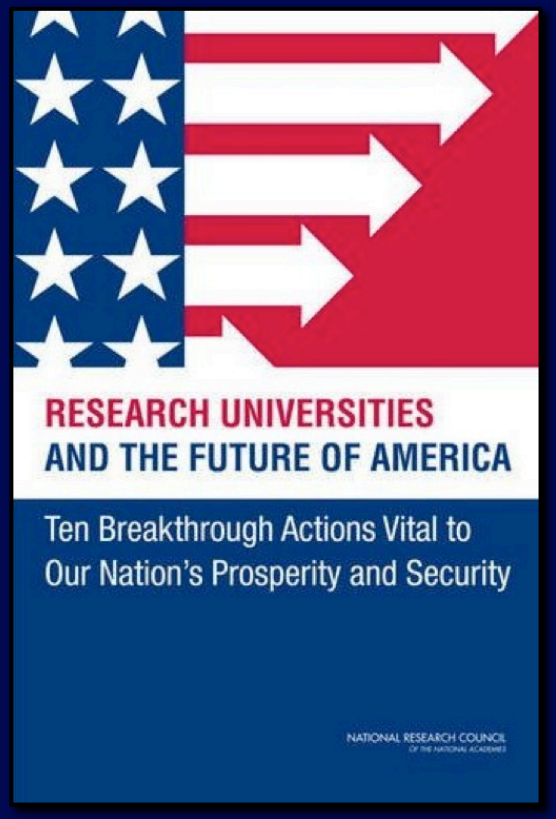
As the number and complexity of research programs increase, the capacity of systems and operational support often lag, putting the research enterprise for the institution as a whole at risk.

1. Limited funding, hyper-competition, need for greater cooperation between sponsors and universities.
2. Excessive regulation and reporting.
3. Lack of standard measures of performance, limited reward for efficiency and effectiveness.
4. Lack of reliable data to inform strategic decisions and resource allocations.
5. Failure to demonstrating and promoting the value of research.
6. Fragility of research administration and leadership.



1. Stable and effective policies, practices, and funding
2. Greater autonomy for public research universities
3. Strength the role of the business sector
4. *Increase cost-effectiveness and productivity*
5. Create a "Strategic Investment" program
6. Sponsors should cover the full cost of research
7. Reduce or eliminate unnecessary regulations
8. Improve the capacity of graduate programs
9. Universities take a strong role in K-12 and STEM
10. Enhance international students and scholars mobility

Collaborative action is needed to address some of the key challenges such as the burden of compliance, erosion of public support of academic research as well as strengthening of the research program development and administration.

Furthermore, the reports outline how standard metrics, and current and forward-looking data, would play a critical role to realize this. Finally, US academia could benefit from a cohesive national strategy, supporting a national research and innovation agenda.

The Consortium has the intention to explore and develop solutions and implementation strategies as the next phase of its work.

JOIN US !

Phase II -- Next Steps:

Partner with other groups:

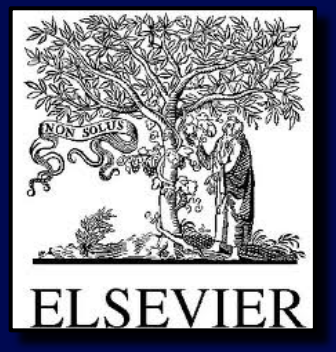
- NRC, A21-Taskforce, Research America, COGR, APLU, AAU, FDP, and others.

Form working groups to focus on the development and testing of solution.

Open to additional members.

Socialize and expand solutions.

Senior Vice President for Global Strategic Alliances



- Work to sustain and advance academic research
- Develop cooperative and collaborative programs with universities and agencies
- Move away from transactional relationship to partnerships
- Have the time and resources to complete the current project and develop others
- Not connected to sales or publishing

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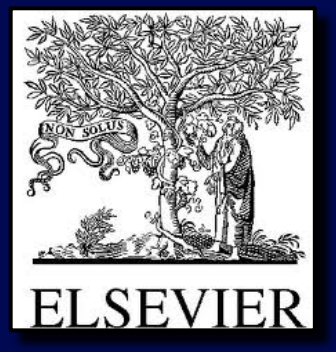

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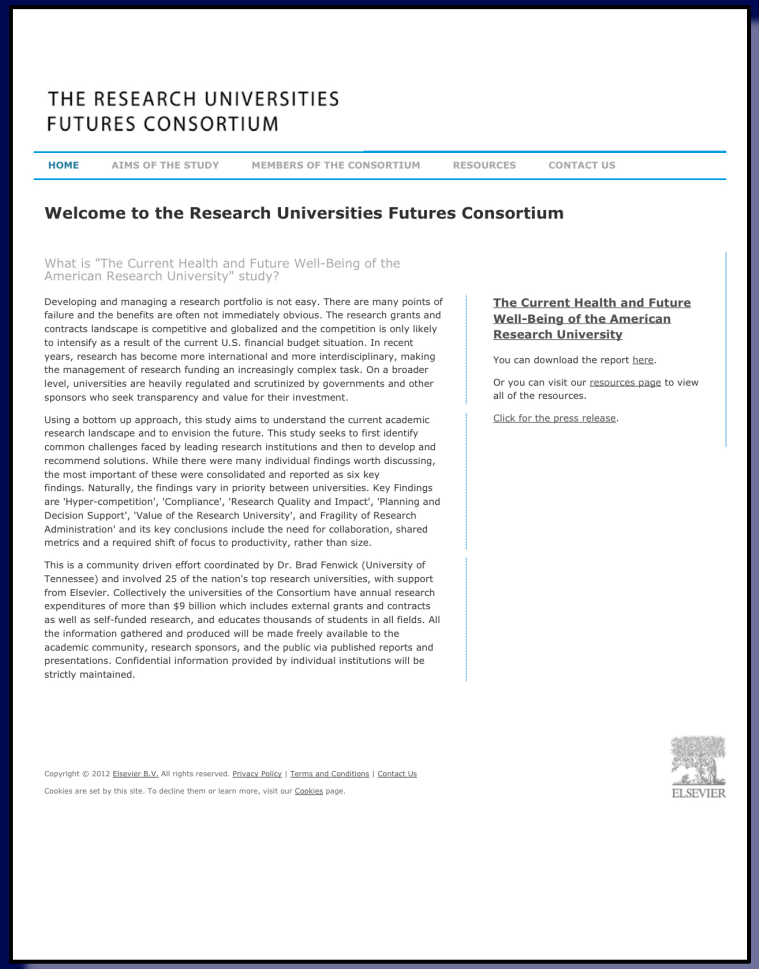
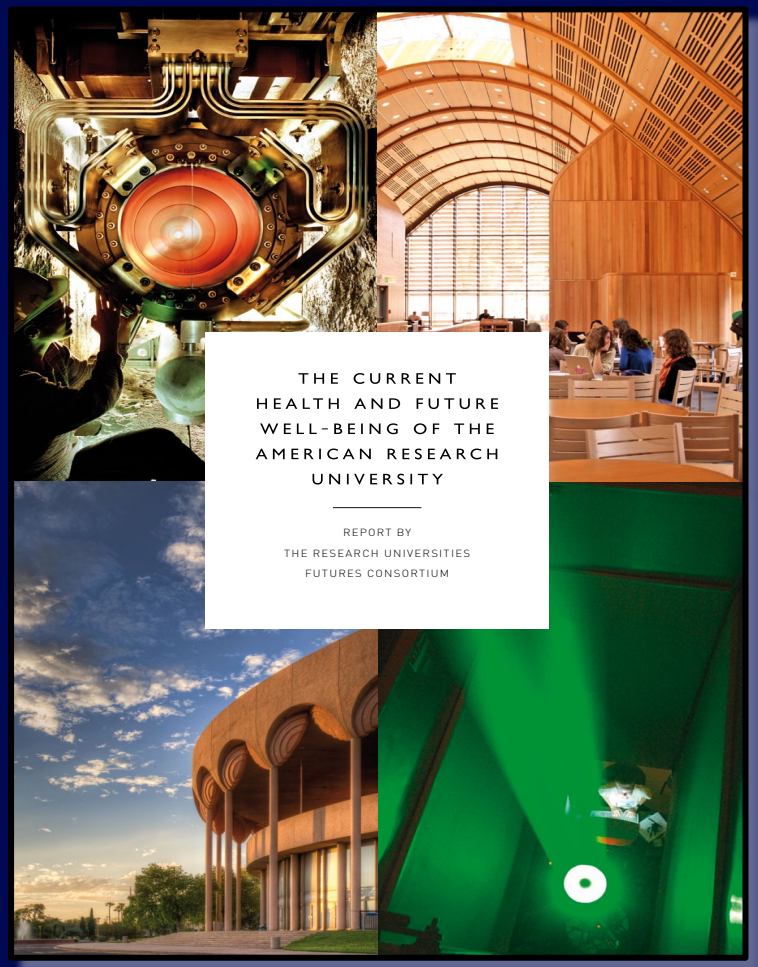
Consortium Leadership: Greg Reed & Charles Louis





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