



## **AAAS Holds Annual Forum on Science and Technology Policy**

**May 5, 2014**

On May 1-2, the American Association for the Advancement of Science (AAAS) held its annual “Forum on Science and Technology Policy” in Washington, DC. The event featured federal officials from across the government speaking on issues such as the federal R&D budget and federal policies and regulations impacting science and technology. A prevailing theme throughout the two-day event was the importance of scientists engaging in the federal policy process to education Congress and other federal officials about the value of R&D supported by the U.S. government and ways in which the scientific community can better articulate this value.

### **Budgetary and Policy Context for R&D in FY 2015**

The keynote address was delivered by John Holdren, Assistant to the President for Science and Technology and Director of the White House Office of Science and Technology Policy (OSTP). Holdren noted that the President’s budget request for fiscal year (FY) 2015 is not what the President believes federal R&D needs, but that the request is constrained by the budget caps set by Congress in late 2013. However, he stated, the request does include a “balanced portfolio” of investments; the 1.2 percent increase for R&D is significant given the 0.2 percent increase proposed for discretionary spending overall. Further, the request proposes additional funding via the Opportunity, Growth and Security Initiative. (See related articles for more information about the FY 2015 budget request.)

Holdren also alluded to efforts by some in Congress to make modifications or otherwise devalue or degrade the National Science Foundation’s (NSF) merit review process, such as through the *Frontiers in Innovation, Research, Science and Technology Act* (H.R. 4186), or FIRST Act. Among the Administration’s concerns with the FIRST Act is the narrowing of research in specific areas by requiring justification to Congress in advance of funding that the outcome of the research will have a positive impact on national security or the economy. Holdren also noted the value of social and behavioral science, stating that the peer review process has proven itself and funds the best research, adding, “We should not be trying to fix what is not broken.” Holdren called on the scientific community to do better at telling stories of the value of federal investments in basic science for which the outcome cannot be known.

### **Overview of R&D in the FY 2015 Proposed Budget**

Matthew Hourihan, Director, R&D Budget and Policy Program at AAAS, outlined the President’s FY 2015 budget request for R&D. Setting the context, Hourihan described what he called the “three phases” of federal R&D budgets over the last 15 years. The first phase (roughly 1998-2004) saw major growth in

federal R&D. During the second phase (2004-2010) R&D spending flattened out, with some agency variation (e.g., NIH decreased while NSF/DOD increased). In the third and current phase (2010-present) R&D spending adjusted by inflation has decreased about 15 percent, including defense and nondefense R&D spending. The story is better for nondefense than for defense R&D.

Hourihan provided agency-specific details of the FY 2015 budget request. The full details can be found in [AAAS Report XXXIX: Research and Development FY 2015](#), an annual volume prepared by the Intersociety Working Group; COSSA contributed to *Chapter 19: Social and Behavioral Science Research*.

## Impact of Federal R&D Budgets on U.S. Universities

Hunter Rawlings III, President, Association of American Universities (AAU), discussed the “Innovation Deficit” (see [related article](#) on the Senate Appropriations Committee hearing). Rawlings explained that federal spending on basic research in the U.S. has decreased while small gains were made in development and applied research; this is at a time when countries in Asia are tripling their basic research investments, causing him to ask: who will lead in the future?

Rawlings discussed the impact sequestration has had on U.S. universities. AAU, the Association of Public and Land-grant Universities (APLU), and the Science Coalition conducted a survey of universities last fall that found that 70 percent of respondent institutions saw a reduction in the number of research grants and many experienced impacts on personnel. With sequestration currently expected to return in FY 2016 (it was avoided in FY 2014 and FY 2015 as a result of the budget deal brokered in late 2013), Rawlings noted its anticipated impact on the next generation of scientists and engineers. Similar to John Holdren’s remarks, Rawlings called on the community to explain the “[innovation deficit](#)” to the public and to policymakers.

Rawlings also spoke in support of the social and behavioral sciences, stating that AAU strongly opposes the notion that social and behavioral science is not as important as other areas of science. He added that complex problems afflicting the nation require social and behavioral sciences as well as the other sciences. AAU opposes to the FIRST Act which seeks deep cuts to social and behavioral science at NSF.

Rawlings also mentioned burdensome federal regulations governing university research accountability and transparency, noting that both political parties in Congress agree these regulations are expensive and inefficient. The National Science Board (NSB) released a [report](#) earlier in the day which recommends steps the government can take to reduce regulatory burden while still ensuring accountability.

## Reproducibility in Science

The forum also included a discussion on the emerging issue of reproducibility in science. Story Landis, Director, National Institute for Neurological Disorders and Stroke (NINDS) at NIH, referenced the January 2014 commentary in [Nature](#) on the issue of reproducibility. Landis observed that science is often viewed as “self-correcting” and largely immune from reproducibility problems. While this principle may prove true over the long term, the short term is where problems with reproducibility persist. Among the reasons Landis outlined for why findings often cannot be reproduced include:

- Poor experimental design and/or underreporting of fundamental quality characteristics;
- Inadequate reporting of resources used and/or unexpected variability in resources;



- Publication trends, such as difficulty in publication of negative findings or "cartoon biology;" that is, overemphasis on the "exciting big picture" finding sometimes results in publications leaving out necessary details of experiments performed; and
- Perverse reward incentives, such as overemphasis on citation analysis.

Landis highlighted some trans-NIH actions already underway to begin tackling this issue, including:

- (1) Outreach to stakeholders – NIH is engaging with professional societies, industry, academia, and patient advocacy groups; convening meetings of study section chairs and board of scientific counselors chairs; and inviting journal editors to meetings to discuss common opportunities.
- (2) Development of training materials – The NIH Office of Intramural Research is creating and will pilot a new module on research integrity as it relates to experimental biases and study design in the ethics training course required for NIH intramural fellows. This is expected to be ready for testing in the spring.
- (3) Implementation of pilots to address key concerns – The NIH director has urged individual NIH institutes and centers to implement their own pilots to improve reproducibility, such as developing a checklist to ensure more systematic evaluation of applications; support replication studies; and determine approaches needed to reduce "perverse incentives" (for example, design changes to bio-sketch requirements or longer-term support for investigators).

Robert Golub, Deputy Editor of JAMA, spoke about the concerns of clinical journals as they relate to reproducibility. As he pointed out, the focus of articles published in clinical journals like JAMA is on applied research, used to help physicians make decisions, and used to provide evidence to practice evidence-based medicine. As a physician, Golub explained, the studies in clinical journals pose challenges because they often aren't applicable to all patients. He suggested that the question not be about "reproducibility," but "how likely is the study to be true?" Questions that journal editors and physicians need answered are on internal validity, external validity, role of changes (statistics), relationship to prior evidence, and how certain do we need to be that the study is true in order to publish.

Golub offered suggestions from the journal/physician perspective for improving studies appearing in journals. Regarding transparency, he endorsed establishing reporting guidelines, such as the [CONSORT guidelines](#); disclosures of potential financial conflicts of interest; standardizing authorship criteria; listing author contributions; providing detailed methods; and publishing protocols, all actions that are currently underway. He also suggested trial registration before patient enrollment as a requirement for publication.

Lastly, his "wish list" as a journal editor includes actions to strengthen the peer review process; adoption of Bayesian statistics and ensuring researchers have statisticians on their teams; encouraging replications; better use of meta analysis; publication of negative (null) studies regularly and commonly; and, perhaps most important, methodology/statistics education of researchers, editors, peer reviewers, media and consumers of the literature.

Brian Nosek, University of Virginia, discussed the [Center for Open Science](#) and the [Open Science Framework](#). The Center opened in 2013 and serves as a place for "improving the alignment between scientific values and scientific practices to improve the accumulation and application of knowledge." The Framework is designed to support the research workflow in the daily practice of scholarly research.



Nosek argued that the central issue with scholarly research is that incentives for success are focused on getting research published and funded, not on getting it right. Challenges associated with the dichotomy of the good research happening in the lab versus what actually gets published and why include motivated reasoning, perceived norms and values and the gap with what is actually happening, minimum accountability, and the fact that we feel we are too busy to rerun the study and decide to publish it anyway.

In order to change the scientific culture, Nosek suggests using technology to enable change, provide training so people know how to enact that change, and provide incentives to embrace change. This is the basis for the Open Science Framework.

