NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) is an independent federal agency created by the National Science Foundation Act of 1950.[1] Specifically, NSF's mission is "to promote the progress of science; to advance the national health, prosperity and welfare; and to secure the national defense."[2] NSF has an important mission and contributes to meaningful scientific discovery, but there are pervasive problems at the agency. There are many areas where the National Science Foundation could be more efficient, trim waste, and better target and manage resources.

NSF wastes millions of dollars on low-priority projects. Taxpayers may question the value of many of the projects NSF funds, such as: How to ride a bike; When did dogs became man's best friend; If political views are genetically pre-determined; How to improve the quality of wine; Do boys like to play with trucks and girls like to play with dolls; How rumors get started; If parents choose trendy baby names; How much housework does a husband create for a wife; When is the best time to buy a ticket to a sold out sporting event; and **how long can a shrimp run on a treadmill.**

Additionally, there is little, if any, obvious scientific benefit to some NSF projects, such as a YouTube rap video, a review of event ticket prices on stubhub.com, a "robot hoedown and rodeo," or a virtual recreation of the 1964/65 New York World's Fair. And only politicians appear to benefit from other NSF studies, such as research on what motivates individuals to make political donations, how politicians can benefit from Internet town halls, the impact of YouTube on the 2008 U.S. elections, and how politicians use the Internet.

NSF also lacks adequate oversight of its grant funding, which has led to significant mismanagement, fraud, and abuse. Internal reports and audits reveal systemic problems with the agency's grant administration, financial controls, and overall stewardship of scientific research dollars. Mismanagement has led to hundreds of millions of dollars lost to ineffective contracting. For example, serious concerns have been raised regarding the agency's contracting practices, categorizing them as "high-risk."[3] In 2010, the NSF spent $422 million on contracts, $283 million of which went to contracts known as "cost reimbursement contracts." These contracts are paid "regardless of whether the work is completed."[4]

Over 70 percent of these funds—$204 million—were for contracts permitting advance payments to three specific recipients.[5] NSF found that none of these three contractors had an approved disclosure statement—precluding the agency from being able to identify and document actual costs. The IG concluded that, "[g]iven the amount of money it expends on these contracts, the risk of fraud, waste, and abuse by NSF contractors will continue to be high until NSF implements fully adequate cost surveillance procedures."[6]

NSF also requires what are called "contingency estimates" in the budgets of large Major Research Equipment and Facilities Construction projects to protect against cost overruns. A recent audit of two projects revealed more than $169 million of unallowable contingency costs, comprising 25 percent of the combined award amounts, which totaled $684 million. The IG explained that this occurred because "no barriers existed to prevent the funds from being drawn down in advance."[7]

Other examples of fraudulent and inappropriate NSF expenditures include the following:

- 47 joint trips to the tune of $144,152 for a pair of romantically involved NSF employees;
- Bowling and amusement park trips using research funds;
- Pervasive porn-surfing by NSF employees;
- Millions spent on alcohol and unrelated costs.

NSF's work faces extensive duplication challenges, within the agency and across the federal government. Duplication of efforts across the federal government can lead to inefficiencies and waste of taxpayer dollars. Congress has all too often given government agencies overlapping authorities and responsibilities, often creating new programs without consolidating or eliminating existing programs with the same purposes.

NSF is one of at least 15 federal departments, 72 sub-agencies, and 12 independent agencies engaged in federal research and development.[8] A NSF-led analysis of the federal research budget explains that the federal government has, "17 science agencies [that] have 17 different data silos, with different identifiers, different reporting structures, and different sets of metrics."[9]

The Department of Defense (DOD), Department of Health and Human Services (HHS), National Aeronautics and Space Administration (NASA), Department of Energy (DOE), Department of Agriculture (USDA), Department of Commerce (DOC), and Department of the Interior (DOI) all join the NSF in scientific research and development. NSF is not the only agency supporting the

social sciences—the National Endowment for the Humanities $167.5 million annual budget includes research, fellowships, and institutional support for social sciences.[10]

A Congressional Budget Office (CBO) analysis shows that DOD funds 45 percent of federal R&D outlays, NIH constitutes 28 percent, Department of Energy provides 8 percent, NASA funds 7 percent, and NSF comprises only 4 percent.[11]

NSF primarily funds what is known as "basic research," a specific type of research and development defined by the CBO as research intending "to expand scientific knowledge without regard to commercial applications."[12] The federal government expended $27.7 billion on basic research in 2008, of which NSF provided $4 billion.[13] OMB reports that in 2009 HHS spent $25 billion on basic research, DOE $4.4 billion, and NSF $6 billion.[14] DARPA reports $328 million in its basic research portfolio.[15]

A dollar lost to mismanagement, fraud, inefficiency, duplication, or a questionable project is a dollar that could have advanced scientific discovery. Retaining America's position as the world's scientific and technological leader in the 21st century must remain a primary goal. Financial realities, however, threaten to undermine our scientific and economic competitiveness.

Decades of excessive borrowing and spending has resulted in a nearly insurmountable $14 trillion national debt. The $147 billion the federal government spends a year on science is dwarfed by the $225 billion spent just to finance interest on the debt. You do not have to be a PhD or brain surgeon to realize more responsible stewardship of our nation's finances would mean more resources to invest in science and research rather than making debt payments. Securing our scientific leadership role, therefore, is dependent upon setting better priorities so we can do more with less.

Eliminate NSF's Social, Behavioral, and Economics (SBE) Directorate – $2.83 billion

Social studies include business administration, economics, geography, political science, sociology, international relations, and communication. To varying degrees, each of these fields represents interesting and—many times—important areas of research and discovery.

But do any of these social studies represent obvious national priorities that deserve a cut of the same pie as astronomy, biology, chemistry, earth science, physics, and oceanography? The recent tragedy in Japan highlights the importance of nearly all of these natural sciences and how a better understanding of each can improve our abilities to protect life and property from natural occurrences such as earthquakes and tsunamis.

From the inception of the National Science Foundation, spending scarce scientific research dollars on the social sciences has been controversial. However, the severity of our current economic situation does not allow time for us to pander to controversial politics and requires shared sacrifice.

Eliminating NSF's SBE directorate will not end federal spending in these fields. For example, the Department of Education provides funding for behavioral, economic, and social endeavors. The Department of Health and Human Services provides support for social, behavioral, and

economic research with health applications. The National Endowment for the Humanities also provides support for social sciences.

The President has been proposing significant increases for this directorate rather than prioritizing the scientific fields with a more obvious benefit to our nation and the world. The President's 2012 budget recommends an 18 percent increase in funding for the directorate, including a 14.9 percent increase for the social and economic sciences.

Rather than ramping up the amount spent on political science and other social and behavioral research, NSF's mission should be focused truly on transformative sciences with practical uses outside of academic circles and clear benefits to mankind and the world.

Rescind Unspent, Expired Funds NSF Currently Holds –$1.7 billon

According to the National Science Foundation's 2010 financial statements, the agency currently has $1.733 billion in "undisbursed balances in expired grant accounts."[16] Agency policy is to close out grant awards on the award expiration date. One quarter later, any un-liquidated funds are to be de-obligated. [17] NSF then identifies funding to be returned to the Treasury from any cancelled appropriations. In 2010, NSF returned $33.68 million to the United States Treasury, while the agency sits on $1.7 billion in undisbursed, expired funding. The account has steadily grown from $1.53 billion in 2008 and 1.66 billion in 2009.[18]

The agency's record of failing to place an emphasis on closing out expired grants and returning unused funds to the United States Treasury raises questions about the overall fiscal management of the agency.

The Government Accountability Office (GAO), which conducted a government-wide review of unexpended grants, concluded that closeout procedures ensure grantees have met all financial requirements, provided final reports, and that unused funds are de-obligated. The audits generally attributed the problems to inadequacies in awarding agencies' grant management processes, including closeouts as a low management priority, inconsistent closeout procedures, poorly timed communications with grantees, or insufficient compliance or enforcement."[19]

"The existence of unspent funds can hinder the achievement of national objectives in various ways, such as leaving projects incomplete, preventing the reallocation of scarce resources to address other needs, or making federal funds more susceptible to improper spending or accounting as monitoring diminishes over time," GAO found.[20]

The $1.7 billion of NSF funds that remain in limbo means, in practical terms, less money for research and contributes to our already excessive debt problem.

Consolidate the Directorate for Education & Human Resources –$9.67 billion

NSF's Directorate for Education & Human Resources is focused on four areas: Preparing STEM professionals; Integrating STEM research and education; Increasing scientific literacy in America; and Closing achievement gaps of underrepresented groups in science.

These are all noble goals and ones already being supported by a plethora of other government agencies. There are nearly 100 federal STEM programs administered by 11 federal agencies, including NSF. An additional $150 billion in financial aid and student loan programs also provide assistance to those seeking higher education.

There are specific teacher training programs and other elementary and secondary education programs that could be consolidated with other federal programs, which could save taxpayers at least $366 million over the next five years, according to the Congressional Budget Office (CBO). With total NSF spending on K-12 STEM education expected to total $272 million in 2011, there are many more opportunities to save money through consolidation. In total, halting appropriations for human resources and training would save taxpayers $872 million annually.[21]

NSF could continue to collaborate with other federal agencies where appropriate, but consolidating this duplicative mission could yield greater results for taxpayers and science. The current activities of national importance conducted by this directorate could be carried out by the multitude of government agencies whose missions are primarily dedicated to education, most notably the Department of Education. In so doing, the mission of this directorate could be advanced more efficiently and strategically. This would also assist to redirect NSF's mission towards supporting research, enhancing discovery, and advancing innovation within the scientific fields where it can make the greatest impact.

Establish Clear Guidelines For What Constitutes "Transformative" and "Potentially Transformative" Science

NSF could advance science simply by better prioritizing the types of research eligible for federal funding. To do so, NSF needs to establish clear guidelines outlining what constitutes "transformative" or "potentially transformative" science.

Science is often described as art with imagination being an essential component to discovery. Hypotheses and theories must be developed to be proven or disproved. Questions must be asked to be answered.

Yet, not all questions and not all theories are of equal value. Many of the studies supported by NSF have been of great scientific value while others were found to be questionable, if not silly. It is the responsibility of NSF to carefully weigh grant applications to determine those with the potential to be transformative and those that are more whimsical.

It is important to recognize not all research can guarantee transformative results. That does not mean lessons cannot be learned from these studies or they should not be supported if they appear to hold the potential to be transformative.

Ultimately, the decision as to what constitutes "transformative" or "potentially transformative" should be left to the scientific community rather than Congress. Yet, it is the role of Congress to ask questions and conduct oversight of how these decisions are made and how wisely taxpayer dollars are being spent and managed.

And while evaluating the overall quality of grant application should remain in the hands of scientists with clear NSF guidance, scientists, agency officials, policymakers, and taxpayers should all be able to agree any research receiving federal funds should be able to affirmatively answer each of the following questions:

- Does this research represent science that could significantly change our understanding of important scientific concepts?

- Does the subject of this study represent an important scientific idea rather than the whimsy of individual researchers?

- Is this study an appropriate expenditure of federal funds at a time when the U.S. national debt is nearly $14 trillion?

Set Clear Metrics To Measure Success And Standards To Ensure Accountability

In December 2009, Congress directed NSF to identify the ingredients of successful science, technology, engineering, and mathematics (STEM) education programs in U.S. elementary and secondary schools by June 2010. The report is now nearly one year overdue. The failure of NSF to answer such a question regarding one of its central missions exposes its lack of metrics.

Along with the National Institutes of Health (NIH), NSF and the Office of Science and Technology Policy (OSTP) are creating a repository of tools to assess the impact of federal R&D known as STAR METRICS. This effort is long overdue and should be a priority to ensure taxpayers, policymakers, and agency officials can accurately measure and better invest in success.

The relatively small amount of resources NSF and NIH have directed towards the STAR METRICS system is a certainly a step in the right direction, but not the comprehensive solution necessary. Whether it is the STAR METRICS system or something analogous, the agency must find a way to place real performance measures on the research it funds.

It is impossible, of course, to place any metrics on research if the agency refuses to hold grantees responsible for promised deliverables. NSF must improve its grant administration and collect annual and final reports as required. These reports must be analyzed and essentially graded for the value of the research.

A strong emphasis must be placed on whether NSF supported research contributed to new discoveries or advancements. It is realistic to expect that most projects may not yield transformative or ground-breaking research, but it is important to determine whether or not the

effort presented a meaningful attempt to advance scientific knowledge or if could still could play a still small role in a larger discovery.

Assigning value to basic research proposals may not be easy, but it is important nevertheless.

$14.2 Billion in Savings Over the Next Decade

By enacting these reforms, which includes eliminating duplicative and low priority spending, over $14 billion could be saved over the next decade. Additionally, by prioritizing NSF's funding on transformative scientific research it will ensure we can retain America's scientific edge without adding to the debt threatening the economic engines that power our nation's leadership role in the world.

SAVINGS

Eliminate NSF's Social, Behavioral, and Economics Directorate
Rescind Unspent, Expired Funds NSF Currently Holds
Consolidate the Directorate for Education & Human Resources

DEPARTMENT OF NATIONAL SCIENCE FOUNDATION TEN YEAR SAVINGS
Discretionary: $14.2 billion
Total: $14.2 billion

[1] Public Law 81-507
[2] Public Law 81-507. The law explicitly authorizes NSF to conduct basic scientific research and research fundamental to the engineering process; programs to strengthen scientific and engineering research potential; science and engineering education programs at all levels and in all the various fields of science and engineering; programs that provide a source of information for policy formulation; and other activities to promote these ends.
[3] Statement Of Allison C. Lerner, Inspector General, National Science Foundation, Before The House Commerce, Justice, Science Appropriations Subcommittee, February 2011,http://www.nsf.gov/oig/testimonyfeb2011.pdf (March 11, 2011).
[4] Statement Of Allison C. Lerner, Inspector General, National Science Foundation, Before The House Commerce, Justice, Science Appropriations Subcommittee, February 2011,http://www.nsf.gov/oig/testimonyfeb2011.pdf (March 11, 2011).
[5] Statement Of Allison C. Lerner, Inspector General, National Science Foundation, Before The House Commerce, Justice, Science Appropriations Subcommittee, February 2011, http://www.nsf.gov/oig/testimonyfeb2011.pdf (March 11, 2011).
[6] Statement Of Allison C. Lerner, Inspector General, National Science Foundation, Before The House Commerce, Justice, Science Appropriations Subcommittee, February 2011, http://www.nsf.gov/oig/testimonyfeb2011.pdf (March 11, 2011).
[7] Statement Of Allison C. Lerner, Inspector General, National Science Foundation, Before The House Commerce, Justice, Science Appropriations Subcommittee, February 2011, http://www.nsf.gov/oig/testimonyfeb2011.pdf (March 11, 2011).
[8] National Science Foundation, "Survey of Federal Funds for Research and Development," Last updated June 2009, http://www.nsf.gov/statistics/srvyfedfunds/ (April 4, 2011).
[9] Julia Lane and Stefano Bertuzzi, "The STAR METRICS Project: Current and Future Uses for S&E Workforce Data," The National Science Foundation and the National Institutes of Health, June 2010, http://www.nsf.gov/sbe/sosp/workforce/lane.pdf.
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[15] Defense Advanced Research Projects Agency, "Department of Defense Fiscal Year (FY) 2012 Budget Estimates," Justification Book Volume 1, February 2011, www.darpa.mil/WorkArea/DownloadAsset.aspx?id=2400 (March 10, 2011).
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