Description of document:	National Science Foundation's (NSF) responses provided to Congressional Committees and Committee Chairs, 2013-2015*
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* Note	Some records undated
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September 22, 2017

Via email

Case #16-129F

This letter is in response to your Freedom of Information Act (FOIA) request that the National Science Foundation's (NSF) received on February 29, 2016. In your request, you sought "a copy of NSF Responses provided to Congressional Committees and Committee Chairs between May 1, 2013 and December 31, 2015."

After a thorough we have located the responsive records. Please find them enclosed. Proprietary information (trade secrets, commercial or financial information, EIN/TID, TIN numbers, pending and non-Federal grants, details of process methods and innovation) has been withheld under the provisions of Exemption (b)(4) of the FOIA. Personal information (Names, SSN, personal email and home address, home phone number, EIN/TID, TIN numbers, bios, and individual salaries) has been withheld wherever it appears under the privacy protection of Exemption (b)(6) of the FOIA. Lastly, two records that were deemed non-responsive but are directly related to your request have been include and contain information protected under the deliberative process privilege of Exemption (b)(5) of the FOIA.

Your right of administrative appeal is set forth in Section 612.9 of the NSF FOIA regulation (copy enclosed). Your appeal must be postmarked or electronically transmitted within 90 days of the date of the response to your request.

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There is no fee for FOIA services in this instance in accordance with 5 U.S.C. § 552(a)(4)(A)(i) et seq. Thank you for your interest in the National Science Foundation.

Sincerely,

Justin Guz
Government Information Specialist

Enclosures

NSF Support for Lifelines in the National Earthquake Hazards Reduction Program

The *National Earthquake Hazards Reduction Program (NEHRP) Strategic Plan for Fiscal Years 2009-2013* (Reference 1) supports earthquake mitigation of critical infrastructure lifelines through the Plan's following strategic priorities and goals/objectives:

- One of the nine Strategic Priorities: "Develop guidelines for earthquake-resilient lifeline components and systems."
- Goal A, Objective 2: Advance understanding of earthquake effects on the built environment: "NEHRP will support basic research to advance scientific and engineering knowledge of earthquake effects on the built environment. This research will contribute to developing cost-effective design methodologies and technologies for mitigating these effects on soils, lifelines, existing structures, and new construction."
- Goal B, Objective 8: Develop tools to improve the seismic performance of critical infrastructure: "NEHRP will use the results of basic research in earthquake-resistant design and construction to develop technologies and measures suitable for system-wide mitigation in new and existing infrastructure lifelines... and critical facilities (e.g., facilities critical to public health, business continuity, or key economic or governmental functions)."

The NEHRP Strategic Plan defines critical infrastructure lifelines using the Department of Homeland Security's *National Infrastructure Protection Plan*, 2006. This critical infrastructure includes communications, energy, transportation and water and wastewater systems.

NSF supports research on earthquake effects on lifelines through special program solicitations, core research programs, and the George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES) lifelines facility at Cornell University supported during FY 2005 – FY 2014 as under the NEES operations umbrella award CMMI-0927178 to Purdue University. The attached spreadsheet shows NSF awards made through these funding opportunities.

Special Solicitations

As FY 2013 and FY 2015 activities, NSF supported program solicitations 12-610 and 14-581, Interdisciplinary Research in Hazards and Disasters (Hazards SEES)., a joint activity among the Directorates for Geosciences, Computer and Information Science and Engineering (CISE), Engineering (ENG), Mathematical and Physical Sciences, and Social, Behavioral and Economic Sciences (SBE). Below is a synopsis of this solicitation:

> The overarching goal of Hazards SEES is to catalyze well-integrated interdisciplinary research efforts in hazards-related science and engineering in order to improve the understanding of natural hazards and technological hazards linked to natural phenomena, mitigate their effects, and to better prepare for, respond to, and recover from disasters. The goal is to effectively prevent hazards from becoming disasters. Hazards SEES aims to make investments in strongly interdisciplinary research that will reduce the impact of such hazards, enhance the safety of society, and contribute to sustainability. The Hazards SEES program is a multi-directorate program that seeks to: (1) advance understanding of the fundamental processes associated with specific natural hazards and technological hazards linked to natural phenomena, and their interactions; (2) better understand the causes, interdependences, impacts and cumulative

effects of these hazards on individuals, the natural and built environment, and society as a whole; and (3) improve capabilities for forecasting or predicting hazards, mitigating their effects, and enhancing the capacity to respond to and recover from resultant disasters.

Hazards SEES seeks research projects that will productively cross the boundaries of the atmospheric and geospace, earth, and ocean sciences; computer and information science; cyberinfrastructure; engineering; mathematics and statistics; and social, economic, and behavioral sciences. Successful proposals will integrate across these multiple disciplines to promote research that advances new paradigms that contribute to creating a society resilient to hazards. Hazards SEES intends to transform hazards and disaster research by fostering the development of interdisciplinary research that allows for appropriately targeted data collection, integration, and management; modeling (including predictive models for real-time decision making); visualization and simulation; data analytics and data-driven discovery; real-time sensing; cross-cutting knowledge development; and synthesis of applicable models and theory. Proposals must demonstrate the inclusion of the appropriate expertise to address the research questions, hypotheses, and problems being posed. Hazards SEES research projects should be designed around one or more locations, identifiable hazards, and/or themes. Furthermore, Hazards SEES research should train the next generation of scientists for interdisciplinary hazards and disaster research.

As an FY 2014 activity, NSF supported program solicitation NSF 14-524, Resilient Interdependent Infrastructure Processes and Systems (RIPS) through the Directorates for CISE, ENG, and SBE. The anticipated funding amount is $15,000,000 and up to 20 awards will be made. Awards will be made by end of FY 2014. Below is a synopsis of this solicitation:

"Critical infrastructures are the mainstay of our nation's economy, security and health. These infrastructures are interdependent. For example, the electrical power system depends on the delivery of fuels to power generating stations through transportation services, the production of those fuels depends in turn on the use of electrical power, and those fuels are needed by the transportation services.

The goals of the **Resilient Interdependent Infrastructure Processes and Systems** (RIPS) solicitation are (1) to foster an interdisciplinary research community that discovers new knowledge for the design and operation of infrastructures as processes and services (2) to enhance the understanding and design of interdependent critical infrastructure systems (ICIs) and processes that provide essential goods and services despite disruptions and failures from any cause, natural, technological, or malicious, and (3) to create the knowledge for innovation in ICIs to advance society with new goods and services. The objectives of this solicitation are:

- Create theoretical frameworks and multidisciplinary computational models of interdependent infrastructure systems, processes and services, capable of analytical prediction of complex behaviors, in response to system and policy changes.
- Synthesize new approaches to increase resilience, interoperations, performance, and readiness in ICIs.
- Understand organizational, social, psychological, legal, political and economic obstacles to improving ICI's, and identifying strategies for overcoming those obstacles.

The RIPS solicitation seeks proposals with transformative ideas that will ensure ICIs services are effective, efficient, dependable, adaptable, resilient, safe, and secure. Successful proposals are expected to study multiple infrastructures focusing on them as interdependent systems that deliver services, enabling a new interdisciplinary paradigm in infrastructure research...Projects supported under this solicitation may undertake the

collection of new data or use existing curated data depending on the category of award, and must recognize that a primary objective is integrative predictive modeling that can use the data to validate the models and which can be integrated into decision making."

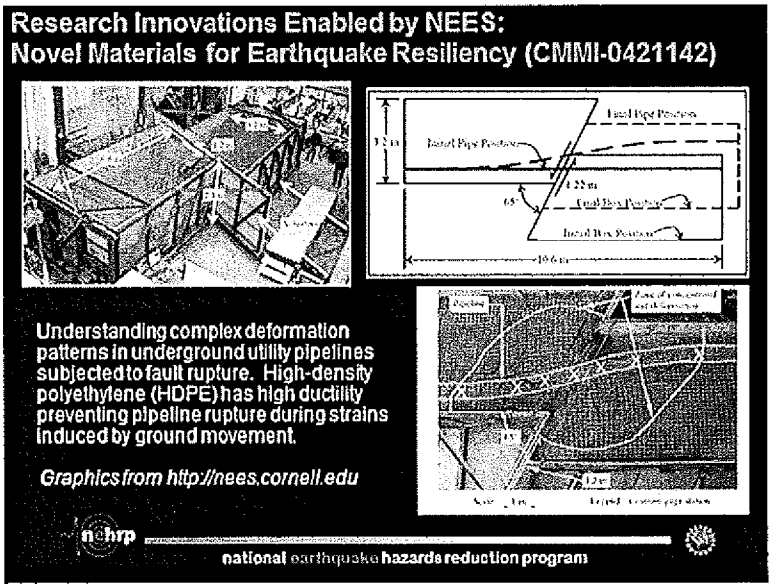
NSF Core Research Programs

Research on earthquake mitigation for lifelines has been supported from the following core research programs in the ENG Directorate, Division of Civil, Mechanical, and Manufacturing Innovation:

- Geotechnical Engineering (GTE)
- Hazard Mitigation and Structural Engineering (HMSE)
- George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES) Research (NEESR)
- Infrastructure Management and Extreme Events (IMEE)

NEES Lifelines Facility at Cornell University

Located in Cornell University's Department of Civil Engineering, this facility has enabled large-scale testing to study the effects of large differential ground deformation on buried pipeline and conduit performance. The slide below show a test at the Cornell lifelines facility investigating the seismic capacity of high-density polyethylene (HDPE) pipelines.



References:

Strategic Plan for the National Earthquake Hazards Reduction Program, Fiscal Years 2009-2013, October 2008, http://www.nehrp.gov/pdf/strategic_plan_2008.pdf

Department of Homeland Security, *National Infrastructure Protection Plan*, 2006. http://www.chemicalsecurity.com/index/NationalStrategy/NationalInfrastructureProtectionPlan(2006).pdf. Note: The most recent version is dated 2013.

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A REVIEW OF THE NATIONAL EARTHQUAKE HAZARDS REDUCTION PROGRAM

Tuesday, July 29, 2014

House of Representatives,

Subcommittee on Research and Technology

Committee on Science, Space, and Technology.

Washington, D.C.

The Subcommittee met, pursuant to call, at 10:04 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Larry Bucshon [Chairman of the Subcommittee] presiding.

Chairman BUCSHON. Good morning. The Subcommittee on Research and Technology will come to order.

Welcome to today's hearing entitled ''A Review of the National Earthquake Hazards Reduction Program.'' In front of you are packets containing the written testimony, biographies, and truth-in-testimony disclosures for today's witnesses. I recognize myself for 5 minutes now for an opening statement.

Earthquakes present a potential hazard to every State in our Nation. The U.S. Geological Survey recently updated its National Seismic Hazards Maps with research identifying that in the next 50 years, 42 of our 50 States have a chance of experiencing damaging ground shaking from an earthquake. There are 16 States in the United States that have a high likelihood of experiencing damage because they have sustained earthquakes with a seismic magnitude of 6 or greater. My home State of Indiana is at risk of experiencing the effects of earthquakes stemming from the New Madrid fault.

Earthquakes are unique among natural hazards because they strike without warning. The cascading nature of an earthquake can induce secondary effects such as landslides, liquefaction, and tsunamis. Earthquakes impact people and communities worldwide from the devastation of loss of life and property to the turmoil caused by the disruption of important services, including water, electricity, and other

utilities or lifelines including roads and bridges.

In 1977 the Congress passed the Earthquake Hazards Reduction Act establishing the National Earthquake Hazards Production Program, or NEHRP, as a long-term earthquake risk-reduction program for the United States. Four federal agencies contribute to NEHRP research and activities: the National Institute of Standards and Technology, the National Science Foundation, the United States Geological Survey, and a Federal Emergency Management Agency. Program activities are focused on supporting the development of earthquake hazard reduction measures, promoting the adoption of these measures by federal, state, and local governments, improving the understanding of earthquakes and their effects on people and infrastructure, and developing and maintaining the Advanced National Seismic System, the George E. Brown, Jr. Network for Earthquake Engineering Simulation, or NEES, and a Global Seismographic Network.

In Indiana, Purdue University leads the collaborative George E. Brown, Jr. Network for Earthquake Engineering Simulation, or NEES. The mission of NEES is to accelerate improvements in seismic design and performance by serving as an indispensable collaboratory for discovery and innovation. Support for research and activities that strengthen preparedness for, reduce the impact of, and aid in recovery from earthquakes will fortify the Nation's ability to respond

to earthquake hazards.

Today's hearing is a bipartisan effort to learn about NEHRP and understand the Nation's level of earthquake preparedness. We worked across the aisle to bring together two panels of experts who can shed light on these important issues. I look forward to hearing from all the witnesses on both of our panels to understand the work NEHRP agencies and how that work intersects with engineers, emergency managers, and lifeline experts.

[The statement of Mr. Bucshon follows:]

********** INSERT 1 **********

Chairman BUCSHON. At this point I ask unanimous consent to put two letters in the record regarding the NEHRP program: a letter from the American Society of Civil Engineers and a letter from the BuildStrong Coalition. Without objection, so ordered.

[The information follows:]

********** INSERTS 13, 14 **********

Chairman BUCSHON. At this point I now recognize the gentleman from California, Mr. Peters, for an opening statement.

Mr. PETERS. Thank you, Mr. Chairman. Thank you for holding this hearing today on the National Earthquake Hazards Reduction Program, or NEHRP, an unfortunate acronym for an important program. I want to thank witnesses on both panels for being here today.

Though infrequent, earthquakes are unique among natural hazards in that they strike without warning. While areas like my home State of California, in addition to Oregon, Washington, and Alaska, are the most well-known for earthquakes, earthquakes are not a hazard confined to the West Coast. A 2011 earthquake here in Washington, D.C., caused over $200 million in damages, including damage to the Washington Monument and the Smithsonian, and it is estimated that 75 million Americans in 39 States are exposed to significant seismic risk and nearly all States in the United States have some level of risk.

In an effort to mitigate the harmful impacts and better prepare for future earthquakes, Congress authorized the National Earthquake Hazards Reduction Program, an interagency program that includes National Institute of Standards and Technology, the National Science Foundation, Federal Emergency Management Agency, and the United States Geological

Survey.

Since NEHRP was founded in 1997, we have learned a lot about how to prepare for, mitigate, and respond to a large-scale earthquake. Research programs, including ones at the University of California San Diego and San Diego State University, are underway to help us better understand earthquakes, develop safer building instruction standards, and ensure that affected communities can respond to and recover from earthquakes as quickly as possible. But more work is needed.

I am pleased we have representatives today from all four agencies here to testify about their activities to reduce the risks of life and property from earthquakes in the United States. I am also pleased that we will hear from outside stakeholders, both private sector and academic, about how the program is working and what if any changes are needed to improve its effectiveness.

As my colleagues may know, the reauthorization of these risk-reduction programs is long overdue. The authorization for this program expired in 2009. Interagency programs like these improve our understanding of earthquakes and then turn and knowledge into mitigation and outreach activities that will save lives and reduce economic damages. While we can't prevent natural disasters, we can do more to lessen the cost to human life and property.

Over the last 2 years the Federal Government has spent more than $136 billion, much of it off-budget, on relief for hurricanes, tornadoes, droughts, wildfires, and other extreme weather events. It is time that the government stops working in a reactive way to natural disasters and instead gets to work efficiently to get ahead of the issue and help States and localities find the best steps to prepare, plan for, and recover more quickly from these events.

We know that for every $1 spent now in resiliency we can avoid at least $4 in future losses. It makes more sense to approach this by thinking how we can make our communities better prepared. If we are focused on reducing spending, let's do it in a way that saves us in the long run.

Mr. Chairman, our goals are the same: to decrease the vulnerability of communities across the country including mine in San Diego. I look forward to working with my colleagues on both sides of the aisle on a bipartisan bill that would reauthorize the Earthquake Hazards Reduction Program and welcome any comments from the witnesses today about changes and updates that should be made to the authorization language.

Thank you, Mr. Chairman, for holding the hearing. I look toward to hearing the testimony, and I yield back the balance of my time.

[The statement of Mr. Peters follows:]

156 ********** INSERT 2 **********

Chairman BUCSHON. Thank you, Mr. Peters. I now recognize the Ranking Member of the full committee for a statement, Ms. Johnson.

Ms. JOHNSON OF TEXAS. Thank you very much, Mr. Chairman, for holding this important hearing on the National Earthquake Hazards Reduction Program, or NEHRP. I also want to thank the Chairman of the full committee, Mr. Smith, for agreeing to this hearing. Chairman Smith agreed to hold a hearing on NEHRP and work on the NEHRP reauthorization bill while we were discussing the National Windstorm Impact Reduction Program. This hearing is a good first step in fulfilling that agreement. I want to thank the Chairman and majority staff for working with my staff on putting together this hearing.

Though infrequent, earthquakes are unique among natural hazards in that they strike with little or no warning. In 1964 Alaska was hit with a great earthquake that measured 9.2 in magnitude. That was the second-strongest earthquake in recorded history and resulted in significant damage from both the earthquake itself and the tsunamis that followed. California has numerous active faults that have produced large earthquakes in the last two decades, from 1971, the San Fernando earthquake to the 1989 Loma Prieta and the 1994 Northridge earthquakes. In fact, NEHRP was established in Congress in response to the 1964 Alaska and the 1971 San

Fernando earthquakes.

Since its creation, NEHRP has accomplished a great deal. It has improved our understanding of earthquake processes, improved our earthquake hazard and risk assessments, improved earthquake safety for new and existing buildings, and increased public awareness of earthquake risk and mitigation techniques. But more work is still needed, including improving the earthquake resilience of communities nationwide and developing cost-effective measures to reduce earthquake impacts on individuals, the environment, and society.

To ensure that this work is accomplished, we need to reauthorize NEHRP, which has not had Congressional authorization since 2009. That is why I am a cosponsor of H.R. 2132, the Natural Hazards Risk Reduction Act of 2013, which was introduced by Representative Wilson last May. H.R. 2132 would reauthorize NEHRP program, as well as the National Windstorm Impact Reduction Program, and would make changes to the Fire Research Program. This legislation is modeled after bipartisan legislation that passed the House by an overwhelming margin in the 111th Congress. And I am pleased that the Windstorm program is reauthorized in a separate bill, H.R. 1786, that was introduced by Representative Neugebauer, and I supported that bill when it passed the House earlier this month.

However, I do believe we need to take a multi-hazards

approach to disaster mitigation. Taking a multi-hazards approach could create opportunities for synergy among the various research and mitigation activities. Further, a multi-hazard approach could help achieve the goal of producing communities that are resilient to any and all disasters. I hope that as we work on NEHRP reauthorization bill we look for opportunities to create synergies and coordination across the hazards program.

I want to thank the witnesses from both panels for being here today, and it is important to hear from you as we consider reauthorizing this important program. I look forward to your testimony.

Thank you, Mr. Chairman. I yield back.

[The statement of Ms. Johnson follows:]

********** INSERT 3 **********

Chairman BUCSHON. Thank you. Just as a sideline, I have been in three earthquakes myself, one in Southern California in the late '80s, one in Illinois, southern Illinois when I was a kid, and one in Evansville, Indiana, in about 2001. So it is a fairly--if you have never been in an earthquake, it is a fairly unique experience.

At this point if there are Members who wish to submit additional opening statements, your statements will be added to the record.

[The statement of Mr. Lipinski follows:]

********** INSERT 4 **********

Chairman BUCSHON. At this time I would like to introduce our first panel of witnesses. Our first witness today is Dr. John Hayes, Jr. Dr. Hayes is the Director of the National Earthquake Hazards Reduction Program of the Engineering Laboratory at the National Institute of Standards and Technology.

Our next witness is Dr. Pramod--I said this before and now I will get it correct--Khargonekar is the Assistant Director for the Directorate of Engineering at the National Science Foundation. Welcome.

Our third witness is Dr. David Applegate. Dr. Applegate is the Associate Director for Natural Hazards at the U.S. Geological Survey.

And our final witness on the first panel is Mr. Roy Wright. Mr. Wright serves as the Federal Emergency Management Agency's Deputy Associate Administrator for Mitigation.

As our witnesses should know, spoken testimony is limited to 5 minutes each. I now recognize Dr. Hayes for 5 minutes to present his testimony.

STATEMENTS OF JOHN R. HAYES, JR., DIRECTOR, NATIONAL EARTHQUAKE HAZARDS REDUCTION PROGRAM, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY; PRAMOD P. KHARGONEKAR, ASSISTANT DIRECTOR, DIRECTORATE OF ENGINEERING, NATIONAL SCIENCE FOUNDATION; DAVID APPLEGATE, ASSOCIATE DIRECTOR FOR NATURAL HAZARDS, U.S. GEOLOGICAL SURVEY; AND ROY E. WRIGHT, DEPUTY ASSOCIATE ADMINISTRATOR FOR MITIGATION, FEDERAL EMERGENCY MANAGEMENT AGENCY

STATEMENT OF JOHN R. HAYES, JR.

Mr. HAYES. Chairman Bucshon, Congressman Peters, and other members of the subcommittee, thank you for inviting me to testify as you review the National Earthquake Hazards Reduction Program, or NEHRP, as you have already said, for possible reauthorization.

Mr. Peters, I can assure you that the acronym NEHRP grows on you after a while so it works.

In your invitation to me you asked me to address several topics and I will try to address each one of those briefly in my testimony this morning.

NIST fulfills two broad roles within NEHRP. First, NIST performs statutory lead agency duties, including supporting an Interagency Coordinating Committee and the Advisory Committee on Earthquake Hazard Reduction, drafting and

updating NEHRP's strategic plans, submitting annual NEHRP reports to Congress, and fostering interagency coordination and cooperation.

Second, NIST performs applied research related to earthquake engineering, including developing performance-based design tools, guidelines, and standards for practitioners who design buildings to resist earthquake effects.

A 2003 Applied Technology Council report identified a major earthquake engineering technology gap between performing basic research and developing earthquake-related provisions for national model building codes and standards. NIST bridges this gap with its Applied Earthquake Engineering Research Program. In 2008 the NEHRP agencies produced a NEHRP strategic plan which guides our way forward. The National Research Council, or NRC, developed a 20-year action plan for improving U.S. earthquake resilience, and in the process endorsed the NEHRP strategic plan. The Building Seismic Safety Council, or BSSC, formulated recommendations for applied research that point us at NIST toward addressing the broad research directions that were set by the NRC plan.

NIST research projects address issues identified by leading earthquake engineering practitioners and researchers, as well as the work that was suggested by BSSC in its plan.

Our research includes significant interactions with our NEHRP partners and continuous engagement with other leading earthquake researchers and practitioners. Alongside FEMA and USGS, we participate in the technical committees that develop new building codes and standards. This provides us direct access to practicing engineers' needs and facilitates the effective transfer of new knowledge gained through our research back to the practitioners.

Our work is subdivided into program elements that includes seismic design technical briefs, codes and standards support projects, structural and geotechnical engineering-related projects, and planning projects that support both NIST and NEHRP-wide activities. Since 2008 we have produced approximately 30 reports on these topics that are widespread or in widespread use by practitioners and researchers alike. Webinars have also been developed to inform practitioners in the United States and around the world about these tech briefs.

Coordination among the NEHRP agencies fosters synergies that complement agency capabilities. FEMA and USGS work closely on earthquake hazards definitions, hazard mapping, and earthquake monitoring. NIST and FEMA work closely in fulfilling our respective roles for engineering research and implementation and we have formed a very special partnership that involves frequent exchanges of project information and

in some instances direct collaboration on critical projects. FEMA, USGS, and NIST work closely with NSF-supported researchers to ensure effective transfer of basic research knowledge into our research programs.

In closing, I note that NEHRP was created to address the reality that earthquakes are inevitable and occur without warning. We have done much to minimize their consequences but much more needs to be done. The NEHRP agencies translate our research results into actions to ensure that Americans are less threatened by the effects of devastating earthquakes. The NEHRP agencies fulfill unique but complementary roles in a partnership not duplicated elsewhere.

It is also important that I note that the NEHRP family extends well beyond the four NEHRP program agencies to other federal agencies, state and local governments, nongovernmental professional organizations, model building codes and standard organizations, and earthquake professionals both in the private sector and academia. Without these dedicated professionals, the NEHRP agencies could not satisfy our statutory responsibilities.

Thank you again for the opportunity to testify this morning. This concludes my remarks and I am happy to answer any questions that you may have.

[The statement of Mr. Hayes follows:]

350 ********** INSERT 5 **********

Chairman BUCSHON. Thank you, Dr. Hayes.

I now recognize Dr. Khargonekar for his testimony.

STATEMENT OF PRAMOD KHARGONEKAR

Mr. KHARGONEKAR. Chairman Bucshon, Ranking Member Lipinski, and other distinguished members of the subcommittee, it is my pleasure to be able to testify before you today on the topic of National Science Foundation's activities in earthquake hazards reduction. I am Pramod Khargonekar, Assistant Director for Engineering at NSF.

Since the start of NEHRP, NSF has supported a broad range of fundamental research in geosciences, engineering, and social sciences relevant to the understanding of the causes and impacts of earthquakes. The Foundation also provides support for education of new scientists and engineers, the integration of research and education, and outreach to professionals and the public. Today, I would very briefly like to outline NSF's NEHRP efforts related to facilities, research, and coordination.

NSF funds three distributed multiuser national facilities that support critical fundamental research relevant to NEHRP. The George E. Brown, Jr. Network for Earthquake Engineering Simulation, or NEES, the Geodetic Facilities for the Advancement of Geoscience and EarthScope,

or GAGE, and the Seismological Facilities for the Advancement of Geoscience and EarthScope, or SAGE.

NEES currently provides access to 14 earthquake simulation experimental facilities located in eight States. The NEES facilities include shake tables, large-scale labs, geotechnical centrifuges, field testing equipment, and a tsunami wave basin. NEES operations are currently supported through an award at Purdue University covering the fiscal years 2010 to 2014. Following 2014, NSF has updated its strategy for the future of NEES operations, which will include NSF support for multiple NEES awards managed under a single program. This strategy maintains the NSF commitment toward correct research and infrastructure while aligning it more strategically under a multi-hazards approach.

The GAGE and SAGE facilities provide key data, instrumentation, and educational information and basic research and education in the Earth sciences. Of particular relevance to NEHRP, SAGE supports the Global Seismographic Network, GSN, a worldwide array of 153 permanent seismic stations funded by NSF and USGS with additional support from the Departments of Energy, State, and Defense.

Complementing these facilities, NSF funds a wide range of fundamental research into the processes that drive and control earthquakes and into the impacts of earthquakes on the built environment. This includes individual

investigative grants, research centers, and a variety of research collaborations.

NSF also supports rapid response activities to gather data from disaster sites using its RAPID funding mechanism. In the response to recent earthquakes in New Zealand and Japan, NSF supported over 30 RAPID awards.

Another research effort conducted in partnership by NSF and USGS is EarthScope, an Earth science program to explore the structure of North America and provide a framework of broad integrated studies. Scientists using EarthScope data are developing a comprehensive understanding of the structure, dynamics, and evolution of North America.

NSF supports multiagency collaboration on NEHRP activities through a variety of matters. In addition to research collaboration, NSF activity contributes to the NEHRP Program Coordination Working Group and the Interagency Coordinating Committee.

Finally, NSF staff regularly briefs the NEHRP Advisory Committee for earthquake hazards reduction and responds with recommendations for NSF.

In closing, I would like to leave you with two quick examples of some recent achievements of NSF-funded grantees. NSF-funded researchers have discovered how to make underground water lines that bend and move rather than snap and rupture in an earthquake. The Cornell team found that

medium and high density polyethylene pipelines remain intact even when the Earth liquefies and shifts. The City of Los Angeles is now installing these pipelines in Elizabeth Tunnel, which provides half the city's water supply.

The second example concerns ports. In 2005 NSF supported a research project led by Georgia Tech which examined the seismic vulnerability of ports. Project researchers found that a majority of the ports located in the areas of high seismic risk had either no or only informal seismic risk mitigation plans. Utilizing unique NEES facilities, the project team developed a new approach for assessing and managing seismic risk in container ports.

Mr. Chairman, NEHRP is a strong and dynamic program at NSF and we hope to continue to support research, education, and facilities to mitigate the impacts of earthquake hazards. I thank the Subcommittee for considering priorities for reauthorization of the program and appreciate the opportunity to testify today. Thank you.

[The statement of Mr. Khargonekar follows:]

********** INSERT 6 **********

Chairman BUCSHON. Thank you very much.

I now recognize Dr. Applegate for his testimony.

STATEMENT OF DAVID APPLEGATE

Mr. APPLEGATE. Great. Well, thank you, Chairman Bucshon and Congressman Lipinski, other members of the subcommittee. I very much appreciate the invitation for the U.S. Geological Survey to testify at this hearing.

The USGS is proud to be part of the NEHRP four-agency partnership effort. I think it has been highly successful and continues to make valuable contributions to the Nation's resilience to earthquakes.

As Jack Hayes noted, NEHRP is predicated on the recognition that while earthquakes are inevitable, their consequences are not and there is much that we can do as a nation to improve public safety when it comes to earthquakes and related hazards. Within NEHRP, each agency performs a distinct and complementary roll essential for the overall success of the program. The heart of this partnership is a broadly shared commitment to translate research results into implementation actions that can reduce earthquake losses. That commitment involves collaboration that goes well beyond the four NEHRP agencies to include other federal partners, plus state, tribal, and local governments, universities,

nongovernmental organizations, and the private sector, as reflected in the second panel.

Carrying out its role within NEHRP, the USGS strives to deliver the data and information tools that engineers and design professionals, emergency managers, government officials, and the public need to prevent earthquake hazards from becoming earthquake disasters. With its partners, the USGS provides rapid and authoritative information on earthquake size and location, shaking intensity, and potential impacts. We develop hazard assessment maps and related products, we support targeted research to improve our monitoring and assessment capabilities, and we build public awareness of earthquake hazards.

When damaging earthquakes strike here in the United States or around the world, the USGS delivers a broad suite of information tools that are made possible by our Advanced National Seismic System and the worldwide coverage of the Global Seismographic Network, which is a program involving USGS, the National Science Foundation, and the Incorporated Research Institutions for Seismology.

The ANSS consists of a national backbone network, regional networks that are operated by state and university partners, and the USGS National Earthquake Information Center, ground and structure-based instruments concentrated in high-hazard urban areas. With funding from Congress since

2000, USGS and its partners have installed more than 2,800 new and upgraded stations out of a total of 7,100 that are targeted in the ANSS plan for full implementation of the system. Investments in ANSS have greatly improved the information available for emergency responders, engineering performance studies, and long-term earthquake hazard assessments.

Recent earthquakes in Colorado, Oklahoma, and Virginia, that last one felt up and down the East Coast have underscored the national nature of earthquake risk. One of the most important achievements that NEHRP has made is the translation of research into national models of the location and expected severity of earthquake shaking within specified time periods. These models are in turn used to generate maps that are incorporated into the seismic safety elements of building codes and standards.

As you noted in your opening statement, earlier this month the USGS released the latest update of the National Seismic Hazard Maps, the timing coordinated with the consequent release of the next generation of model building codes and seismic safety standards, a process that involves close collaboration among USGS, FEMA, the Building Seismic Safety Council, American Society of Civil Engineers, International Code Council, and other organizations. Complementing the national maps, urban seismic hazard maps

provide more detailed information on local site conditions for use in engineering and planning most recently delivered for Evansville, Indiana.

Looking forward, the Administration's 2015 budget continues several initiatives that Congress supported in 2014. In particular, I wish to highlight Earthquake Early Warning, which we see as representing the next advance in public safety. Modern seismic networks can in favorable circumstances provide a minute or more of warning before the onset of strong shaking. In a number of countries around the world, operational earthquake early warning systems exist today. The USGS has supported research and development toward establishing such a capability in California and the test system is now operating and delivering warnings to a small group of test users. Considerable additional testing and equipment deployment will be required to create a robust and reliable warning system but we are on our way.

In conclusion, USGS and the Department of the Interior strongly support reauthorization of NEHRP. It has proven to be a successful partnership that continues to make valuable contributions to the Nation's resilience to earthquake and other hazards.

Thank you, Chairman, for the opportunity to provide the Subcommittee with the USGS views, and I would be pleased to answer any questions.

[The statement of Mr. Applegate follows:]

********** INSERT 7 **********

Chairman BUCSHON. Thank you very much.

I now recognize Mr. Wright for his testimony.

STATEMENT OF ROY E. WRIGHT

Mr. WRIGHT. Good morning, Chairman Bucshon, Ranking Member Lipinski, and members of the subcommittee, thank you for having me here today.

I am Roy Wright, the Deputy Associate Administrator for Mitigation within the Department of Homeland Security's Federal Emergency Management Agency. It is my pleasure to be here today to discuss the National Earthquake Hazards Reduction Program and FEMA's principal responsibilities within that program.

I want to start by giving you my simple bottom line. By including science into building codes, conducting outreach, and advancing mitigation, the NEHRP funds enable state-level efforts to better prepare for earthquakes. These actions make the Nation more resilient and better able to address this threatening hazard. As others have said this morning, these are no-notice events and they can be catastrophic. And we share the view that while earthquakes may be inevitable, disasters caused by earthquakes are not. This really guides everything that we do.

FEMA and our NEHRP partners have made significant

progress in earthquake safety since NEHRP was established 37 years ago. Although changing demographics and economic conditions present challenges, the program is committed to building on our progress, developing practical solutions to reduce or eliminate the earthquake risk, and ensuring our nation's continued resilience.

I would briefly like to talk with you this morning about two areas of our focus: building codes and education. In terms of building codes, NEHRP primarily works with the National Codes and Standards to promote implementation of research results. That is, we work with stakeholders to ensure the promotion of and use of those building codes so that we all can be safer. For example, FEMA worked with the International Code Council and other partners in the 2009 edition of the International Residential Code to develop updated provisions for braced sheer wall panels which help ensure the stability of the structure.

As you can see from the maps on the screens, adoption of these codes strong in some areas of the country, particularly those where they are most likely to experience an earthquake. It is something we are proud of and we have worked hard with our partners to achieve, but there is more to do. There are still too many areas where the risk is high but adequate building codes have not yet been adopted. This leaves these communities vulnerable to the impacts of potential

earthquakes. We still have much more that needs to be done and we are committed to educating these communities on best practices and the importance of earthquake hazard mitigation, which brings me to our second area of focus: education.

FEMA develops and supports public education and awareness programs on earthquake loss reduction, sharing best practices, and encouraging mitigation. We pursue all of this of course to create resilience and help ensure the safety of our citizens. I would like to give you but one example of our work in this area. After we were approached by the City of San Francisco, FEMA commissioned a study to examine whether it was possible to retrofit only the first story of a weak-story building without altering the rest. So a weak-story building is a multistory wood-framed building where the first floor is much weaker than the upper stories due to a garage or a storefront opening. FEMA published its findings and created an electronic tool that allows an engineer to assess the strength of walls on the first floor and upper floors. Then the engineer can virtually strengthen these walls and recalculate the strength. The goal is to strengthen the first floor just enough so the entire building can withstand an earthquake.

As a Nation, our architects, engineers, local officials, homeowners, and our federal partners, we all have an indispensable role in--to play in preparing for earthquakes

and mitigating their impacts. The NEHRP has done a commendable job in identifying the hazards, communicating the risks, and researching how we can protect our citizens. As we look forward to reauthorization, more must be done. It is not enough to educate the public about what earthquakes can do. Until we are able to convince the public to take action to address that risk, we have not truly implemented this program. We must continue to work together across the whole community to move beyond understanding risks to making concrete steps to mitigate and strengthen our collective resilience.

Thank you and I appreciate the opportunity to come before you this morning and I look forward to your questions.

[The statement of Mr. Wright follows:]

********** INSERT 8 **********

Chairman BUCSHON. Thank you very much. I would like to thank the witnesses for their testimony.

I am reminding the members that committee rules limit questioning to 5 minutes. The Chair at this point will open the round of questions. The Chair recognizes himself for 5 minutes.

Dr. Hayes notes in his testimony that maintaining the serviceability of lifeline systems is critical to societal resilience. What research and development is being supported through NEHRP related to lifelines in a seismic event and what more needs to be done? I will address that to Dr. Khargonekar first.

Mr. KHARGONEKAR. Chairman Bucshon, that is a very, very important question. We are funding research in this area at a number of institutions across the research universities in the United States. I don't have a list of projects that we are funding, but just to go back to the example I gave about--on high density polyethylene pipes is a major impact off the kind of work that NSF has supported in this space.

Chairman BUCSHON. You might just--when you do have that list might just submit that for the record so we will have that in the Congressional record what you are doing.

Anyone else have any other comments?

Dr. Hayes, you made this--you mentioned this in your testimony.

Mr. HAYES. Yes, sir. If I could just comment briefly, the NEHRP agencies are currently in the process of wrapping up a study with a contractor who is examining all of the issues related to lifelines research and implementation. That report should be out sometime in the next, oh, 60 to 90 days, and it outlines the kinds of things that NSF researchers at the basic level need to do, we need to do at the applied level, the kinds of things that USGS needs to do, the kinds of things that FEMA needs to do to implement lifelines safety efforts as well.

And one of the key issues there is that lifelines are absolutely critical to societal resilience in any given community around the country, and one of the main findings so far has been that no matter whether it is an earthquake or some other hazard, the disruptions to lifelines are really critical and we hope the study will help point all of us in the future on what we should be doing in that area.

Mr. APPLEGATE. Just very briefly, one area that we have been working on is developing scenarios that sort of play out the impacts of events trying to make the hazard real to people before they have to go through the catastrophic event. And lifelines has been a very important part of that, getting the operators together, getting their input, understanding what those consequences--those cascading consequences are going to be, and enabling, particularly in

California and Southern California and now with the new focus on the Hayward Fault in the Bay Area on what those impacts--what can be done before the event to change those outcomes.

Chairman BUCSHON. Thank you.

Mr. Wright, part of the preparedness puzzle is learning how to work together and forming a seamless response and recovery effort. Can you comment on the coordination between federal, state, and local stakeholders and their roles in earthquake response? You had some of that in your testimony, but kind of talk about that a little more, and how do NEHRP stakeholders coordinate efforts with emergency responders?

Mr. WRIGHT. Absolutely. It is FEMA's responsibility to look across all hazards and ensure that we are prepared for them. And as we look at these seismic elements, very specific investments have been made. In 2011 there is a national-level exercise that looked across the New Madrid area where we brought together the totality of the federal family, but particularly working with the state emergency managers as well as the state and locals, we do this across the West Coast. And there is a particular relationship we share with the USGS on this by which we are directed to ensure that the kind of warnings and insights that can be given to us from the USGS then move its way out. That helps from a response and from a recovery. Obviously you look at

these larger earthquakes that played out in California, Loma Prieta, and Northridge where significant dollars were made available under the Disaster Relief Fund after the event, but collectively, it is that kind of integrated respond that we do and it is a long-standing relationship, particularly between myself and Dr. Applegate and others across our agencies to make that happen as cooperation with the state and locals.

Chairman BUCSHON. Yeah, because I think that is critically important along with the lifelines. The last earthquake I was in I was on the 6th floor of the hospital in Evansville, Indiana, and, you know, nothing happened but if that was an area where a hospital lost access to water and power, you know, that couldn't be restored quickly, it is a big issue. I didn't think it was an earthquake and the patient did. She said--she was an elderly lady and she said I think it is an earthquake. I said no, it can't be an earthquake. So I turned on the TV and sure enough, it was an earthquake.

I now recognize Mr. Lipinski for 5 minutes.

Mr. LIPINSKI. Thank you, Mr. Chairman. Thank you for holding this hearing. I am very hopeful that we can do a NEHRP reauthorization soon.

It was good to hear that--all the testimony today. I want to thank Dr. Applegate for work USGS has done with my

staff and with me. We have gone through a few conversations about an earthquake that I felt sitting at my kitchen table at home that was--we believe was induced by some quarrying activity and there is more work going on with that. But it was very helpful for me to be able to have those discussions to try to get at and understand what had happened there, so I thank you for--thank USGS for that.

I wanted to ask Dr. Khargonekar about social science research. You mentioned in your testimony of the involvement of social science research and NSF's efforts on earthquake research. How does social, behavioral, and economic research help with planning effective risk mitigation efforts and how does--how is SB research integrated into NSF's NEHRP activities?

Mr. KHARGONEKAR. Congressman Lipinski, thank you very much for that question, which is evidently very important.

If you think about resiliency, which is certainly one of the major objectives, people's behavior plays a huge role in terms of how we can achieve systems that can recover from a major disaster. NSF is funding a number of projects in that area out of the Directorate of Engineering. We have a program on Infrastructure Management and Extreme Events that funds social science type of research. For example, how do we communicate risk? How do people respond to those types of communications?

And things are changing. I mean with the mobile phones and cellular technologies and so forth, people are getting their information in very different ways than used to be the case before. We are funding research into the next frontier that can allow us to leverage all the advances in technology and couple it to people's perception of risk, the reactions to risk, and those types of activities. So we believe this to be a very important part of the research program. It is no good to come up with technological solutions that people don't use for improved public safety and the safety of themselves and their property and so on and so forth.

Mr. LIPINSKI. Thank you.

And I wanted to--the next thing I want to address is building codes and address this to Dr. Hayes and Mr. Wright. We know with strong and model building codes are often cited as the most effective tools for limiting the impact of earthquakes. How do model building codes in the United States compared to building codes in other countries such as Chile, Haiti, Japan, and New Zealand? And what have we--what lessons have we learned about the design of resilient structures from the recent earthquakes in these countries that I mentioned?

So, Dr. Hayes, do you want to begin?

Mr. HAYES. I think our current building codes are actually quite comparable to those that you would see in some

of the countries you mentioned, particularly New Zealand and Japan. They are not identical. They have evolved in slightly different ways, but the earthquake professional community around the world is extremely close-knit and the provisions that are in one country will bear a striking resemblance quite often to provisions in another country.

The NEHRP agencies try to study the earthquake events that occur in other countries to try to learn from them, particularly when the building codes in those countries lead to construction that is very similar to what we see in our country. And we are very conscious of the earthquake that occurred down in Chile that led to a lot of interest here in the United States and also the one in New Zealand that occurred that--in Christchurch.

And in Christchurch, frankly we haven't yet had a chance to study that much about it, but a couple of things that have leaped out at us about Christchurch is that the liquefaction that occurred in the area is very similar to liquefaction that could occur in many earthquake-prone areas in our country, particularly in the middle United States. And the older buildings in Christchurch that were severely damaged bear a striking resemblance to the kinds of brittle or non-ductal buildings that you would see in many cities in the United States, and I think there is a lesson there that we all carry that these older buildings are really something

that really need to be looked at very carefully in the future as we look at how we make our society more resilient.

In New Zealand also I think that there was a realization that a moderate earthquake which people had somewhat thought might happen could be much more damaging than perhaps it was expected to be in Christchurch. That was a devastating event there and the area has not fully recovered yet over 2 years later. It is still working on doing that.

In Chile, their primary means of construction down there was in reinforced concrete, and it turns out that in Chile they have adopted much of the American Concrete Institute's provisions for seismic design in our country but not all, and we have been studying what happened down there to learn from the--what went well and what didn't go so well in their buildings and have produced a couple of reports on that already.

Mr. LIPINSKI. End of my time but if the Chairman would allow Mr. Wright--do you have anything to add?

Mr. WRIGHT. Just briefly to build on that. I think that particularly the work we see in Japan and Chile and how that can be learned, we work with the other agencies that are here after those events in particular to see how those elements will perform. Again, we are on a 3-year cycle with the building codes in this nation by which we are continuing to make sure that those are being updated. The 2015 ones

have now been set. And we would look to the kinds of things that we will learn from Christchurch and Chile in terms of what it would mean to inform the next cycle.

Mr. LIPINSKI. Thank you.

Chairman BUCSHON. Thank you.

I will just--Chair--Dr. Khargonekar, go ahead.

Mr. KHARGONEKAR. Well, I just want--you know, in the spirit of the question, I would like to offer an example. We supported RAPID response team in Hawaii and Oregon State to perform high resolution survey of damaged coastline around Japan after the Tohoku Earthquake. Now, cutting long story short, they have collected data and their results are now being used by the committee working on Chapter 6 on tsunami loads and effects for ASCE 7 standards. So we think that that is a great example where we fund research to go collected data, do all the work, and it comes back in effect. So we think that once the ASCE 7 standards are opted, it will improve the whole building code in that particular section. Thank you.

Mr. LIPINSKI. Thank you.

Chairman BUCSHON. Thank you.

I now recognize Mr. Johnson for his line of questioning.

Mr. JOHNSON OF OHIO. Thank you, Mr. Chairman. And I want to thank our panel for being with us today.

You know, while your agencies are the four NEHRP

agencies as defined in statute, I understand that other agencies such as NASA also conduct seismic or earthquake-related research and activities. Have there been any related earthquake-related collaborations that your agencies participated in with other agencies? And if so, what were those agencies and can you give us any idea of the work that was done to help us better prepare for earthquakes? Any of you?

Mr. APPLEGATE. I can start on that one. Yeah, absolutely. It is a very good point. There are many different agencies that are involved in the earthquake arena and we actually have a White House Subcommittee on Disaster Reduction that brings together all of those agencies looking at different hazards and it is a way to bring this partnership in and coordinate with the broader effort.

With NASA, the USGS works very closely on, for example, SAR technology, Synthetic Aperture Radar, where you can use overlapping images to see change patterns. And so using that remote sensing technology that has been developed through NASA has been very valuable for understanding the damage patterns, for example, after events.

We also work very closely with the U.S. Nuclear Regulatory Commission. Of course they have very specific concerns and issues as they ensure the safety of the Nation's nuclear power plants and they have supported some tremendous

research looking at particularly some of these sort of very long-term--you know, the Black Swan type events and events in the eastern and central United States, so a number of other agencies that play a key role here.

Mr. JOHNSON OF OHIO. Okay. Thank you.

Anybody else?

Mr. KHARGONEKAR. On the disaster recovery side of the problem, we work closely with other agencies such as Department of Transportation, Department of Energy on developing plans on how one would recover from disasters. We have ongoing research projects and activities that bring together these communities.

Mr. JOHNSON OF OHIO. Okay. All right. Well, thank you.

Shifting gears just a little bit, talking about earthquake hazard mitigation, what type of research in your opinion is needed to better understand and encourage people to adopt earthquake hazard mitigation measures? I mean what is our greatest weakness in terms of our current approach to earthquake mitigation?

Mr. WRIGHT. Well, I will start. It is--the country's understanding of risk is a very difficult thing to somehow pierce through. We see this across many of the natural hazards by which they may understand that there is a hazard that could affect them but they somehow believe that it won't

necessarily impact them the day that it occurs, this kind of cognitive dissonance that sits there. And so it is that kind of partnership that goes towards that social science research that helps us get past those next kind of pieces.

You look across the Nation and, as I was showing the map of it earlier, about--there are high seismic risks in parts of the country, yet the element that we know does the most to help mitigate that related to building codes, many have not chosen yet to adopt those. And so these elements are things we continue to collaborate, particularly with the National Science Foundation, but others as well in terms of how do we link what we know on the seismic side with the social science side?

Mr. JOHNSON OF OHIO. So it is kind of ''it is not likely to happen to me'' syndrome that we are dealing with?

Mr. WRIGHT. That is exactly the case. And we struggle with this across a whole range of hazards that we would deal with in an emergency management space, but these kind of no-notice events that happen on sort of a severe or catastrophic level on a far less frequent basis really allow people's attention to them to erode.

Mr. KHARGONEKAR. I would like to just add a few comments to what was stated. You know, one of the questions you may ask is what is the impact of having insurance on people's behavior in adoption of solutions? So we funded

again collaborative research with colleagues in New Zealand because their situation is very similar to the United States' situation with respect to insurance, and we are funding research, we are collecting data from Christchurch to see what was the impact of having different kinds of insurance on people's behaviors and decisions, so it is sort of the social, behavioral science type of activity, and that complements what was said earlier.

Mr. JOHNSON OF OHIO. So do you have any examples of low-hanging fruit in overcoming that risk avoidance or lackadaisical attitude if you will? I guess that is a good way to phrase it. Any ideas on how we go about penetrating that? You talked about some of them but--

Mr. WRIGHT. I think part of what we have found when we deal with these issues some of it happens from a grassroots perspective but local elected leaders and particularly the economic drivers in the community often are the kind of place by which they are able to provide the kind of leadership in a State--you look at--there are particular things that happen in some of the major industries that are in the Memphis area and how they began to really lean forward in this space and work with those local electives to pay more attention to this kind of risk.

Mr. JOHNSON OF OHIO. Okay. Well, thank you.

Mr. Chairman, I yield back.

Chairman BUCSHON. Thank you.

I would like to just comment on what you talked about briefly and I think in healthcare we are acutely aware of people's lack of understanding of statistical probability. I think it may start in grade school where we are not doing a good enough job for people, in all seriousness, understanding statistics, and that is very important. Without that understanding, you can't really figure out what the risk is so--

Mr. WRIGHT. Without question.

Chairman BUCSHON. Yes.

Mr. Collins, I recognize you for 5 minutes.

Mr. COLLINS. Thank you, Mr. Chairman.

I am kind of a private sector guy. I am new to Congress but I have spent decades in the private sector, and I always come to work and when I tour companies now, the first thing I look for on the wall is a vision statement. Why did you come to work today? And a mission statement, what are we going to try to accomplish? And I always talk about 5-year strategic plan and so forth and so on, just very metric-driven and results-oriented.

So I guess with half the money--Dr. Applegate, for NEHRP, more or less half of it going to your agency, and I know you are natural hazards so that is beyond just earthquakes, but a simple question. Is there an underlying

vision statement and/or mission statement related to the work that we are doing on earthquakes that somebody would see when they come to work and say this is the Holy Grail? Or--and is there a strategic plan within your organization? And if so, are there like three things you could point to, ABC, that you accomplished last year and three more this year and three more next year, just kind of hard things?

Mr. APPLEGATE. Sure, absolutely. I mean I guess working in the broader hazards mission of the USGS and I oversaw these earthquake efforts previous to that, yeah, you know why you get up in the morning and it is about making the American people safer. It is as simple as that. It is a public safety mission. We are trying to ensure that science is there to help people when the event strikes so that we are providing the situational awareness, where the shaking is most intense, what the emergency managers need to be able to respond, what the public needs to know

But the most important things we do are what happens before the event and that is what a lot has been talked about here. We use our seismic hazard assessments to bring everything that we know about the hazard both from the fundamental research coming through NSF, as well as the targeted research we do that feeds then into the building code process and helps to make people safer. So you have the one element is the monitoring, the situational awareness; the

other is the assessment understanding so that you can build buildings that are going to be safe for people.

And the third piece of it is education. It is just what we were talking about. How do you make these hazards real to people? And so we do a lot with our agency partners in the public preparedness arena, the shakeout events which now--started in California but they now involve--I think we are up to about 38 of the States--FEMA has been a big supporter of this--to simply get people to participate and drop, cover, and hold drills and do one of the things to protect themselves.

Jack would be the best to talk about the broader NEHRP strategic plan. Within USGS, we have nested our earthquake hazards program plan within that broader NEHRP strategy as well as within our broader natural hazards mission.

Mr. COLLINS. Now, I would think early warning, you know, would go a long way. And I understand we have got a pilot program in California, but if there is probably anything that could truly save lives, you can't prevent the earthquake, but if somebody had even the--you know, the 1- or 2-minute warning, it--

Mr. APPLEGATE. Absolutely. I mean I think what we saw in the Japan, there are three key elements. I mean there were relatively low--from the magnitude 9 earthquake, giant earthquake that struck that country, relatively low

fatalities from the earthquake shaking itself, and that probably in the order of maybe 100, 150. That reflects three things. One of them is building codes. They were--people were in buildings that did not collapse, and that is I think the first thing and the most important. Then it is the--that public awareness, that culture. The third thing is they have early warning and so people did receive the notice before the shaking event so they could get themselves safe. There are a lot of things that can be done even with just a few seconds. And so we are trying to move towards that for that very reason.

Mr. COLLINS. Do you have a goal in mind there? Again, back to vision statements, is there a goal to have early warning at least in the most critical areas by date certain and is there a way to measure that? And--

Mr. APPLEGATE. Yeah. We have just recently issued an implementation plan for earthquake early warning for the West Coast, so that is--the beginning phase is the pilot effort in California expanding up the West Coast. But in many ways the high hazard areas, for example, in the central United States where you are likely to have shaking experience over very broad areas, you would actually get additional time before that shaking arrives, so less frequent events but the potential for damage over much broader areas. So, yeah, absolutely, we have those plans in place. We--and we would

be very happy to share those.

Mr. COLLINS. Yeah. No, thank you very much.

It looks like my time is expired. I yield back, Mr. Chairman.

Chairman BUCSHON. Thank you.

And at this point I would like to thank the witnesses for your valuable testimony. It is a very fascinating subject.

The members of the committee may have additional questions as we asked about the list of funding projects for you and we will ask you to respond to those in writing. The witnesses are excused, and at this point we will take a very short break prior to the next panel. Thank you very much.

[Recess.]

Chairman BUCSHON. Thank you very much. Now, I will introduce our witnesses for our second panel.

Our first witness of our second panel is Dr. Julio Ramirez. Dr. Ramirez is Professor of Civil Engineering, Chief Officer of the Network for Earthquake Engineering Simulation and NEEScomm Center Director at the George E. Brown, Jr. Network for Earthquake Engineering Simulation at Purdue University. And I have visited their facility; it is a great facility.

Our second witness is Dr. William Savage, Manager of William Savage Consulting, LLC. He is also an Adjunct

Professor in the Department of Geoscience and Department of Civil and Environmental Engineering and Construction at the University of Nevada Las Vegas.

Our third witness is Mr. Jonathan Monken, Director of the Illinois Emergency Management Agency. Mr. Monken previously served as Acting Director of the Illinois State Police and possesses a distinguished military career having served in Kosovo and Iraq. Thank you for that service. It is much appreciated.

Our final witness is Dr. Andrew Whittaker. Dr. Whittaker is Professor and Chair of the Department of Civil, Structural, and Environmental Engineering at the University at Buffalo, and the Director of MCEER.

As our witnesses know, spoken testimony is limited to 5 minutes each, after which members of the committee will ask questions for 5 minutes. Your written testimony will be included in the record of the hearing.

I now recognize our first witness, Dr. Ramirez, for 5 minutes.

STATEMENTS OF JULIO A. RAMIREZ, PROFESSOR OF CIVIL ENGINEERING, NEES CHIEF OFFICER AND NEESCOMM CENTER DIRECTOR, GEORGE E. BROWN, JR., NETWORK FOR EARTHQUAKE ENGINEERING SIMULATION, PURDUE UNIVERSITY; WILLIAM U. SAVAGE, CONSULTING SEISMOLOGIST, WILLIAM SAVAGE CONSULTING, LLC; JONATHAN MONKEN, DIRECTOR AND HOMELAND SECURITY ADVISOR, ILLINOIS EMERGENCY MANAGEMENT AGENCY; AND ANDREW S. WHITTAKER, PROFESSOR AND CHAIR, DIRECTOR MCEER, DEPARTMENT OF CIVIL, STRUCTURAL, AND ENVIRONMENTAL ENGINEERING, UNIVERSITY AT BUFFALO, STATE UNIVERSITY OF NEW YORK

STATEMENT OF JULIO A. RAMIREZ

Mr. RAMIREZ. Good morning and thank you for the opportunity, Chairman Bucshon, Congressman Lipinski, and distinguished members of the panel, to testify before the Congress as you work to reauthorize the National Earthquake Hazards Reduction Program, NEHRP.

I am Julio Ramirez, a Professor of Structural Engineering in the School of Civil Engineering of Purdue University in West Lafayette, Indiana, and the Chief Officer of the NSF-funded George E. Brown, Jr. Network for Earthquake Engineering Simulation, NEES.

Existing vulnerable buildings and infrastructure assets are the number one seismic safety problem in the United

States and the world today. Since the 1980s, I have been involved in the development of building codes and conducted research in earthquake safety of buildings and bridges. I have lead or participated in some eight reconnaissance missions starting with the earthquake of Northridge, California. The central purpose of these missions was to gather perishable data on the performance of bridges and buildings following major earthquakes to distill lessons to improve the seismic resilience of our society.

The NEHRP vision is for a nation that is earthquake-resilient with regard to public safety, economic strength, and national security. NEHRP provides the critical support structure for seismic protection in the United States. The NSF provides the fundamental research arm of NEHRP supporting research in engineering, Earth, and the social sciences. To mitigate the earthquake risk by reducing the vulnerability of the built environment, the NSF-funded NEES originated in 2004 as a national multiuser research infrastructure, and its central mission aligns with the larger NEHRP national plan for earthquake risk reduction. May I have the first slide, please?

[Slide.]

Mr. RAMIREZ. NEES laboratories are used for research conducted or funded by the NSF, other government agencies, and by private industry. To date, more than 400 multiyear,

multi-investigative projects have been completed or are in progress at NEES sites. These projects are yielding a wealth of valuable experimental data and continue to produce informational research and outcomes that impact the engineering practice from building models to design guidelines and codes.

Information on the impact of NEES work is submitted with my written testimony as Reference 3, ''NEES, 2004-2014, A Decade of Earthquake Engineering Research.'' In this document there are--there is information regarding lifelines projects that have been funded by NSF and many other references as well.

The human capital gain in this activity represented by the more than 2,000 graduate and undergraduate students that have participated in on-site of NEES researchers also supports the United States in retaining a competitive edge in the STEM areas. Many of the world's global challenges such as the mitigation of earthquake risk can best be met with a strong presence of engineers working in teams with social scientists and other experts, yet the number of U.S. engineering students is declining.

Purdue University and our College of Engineering have taken a leadership role as part of a national call to graduate 10,000 more engineers per year enhancing our state and national capacity for innovation, economic growth, and

solutions to global challenges.

Next slide, please.

[Slide.]

Mr. RAMIREZ. Linking the NEES experimental facilities to its users in the community is the NEES cyber infrastructure. This unique system of IT resources enables researchers participating at the facilities or remotely to collect, view, process, and store data from NEES experiments and to conduct numerical simulations with access to key U.S. high-performance computing resources.

At the heart of this system is NEEShub, a platform designed to facilitate information exchange and collaboration among earthquake engineering research and other stakeholders. NEEShub features the NEES Data Repository with over 2.5 million data files. This public repository is used to store and share data of research and research results.

Final slide, please.

[Slide.]

Mr. RAMIREZ. Since the first release of NEEShub in August 2010 it has served tens of thousands of users of more than 200 countries.

In conclusion, maintaining a balanced program supporting research and the Earth science, engineering, and social sciences is important. In achieving resilience of communities against earthquakes and tsunamis,

engineering-related research is of the highest priority as it directly impacts the mitigation of the extent of damage to the built environment and can reduce the time needed for recovery. Thank you.

[The statement of Mr. Ramirez follows:]

********** INSERT 9 **********

Chairman BUCSHON. Thank you very much.

I recognize Dr. Savage for 5 minutes for his testimony.

STATEMENT OF WILLIAM U. SAVAGE

Mr. SAVAGE. Thank you, Chairman Bucshon, Ranking Member Lipinski, and members of the subcommittee.

I am speaking to you today on behalf of the Seismological Society of America, a scientific organization devoted to the advancement of seismology and the understanding of earthquakes for the benefit of society. I also am speaking specifically about lifelines and my experience there devolves from 15 years working for Pacific Gas and Electric Company in San Francisco in the late '80s until 2000.

My written testimony--excuse me--addresses four pertinent questions that I was asked. Although there is not time this morning to cover all four, I would like to discuss the question asked about my views on the Nation's level of earthquake preparation and resiliency regarding lifelines, particularly the urban utility systems for electric power, natural gas, potable water, and wastewater. These systems are the underpinning of our modern society.

To get to the essential point, I personally think that we actually do not know how resilient our urban utilities

systems are in terms of their operability to deliver customer service after the next strong earthquake. Utility personnel may have opinions one way or another but they generally do not have a strong objective basis for a definitive statement.

In my written testimony I briefly discussed four guideline documents prepared by FEMA's American Lifelines Alliance that use currently available information to provide guidance for conducting such assessments for the four types of urban utility systems. The guidance calls for systematic and quantitative consideration of the two key aspects of each assessment. First, specification of the local and regional earthquake hazards, both ground shaking and ground failures; and secondly, estimation of the expected performance of the utility system components given the hazard and the impact of the performance on customers.

The American Lifelines Alliance guidelines can only go so far in giving a rigorous answer to questions about what would happen if this or that earthquake occurred. The next stage of lifeline resiliency assessment is calling for development of more refined hazard characterization using advances in geotechnical and seismological modeling to estimate ground motions and ground failures. The U.S. Geological Survey is already engaged in research that is leading to such advances.

Performance modeling of pipelines, substation equipment, overhead transmission structures, et cetera, is also advancing with NSF and NIST exploring research in these areas. Operating utilities and related professional organizations are evaluating the benefits of such advances and are likely to help fund them. These advances are necessary to achieve a high level of confidence in understanding the earthquake performance of lifeline components and thus the resiliency of utility operations. One of the mechanisms to pursue this goal is a reauthorized NEHRP program. Authorization of this valuable program provides continuity and stability for the NEHRP agencies.

In closing, I should point out the obvious. There are two ways to find out if a utility lifeline is resilient to earthquakes. The first way is to invest in improved hazard characterizations and performance models for lifelines and plans to mitigate the unacceptable risk. The second way is just wait and see what happens in the next damaging earthquake.

Thank you for the opportunity to speak before you and I would be happy to answer any questions you may have.

[The statement of Mr. Savage follows:]

********** INSERT 10 **********

Chairman BUCSHON. Yeah, hopefully we can use the former in that to figure this out.

I now recognize Mr. Monken for 5 minutes for his testimony.

STATEMENT OF JONATHAN MONKEN

Mr. MONKEN. Thank you very much, Chairman Bucshon, Ranking Member Lipinski. I very much appreciate the opportunity to be here to speak with all of you and represent the Illinois Emergency Management Agency, Governor Quinn, and the State of Illinois to discuss this incredibly important program of the National Earthquake Hazards Reduction Program.

So it is a critical asset not just in our ability to work with the earthquake hazard but all hazards because it is really about that collaborative nature that the program is really founded under.

My biggest concern right now with the program overall is that the collaborative nature in which it was founded to execute is something that we have kind of strayed from over the course of the past few years. And there is a variety of different reasons why that has happened, but right now, it comes at a time when the risk of this particular hazard, we are gaining a better understanding of it and we are certainly

seeing both increased frequency of seismic activity and we are getting a better understanding of the severity of the potential threat. And that was mentioned earlier with the USGS's release of their updated earthquake hazard maps and some of the statistics that we see just from the last few years.

So taken in context in Illinois and the central United States, that area of the country on average from 1981 to 2011 saw an average of 20 earthquakes per year. In the last 3 years we have seen a quintuple increase in the frequency of earthquakes to the tune of 100 earthquakes per year. So this in another itself is certainly concerning but it also highlights the importance of what we are talking about here.

Now, it is a little-known fact that the most powerful earthquake in the continental United States in history actually happened in the central United States in 1811 and 1812 when a 7.7 magnitude earthquake struck and two aftershocks. If a comparable magnitude earthquake struck today in the same area, it would cause economic damage to the total of about $300 billion. Put into context, Hurricane Katrina, the most expensive U.S. disaster in history to date, was $106 billion.

So there is a lot of progress that we can make in a lot of things that we have seen to make progress in this area in

the emergency management community. A specific example is the CAPSTONE-14 exercise conducted in June of this year when we had an opportunity for 2,500 personnel in 20 States to participate in this 4-day event. We beta-tested the first-ever multistate common operating picture sharing more than 13,000 real-time status updates of critical data from 440 counties and 7 impacted States. Additionally, we launched the first National Resource Database with more than 500 mission-ready packaged asset deploying from 18 different States across the country. The tools and processes created for this exercise have fundamentally changed the way we plan for, respond to, and recover from disasters of all types. Additionally, we developed awareness campaigns such as the Great U.S. ShakeOut with millions of people participating across the country. We also improved school safety drills and created public service announcements to educate those in areas of the country where the threat still remains a relative unknown.

Despite these successes, these efforts also served to identify gaps in our systems and capabilities, as well as the inherent weaknesses in our critical infrastructure and life-support systems. The problem in front of us now is, because of these issues, right now the track of NEHRP really threatens to not only lose some of the lessons that we have learned in recent years but really take us back to a time

that predates the existence of the program.

Some of these problems began with the expiration of the NEHRP authorization of 2009, as has been discussed extensively today, and the lack of reauthorization since then. This program absolutely deserves to be a legislative priority and balance should be restored in terms of how the program is governed and funded. While emergency management plays a significant role in earthquake preparation response and mitigation, only 1 of the 15 members of the NEHRP Advisory Committee actually come from the emergency management profession.

From a funding perspective, emergency management is also grossly underrepresented, receiving less than 7 percent of all funds allocated for this particular threat. To make matters worse, the state-level earthquake program managers are rapidly disappearing due to a decision by the Federal Emergency Management Agency pulling all state funding in federal fiscal year 2013.

The need for coordination between all levels of government has never been greater, and yet the program continues to lag behind at the federal level because of FEMA's NEHRP office being buried and fragmented within the agency. This disjointed approach makes it even more important for the earthquake consortia located throughout the State that perform that multistate coordination effort.

Language related to consortia absolutely needs to be restored as part of the authorization recognizing these entities as critical in the process of multistate coordination for these particular threats and along regional lines.

The most important change in research and development measures is a better integration of the components of the program. NEHRP was designed to be a hazard reduction program, not just hazard research, conducts more targeted risk assessments based on joint evaluations from program participants. These assessments should be focused on more detailed impact analysis and sectors of critical infrastructure such as road and bridge networks, rail systems, potable and wastewater systems, voice and data communications in the national power grid to use the limited resources that we have on the most important projects first.

I appreciate the time here today and I look forward to any questions that you might have.

[The statement of Mr. Monken follows:]

********** INSERT 11 **********

Chairman BUCSHON. Thank you very much.

I now recognize Dr. Whittaker for his testimony.

STATEMENT OF ANDREW S. WHITTAKER

Mr. WHITTAKER. Chairman Bucshon, Ranking Member Lipinski, and other members of the committee, good morning.

My name is Andrew Whittaker and I am delighted to appear before you this morning. I am an academic structural engineer employed as a Professor of Civil Engineering in the Department of Civil, Structural, and Environmental Engineering at the University at Buffalo and I serve as the Director of the earthquake-focused center known by the acronym MCEER.

Your letter of invitation asked me to respond to four specific items in my written testimony and I talk to only one today, one of the four today for reasons of time. And the question is what are your recommendations for research and development measures in earthquake preparation and mitigation?

The United States Geological Survey is building the Advanced National Seismic System, as identified previously by Dr. Applegate. Information from these instruments or the instruments in the system will permit refinement in the mapping of the earthquake hazard, the development of improved

ground motion prediction equations, and a much better understanding of how clusters of buildings respond to earthquakes, and importantly, the successful and complete deployment of the Advanced National Seismic System by the USGS will enable the Earthquake Early Warning System that was identified previously. ANSS is not being deployed at the speed originally envisioned and I recommend that ANSS be completed as quickly as possible and that its maintenance and use be adequately funded.

Second, the National Science Foundation has operated the NEES collaboratory since 2004. As Professor Ramirez noted, the equipment sites within the collaboratory offer unique physical testing capabilities ranging from geotechnical centrifuges to earthquake simulators to a tsunami wave basin. University at Buffalo is home to one of these NEES equipment sites. Professor Ramirez identified the benefits of NEES that have found their way into our building standards and building codes already. The NEES collaboratory will end in September 2014 to be replaced by a smaller number of equipment sites with an expanded treatment of hazards.

It is unclear what the impact on seismic risk reduction and earthquake resilience will be, but the momentum we have gained over the past decade will certainly be lost unless the National Science Foundation's support for earthquake engineering research is maintained at current levels or

increased.

Five subject areas deserving of future NEHRP resources are identified in my written testimony and these cut across the 18 elements of the National Research Council roadmap. I will focus here on three of the five. First, lifelines. Lifelines such as water, gas, and oil pipelines, power transmission systems, and rail lines and highways and bridges provide the core of resilience. Their failure or part thereof has led to significant cascading financial losses in past earthquakes and their unavailability after an earthquake dramatically slows response and recovery. The interdependency of lifelines and the regional and national economic and social impacts of their loss in the event of a major earthquake are not understood. Lifelines should be a focus of NEHRP because they substantially affect earthquake resilience and in my opinion have received far too little attention to date.

Progress has been made in the domain of performance-based earthquake engineering through NSF funding, NEES research, and the FEMA-funded ATC-58 project. Additional work is needed to refine the tools and calculation procedures, address other types of buildings and structural systems to better consider the effects of soil structure interaction and to extend the products to non-building structures.

Technology transfer and earthquake engineering has traditionally been accomplished by the promulgation of codes, standards, and guidelines. NEHRP has made many significant contributions to these standards, codes, and guidelines, and these efforts must be continued.

In the past 6 years, NIST has sponsored the preparation of technical briefs that transform basic and applied research into practical guidance for design professionals, enabling them to fully leverage federal investments in NSF and USGS, and this activity must also continue.

FEMA plays a critical role in implementing risk mitigation measures developed by its NEHRP agency partners and others, and I recommend that support for FEMA be substantially strengthened to enable effective implementation, which is the key to achieving resilience.

In closing, continued support at NEHRP is vital because the risk our nation faces measured here in terms of economic loss, business interruption, dislocation of social fabric, and casualties grows by the day because mission-critical infrastructure, property, and population density are increasing in locations affected by earthquakes. Our nation will not become earthquake-resilient if the NEHRP agency partnership with the earthquake professional community is ended.

Thank you for the opportunity to testify today.

[The statement of Mr. Whittaker follows:]

********** INSERT 12 **********

Chairman BUCSHON. Thank you very much for your testimony and thank all the witnesses. And be assured that your written testimony is critical to the committee even though we don't have a large number of Members here today. Your both spoken and written testimony is critical when we try to reauthorize these programs. So I wanted you to know that.

Also, I thank Mr. Monken because this past winter I had two family members stuck on I-57 for about 12 hours when you had that big snowstorm. But--I don't know if you were there then but--and your agency was very responsive trying to find out the status of my family. It was about 10 below 0 and there were accidents on 57 and people were stuck for a long time, so thank you. And I will take that personal privilege to thank your agency at this point.

Mr. MONKEN. You are very welcome, sir.

Chairman BUCSHON. And I am going to remind the Members that the committee rules limit questioning to 5 minutes.

The Chair at this point will recognize himself for 5 minutes. And I will direct this to Dr. Ramirez.

And I say this a little tongue-in-cheek, are all the major problems in earthquake engineering solved and should we now focus on solving problems in response and recovery?

Mr. RAMIREZ. Thank you, Chairman, for the question.

To improve the resilience of our society, it is

important not only to facilitate the road to recovery but also to limit the amount of damage that occurs after an event. And here is where mitigation plays a critical role not only in identifying the vulnerable infrastructure, assessing it properly, and then putting in place measures to upgrade its performance. Work is very much needed in that area and should be continued.

Chairman BUCSHON. And Purdue has--also to you, Dr. Ramirez, Purdue has pledged to increase the number of engineers graduated. How do undergraduate and graduate engineering students participate in the research funded by the National Science Foundation grant to Purdue and NEES, and how does that contribution to their success--how does that contribute to their success post-graduation?

Mr. RAMIREZ. Thank you. The contribution is essential in the development of the conduct of the research. They do it at various levels. One of the most successful programs in NEES is the research experience for undergraduates. Since the program was instituted about 8 years or so ago, close to 700 undergraduates have benefited from this experience. Of those, fully half of them have continued to do research as graduate students in the earthquake engineering field. Furthermore, in these last 2 years, graduates from the REU program have been now graduate students mentoring current REU students.

The graduate students are the blood of the research that is conducted throughout NEES, fully including Ph.D.'s and masters. Over 1,200 of them have gotten their degrees to Purdue. Of the Ph.D. students, 75 percent of them have gone into academia and are now many of them researchers in NEES as well.

Chairman BUCSHON. Thank you very much.

And this would be for all witnesses. What is the greatest weakness in the current approach to earthquake mitigation? Anyone want to tackle the question?

Mr. Monken.

Mr. MONKEN. So, first off, I was in the emergency operations center all night. I didn't sleep until everyone made it out at about 5:00 a.m.--

Chairman BUCSHON. You remember that, right?

Mr. MONKEN. Every--absolutely. January 6 I will not forget.

Chairman BUCSHON. Yeah.

Mr. MONKEN. I think for--when it comes to mitigation the hard part is the size of the elephant is enormous and trying to prioritize those efforts is where we run into significant issues. There is not enough funding in the world and there aren't enough programs in the world to address them all. And I think the untapped potential that exists with the members of the NEHRP really comes down to a more targeted

approach of risk assessment as we go through and identify the projects that are most critical. So when we look at those lifeline sources, that was articulated well by many of the witnesses here today, starting with some of those systems to be able to try and address some of the systemic weaknesses that exist within the systems I think will have the most significant impact in terms of loss of life and property. So that prioritization I think in mitigation is the biggest shortfall that we had today to make sure that we are making the best use of limited assets.

Chairman BUCSHON. How do we do that? How do we make that happen?

Mr. MONKEN. I think with a greater integration when we look at things like the exercises that we conduct and a better integration with the private sector. So the last exercise we conducted was extremely valuable because we had 45 companies running parallel exercises simultaneously to give us a better and more detailed understanding of that 85 percent of all critical infrastructure that resides within the private sector. So they can help us prioritize some of their efforts and we can do a better assessment holistically if we see that better cross-section of the research community embedded within the exercise programs of emergency management as well.

Chairman BUCSHON. Anyone else have any comments?

Dr. Savage.

Mr. SAVAGE. I think the uncertainty in the NEHRP organizations based on the lack of authorization of the program is a tremendous threat, and I think that action that you all are looking at is probably in the near term the most important thing that can be done.

Chairman BUCSHON. Thank you. Dr. Whittaker, you have--

Mr. WHITTAKER. Just a short comment. You asked what is the greatest weakness in risk mitigation? I would say not knowing our exposure. And in my written testimony have an example of the ports of L.A. and Long Beach through which 40 percent of our nation's imports flow. The loss of those ports would have a catastrophic financial impact on our nation, not just Southern California but the impact would stretch all the way across the country. We just don't yet know what those impacts would be. We don't know the interdependency of the lifelines. And until we know that, it is difficult to develop cost-effective mitigation strategies.

Chairman BUCSHON. Thank you.

I now recognize Mr. Lipinski.

Mr. LIPINSKI. I want to start off by thanking Dr. Ramirez for emphasizing the need for more training more engineers in our country. We certainly need more engineers in our nation and we need more engineers in Congress also I think.

Director Monken, I want to also thank you for your service to our nation and your service now to the State of Illinois. Obviously from what Chairman Bucshon was--the story he relayed, you are doing a good job there in some very tough times.

One question I wanted to ask Director Monken, how is the--how is your work with the Federal Government? Is there more that the Federal Government can be doing, sort of coordinating with States? Is there anything that you would recommend?

Mr. MONKEN. Yeah, I think there is a couple issues that are out there right now. One is that the National Earthquake Program is not treated similarly to other catastrophic hazards, specifically hurricane is an example. So the National Earthquake Program does not have a dedicated program manager; there is not an STS-level individual at FEMA dedicated to the earthquake program. It is currently housed in Mitigation, which is not obviously an unimportant component of what we are talking about. It is hugely important. However, it does not give--because of its presence in Mitigation, it doesn't give it full access to the capacity of FEMA as the hurricane program has in the response and recovery division in terms of access to funding, additional resources, things like that.

And then as I mentioned in my testimony, the removal of

funding directly to States to fund earthquake program managers at the state level being pulled in fiscal year 2013 has really created a situation now where we have very, very limited engagement. Right now, there are more FEMA regions that don't have an earthquake program manager than FEMA regions that do, and that is a huge problem because that is the point of coordination for emergency management nationally and it also underscores the importance of these consortia, the three earthquake consortia located throughout the United States that are region-specific. And they perform an incredible task of that state-to-state coordination and yet have not seen any changes in their funding or programmatic or policy-level support in the past 20 years. So the lack of emphasis on some of those grassroots coordinating programs I think has had a detrimental effect.

Mr. LIPINSKI. And one other question I wanted to ask, as you notice a theme here, I am an engineer. I am also a social scientist. I have always asked about the social science aspects of--in the issue we are dealing with and the research and how you deal with the human element.

So I want to start with Director Monken. What kind of work do you do to try to ensure that people of the State of Illinois understand the risks from earthquakes? Is this a--do you find this to be a big problem? I know most people are going to think more about tornadoes than they do about

earthquakes, but how does all of that come together? And what you do in terms of trying to make people aware of the risk and also to prepare in--so that they know what to do in case there is a major earthquake?

Mr. MONKEN. Yes, sir. It is a great question and I think it is accurately highlighted as a significant issue. We have had 11 declared disasters in Illinois in the last 5 years, none of which were earthquakes, so that is really where a lot of the emphasis happened. But I think some of the public awareness campaigns that we have done, the areas where we have had specific success is certainly within schools and that is where Chairman Bucshon was right on. Elementary school students, these are the folks actually retain this information for the rest of their lives. Adults have made up their minds for all intents and purposes. In trying to reach out to students and educate them on those threats, there is the educational component that exists with it and that extends through the development and training of engineers at all levels. All those levels of understanding are important.

We also saw that our PSAs were actually generated by high school and college students in the States, so we actually put it to them to come up with public awareness campaigns, videos, and radio bits that were much more effective in actually reaching their peers instead of a

government person like myself trying to relate to a 12-year-old and telling them why this is important. Have another one of their fellow students communicate that message to them.

And the ShakeOut grew from just a handful of, you know, a few thousand people the first year to the annual competition between Illinois and Indiana to see who can get more people to participate and over 10 million people participating nationally last year, those are successes that really need to be reinforced.

Mr. LIPINSKI. Thank you, and I appreciate all of the witnesses' comments on NEHRP, and again I emphasize that hopefully we will get reauthorization done. And I think all of your comments have--are very helpful to us as we work to move that forward.

So I yield back.

Chairman BUCSHON. Thank you.

I recognize Mr. Hultgren.

Mr. HULTGREN. Thank you, Chairman. Thank you so much, panel, for being here. I think this is really important for us to be able to hear how NEHRP affects practitioners, especially those at, you know, state and local level, really on the ground, so I really thank you. And I especially want to thank Dr. Monken. So good to have you here. I appreciate your service to our country and to our State, and please say

hi to your family back in St. Charles as well.

Mr. MONKEN. Yes, sir. Will do.

Mr. HULTGREN. I am glad you are here.

Director Monken, I wanted to address a couple questions to you first if I could. First, does NEHRP program--does the program produce actionable data for the emergency management community? If so, what types of data are produced, shared, and utilized, and how are technical guidance, behavior research, and other information produced by NEHRP agencies shared with local stakeholders?

Mr. MONKEN. So the answer is yes and no. So there is actually an incredible amount of information and data that is generated from the entities that are represented here as witnesses today and many other folks who are not, but the hard part is turning information into intelligence, and the difference is whether or not it is actionable. And we have gotten a good partnership with U.S. Geological Survey. We had been able to use some of there what they call the PAGER program where people can actually report ground shake from their mobile phones to give us a clear picture of what is happening and to what extent the ground is shaking. Those things are all very, very important.

What we want to do is tie it together in a more practical sense and have a more collaborative outreach between emergency management to make sure that those efforts

are as integrated as possible to make sure that the time being spent on research is targeted to the areas with greatest impact in terms of lives and property saved and really trying to make sure that it is more of a user-defined system.

So some of the information-sharing that we pilot-tested during the exercises here was unprecedented. Four hundred and forty counties in seven States have never shared data in any way, shape, or form in any disaster in U.S. history. I can't overstate the importance of that. But the research community absolutely needs to be integrated into that process to make sure that the models that are being generated and research are being compared and utilized to effectively execute the exercise.

Mr. HULTGREN. Is there an openness you think for that, first of all recognizing that the successes of the pilot program but then seeing potential hurdles and dealing with those hurdles? Is there an openness there? I guess how can we help?

Mr. MONKEN. Yes, sir. Well, certainly the reauthorization of the program is hugely important and some of the changes I mentioned at FEMA I think would go a long way to making sure we are doing that, and then supporting the consortia because that is--CUSEC, the Central United States Earthquake Consortium that Illinois and Indiana are part of,

was actually the organization that ran that exercise. It wasn't a federally led effort. So reinforcing that type of success is absolutely important.

But I think it is fertile ground. Everybody wants the same thing when it comes down to it. The hard part is making sure, as I mentioned, the NEHRP Advisory Council out of 15 people only has one emergency manager on it. It is very difficult to understand local and state impact when they are not represented on that group that is consulting on how we should be guiding the program. So that is hugely important.

But I think it is fertile ground to do it and I think the folks that are doing the research, they want that input; they want that interplay because it only makes their research more targeted and more effective just like we want access to that information to build our exercises around and then ultimately compare that to a real-world event.

Mr. HULTGREN. Dr. Monken, I wondered if you could address--quickly, we touched on this a little bit--but if you could talk a little bit more about the state of research and development for hazard mitigation tools and products. These activities must meet the needs of state and local officials who must prepare their communities for disaster and help them respond. How well do NEHRP activities meet state and local needs and how could efforts be better aligned? We kind of

touched on that already, but what are the lessons that can be drawn from the resilience demonstrated in responding to a moderate earthquake and in preparing for a great one?

Mr. MONKEN. So I think the issues that we have seen that we have run into is in large part some of the state and local mitigation programs are very compartmentalized. So each of the programs or proposals are analyzed individually. So as we go through the FEMA process for spending mitigation dollars, each program is evaluated on its own merits without a great deal of consideration for the interconnectivity with corresponding projects in the same area of impact within the same scope of the hazard.

So I think that component needs to be brought to bear in more detail, not to mention the fact that in many cases if it is the private sector that benefits specifically from it, so if it is a utility company that has a mitigation project they want to do, that is not something that we do within the federal mitigation program. So how do we coordinate their efforts to make sure that we don't build, as we like to say, cylinders of excellence or these individual silos that are--that have these pockets of competency that aren't really tied into the interconnectivity of these lifeline systems that are out there?

So that is where the private sector outreach comes into play. So utility companies alone, there are 3,000 utility

providers in the country, and trying to tie those folks together is difficult but they are willing participants to do it. And I think some of the issues are really known. If an earthquake like this hit the central United States, power would be out for 6 to 9 months, not days or weeks.

Mr. HULTGREN. Yeah. Well, my time is coming to a close. Thank you again, all of you, for being here. I appreciate your input on this important program.

Thank you. I yield back.

Chairman BUCSHON. Thank you.

At this point I will thank all the witnesses for your valuable testimony. Like I said, your written testimony--your spoken testimony is very important to the committee and for the members for their questions.

The members of the committee may have additional questions for you and we will ask you to respond in writing. The record will remain open for 2 weeks for additional comments and written questions from members.

At this point the witnesses are excused and the hearing is adjourned.

[Whereupon, at 11:49 a.m., the Subcommittee was adjourned.]

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SPEAKER LISTING
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LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives

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August 28, 2014

Dr. Pramod P. Khargonekar
Assistant Director
Directorate of Engineering
National Science Foundation
4201 Wilson Blvd.
Arlington, VA 22230

Dear Dr. Khargonekar,

On behalf of the Subcommittee on Research and Technology, I want to express my appreciation for your participation in the July 29, 2014 hearing titled, "A Review of the National Earthquake Hazards Reduction Program."

I have attached a verbatim electronic transcript of the hearing for your review. The Committee's rule pertaining to the printing of transcripts is as follows:

> *The transcripts of those hearings conducted by the Committee and Subcommittees shall be published as a substantially verbatim account of remarks actually made during the proceedings, subject only to technical, grammatical, and typographical corrections authorized by the person making the remarks involved.*

Transcript edits, if any, should be submitted no later than September 11, 2014. If no edits are received by the above date, I will presume that you have no suggested edits to the transcript.

I am also enclosing questions submitted for the record by Members of the Committee. These are questions that the Members were unable to pursue during the time allotted at the hearing, but felt were important to address as part of the official record. Responses to the enclosed questions must be received no later than September 11, 2014.

All transcript edits should be submitted to me and directed to the attention of Christian Rice at Christian.Rice@mail.house.gov. If you have any further questions or concerns, please contact Mr. Rice at 202.225.6371.

Thank you again for your testimony.

Sincerely,

Larry Bucshon
Chairman
Subcommittee on Research
and Technology

cc: Rep. Dan Lipinski
Ranking Member
Subcommittee on Research and Technology

Enclosures: Transcript

HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY

"A Review of the National Earthquake Hazards Reduction Program"

Dr. Pramod P. Khargonekar, Assistant Director, Directorate of Engineering, National Science Foundation

Question submitted by Rep. Larry Bucshon, Chairman, Subcommittee on Research and Technology

1. Following-up on my question during the hearing, please provide a list of the research and development being supported through NEHRP related to lifelines in a seismic event.

YORK STENOGRAPHIC SERVICES, INC.

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A REVIEW OF THE NATIONAL EARTHQUAKE HAZARDS REDUCTION PROGRAM

Tuesday, July 29, 2014

House of Representatives,

Subcommittee on Research and Technology

Committee on Science, Space, and Technology

Washington, D.C.

The Subcommittee met, pursuant to call, at 10:04 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Larry Bucshon [Chairman of the Subcommittee] presiding.

Chairman BUCSHON. Thank you, Dr. Hayes.

I now recognize Dr. Khargonekar for his testimony.

STATEMENT OF PRAMOD KHARGONEKAR

Mr. KHARGONEKAR. Chairman Bucshon, Ranking Member Lipinski, and other distinguished members of the subcommittee, it is my pleasure to be able to testify before you today on the topic of National Science Foundation's activities in earthquake hazards reduction. I am Pramod Khargonekar, Assistant Director for Engineering at NSF.

Since the start of NEHRP, NSF has supported a broad range of fundamental research in geosciences, engineering, and social sciences relevant to the understanding of the causes and impacts of earthquakes. The Foundation also provides support for education of new scientists and engineers, the integration of research and education, and outreach to professionals and the public. Today, I would very briefly like to outline NSF's NEHRP efforts related to facilities, research, and coordination.

NSF funds three distributed multiuser national facilities that support critical fundamental research relevant to NEHRP. The George E. Brown, Jr. Network for Earthquake Engineering Simulation, or NEES, ~~the Geodetic Facilities for the Advancement of Geoscience and EarthScope,~~ Geodesy Advancing Geosciences and EarthScope,

or GAGE, and the Seismological Facilities for the Advancement of Geoscience and EarthScope, or SAGE.

NEES currently provides access to 14 earthquake simulation experimental facilities located in eight States. The NEES facilities include shake tables, large-scale labs, geotechnical centrifuges, field testing equipment, and a tsunami wave basin. NEES operations are currently supported through an award at Purdue University covering the fiscal years 2010 to 2014. Following 2014, NSF has updated its strategy for the future of NEES operations, which will include NSF support for multiple NEES awards managed under a single program. This strategy maintains the NSF commitment to earthquake research and infrastructure while aligning it more strategically under a multi-hazards approach.

The GAGE and SAGE facilities provide key data, instrumentation, and educational information and basic research and education in the Earth sciences. Of particular relevance to NEHRP, SAGE supports the Global Seismographic Network, GSN, a worldwide array of 153 permanent seismic stations funded by NSF and USGS with additional support from the Departments of Energy, State, and Defense.

Complementing these facilities, NSF funds a wide range of fundamental research into the processes that drive and control earthquakes and into the impacts of earthquakes on the built environment. This includes individual

investigative grants, research centers, and a variety of research collaborations.

NSF also supports rapid response activities to gather data from disaster sites using its RAPID funding mechanism. In the response to recent earthquakes in New Zealand and Japan, NSF supported over 30 RAPID awards.

Another research effort conducted in partnership by NSF and USGS is EarthScope, an Earth science program to explore the structure of North America and provide a framework of broad integrated studies. Scientists using EarthScope data are developing a comprehensive understanding of the structure, dynamics, and evolution of North America.

NSF supports multiagency collaboration on NEHRP activities through a variety of matters. In addition to research collaboration, NSF activity contributes to the NEHRP Program Coordination Working Group and the Interagency Coordinating Committee.

Finally, NSF staff regularly briefs the NEHRP Advisory Committee for earthquake hazards reduction and responds with recommendations for NSF.

In closing, I would like to leave you with two quick examples of some recent achievements of NSF-funded grantees. NSF-funded researchers have discovered how to make underground water lines that bend and move rather than snap and rupture in an earthquake. The Cornell team found that

medium and high density polyethylene pipelines remain intact even when the Earth liquefies and shifts. The City of Los Angeles is now installing these pipelines in Elizabeth Tunnel, which provides half the city's water supply.

The second example concerns ports. In 2005 NSF supported a research project led by Georgia Tech which examined the seismic vulnerability of ports. Project researchers found that a majority of the ports located in the areas of high seismic risk had either no or only informal seismic risk mitigation plans. Utilizing unique NEES facilities, the project team developed a new approach for assessing and managing seismic risk in container ports.

Mr. Chairman, NEHRP is a strong and dynamic program at NSF and we hope to continue to support research, education, and facilities to mitigate the impacts of earthquake hazards. I thank the Subcommittee for considering priorities for reauthorization of the program and appreciate the opportunity to testify today. Thank you.

[The statement of Mr. Khargonekar follows:]

********** INSERT 6 **********

Chairman BUCSHON. Thank you very much. I would like to thank the witnesses for their testimony.

I am reminding the members that committee rules limit questioning to 5 minutes. The Chair at this point will open the round of questions. The Chair recognizes himself for 5 minutes.

Dr. Hayes notes in his testimony that maintaining the serviceability of lifeline systems is critical to societal resilience. What research and development is being supported through NEHRP related to lifelines in a seismic event and what more needs to be done? I will address that to Dr. Khargonekar first.

Mr. KHARGONEKAR. Chairman Bucshon, that is a very, very important question. We are funding research in this area at a number of institutions across the research universities in the United States. I don't have a list of projects that we are funding, but just to go back to the example I gave about ~~—en~~ high density polyethylene pipes, this is a major impact off the kind of work that NSF has supported in this space.

Chairman BUCSHON. You might just--when you do have that list might just submit that for the record so we will have that in the Congressional record what you are doing.

Anyone else have any other comments?

Dr. Hayes, you made this--you mentioned this in your testimony.

of the countries you mentioned, particularly New Zealand and Japan. They are not identical. They have evolved in slightly different ways, but the earthquake professional community around the world is extremely close-knit and the provisions that are in one country will bear a striking resemblance quite often to provisions in another country.

The NEHRP agencies try to study the earthquake events that occur in other countries to try to learn from them, particularly when the building codes in those countries lead to construction that is very similar to what we see in our country. And we are very conscious of the earthquake that occurred down in Chile that led to a lot of interest here in the United States and also the one in New Zealand that occurred that--in Christchurch.

And in Christchurch, frankly we haven't yet had a chance to study that much about it, but a couple of things that have leaped out at us about Christchurch is that the liquefaction that occurred in the area is very similar to liquefaction that could occur in many earthquake-prone areas in our country, particularly in the middle United States. And the older buildings in Christchurch that were severely damaged bear a striking resemblance to the kinds of brittle or non-ductal buildings that you would see in many cities in the United States, and I think there is a lesson there that we all carry that these older buildings are really something

non-ductile

have now been set. And we would look to the kinds of things that we will learn from Christchurch and Chile in terms of what it would mean to inform the next cycle.

Mr. LIPINSKI. Thank you.

Chairman BUCSHON. Thank you.

I will just--Chair--Dr. Khargonekar, go ahead.

Mr. KHARGONEKAR. Well, I just want--you know, in the spirit of the question, I would like to offer an example. We supported a RAPID response team in Hawaii and Oregon State to perform a high resolution survey of damaged coastline around Japan after the Tohoku Earthquake. Now, cutting long story short, they have collected data and their results are now being used by the committee working on Chapter 6 on tsunami loads and effects for ASCE 7 standards. So we think that that is a great example where we fund research to go collect data, do all the work, and it comes back in effect. So we think that once the ASCE 7 standards are ~~prted~~ adopted, it will improve the whole building code in that particular section. Thank you.

Mr. LIPINSKI. Thank you.

Chairman BUCSHON. Thank you.

I now recognize Mr. Johnson for his line of questioning.

Mr. JOHNSON OF OHIO. Thank you, Mr. Chairman. And I want to thank our panel for being with us today.

You know, while your agencies are the four NEHRP

adopted

research looking at particularly some of these sort of very long-term--you know, the Black Swan type events and events in the eastern and central United States, so a number of other agencies that play a key role here.

Mr. JOHNSON OF OHIO. Okay. Thank you.

Anybody else?

Mr. KHARGONEKAR. On the disaster recovery side of the problem, we work closely with other agencies such as Department of Transportation ~~Department of Energy~~ on developing plans on how one would recover from disasters. We have ongoing research projects and activities that bring together these communities.

Mr. JOHNSON OF OHIO. Okay. All right. Well, thank you.

Shifting gears just a little bit, talking about earthquake hazard mitigation, what type of research in your opinion is needed to better understand and encourage people to adopt earthquake hazard mitigation measures? I mean what is our greatest weakness in terms of our current approach to earthquake mitigation?

Mr. WRIGHT. Well, I will start. It is--the country's understanding of risk is a very difficult thing to somehow pierce through. We see this across many of the natural hazards by which they may understand that there is a hazard that could affect them but they somehow believe that it won't

necessarily impact them the day that it occurs, this kind of cognitive dissonance that sits there. And so it is that kind of partnership that goes towards that social science research that helps us get past those next kind of pieces.

You look across the Nation and, as I was showing the map of it earlier, about--there are high seismic risks in parts of the country, yet the element that we know does the most to help mitigate that related to building codes, many have not chosen yet to adopt those. And so these elements are things we continue to collaborate, particularly with the National Science Foundation, but others as well in terms of how do we link what we know on the seismic side with the social science side?

Mr. JOHNSON OF OHIO. So it is kind of ''it is not likely to happen to me'' syndrome that we are dealing with?

Mr. WRIGHT. That is exactly the case. And we struggle with this across a whole range of hazards that we would deal with in an emergency management space, but these kind of no-notice events that happen on sort of a severe or catastrophic level on a far less frequent basis really allow people's attention to them to erode.

Mr. KHARGONEKAR. I would like to just add a few comments to what was stated. You know, one of the questions you may ask is what is the impact of having insurance on people's behavior in adoption of solutions? So we [redacted]

check this one

a potential area of future

collaborative research with colleagues in New Zealand because their situation is very similar to the United States' situation with respect to insurance, ~~and we are funding research,~~ we are collecting data from Christchurch to see what was the impact of having different kinds of insurance on people's behaviors and decisions, so it is sort of the social, behavioral science type of activity, and that complements what was said earlier.

Mr. JOHNSON OF OHIO. So do you have any examples of low-hanging fruit in overcoming that risk avoidance or lackadaisical attitude if you will? I guess that is a good way to phrase it. Any ideas on how we go about penetrating that? You talked about some of them but--

Mr. WRIGHT. I think part of what we have found when we deal with these issues some of it happens from a grassroots perspective but local elected leaders and particularly the economic drivers in the community often are the kind of place by which they are able to provide the kind of leadership in a State--you look at--there are particular things that happen in some of the major industries that are in the Memphis area and how they began to really lean forward in this space and work with those local electives to pay more attention to this kind of risk.

Mr. JOHNSON OF OHIO. Okay. Well, thank you.

Mr. Chairman, I yield back.

House Committee on Science, Space and Technology Subcommittee on Research and Technology

"A Review of the National Earthquake Hazards Reduction Program"

Pramod P. Khargonekar, Assistant Director, Directorate of Engineering, National Science Foundation

Questions submitted by Rep. Larry Bucshon, Chairman,

Subcommittee on Research and Technology

Following up on my questions during the hearing, please provide a list of the research and development being supported through NEHRP related to lifelines in a seismic event.

National Science Foundation Support for Impacts of Seismic Events on Lifelines in the National Earthquake Hazards Reduction Program

The *National Earthquake Hazards Reduction Program (NEHRP) Strategic Plan for Fiscal Years 2009-2013* (Reference 1) addresses earthquake mitigation of critical infrastructure lifelines through the Plan's following strategic priorities and goals/objectives:

- One of the nine Strategic Priorities: "Develop guidelines for earthquake-resilient lifeline components and systems."
- Goal A, Objective 2: Advance understanding of earthquake effects on the built environment: "NEHRP will support basic research to advance scientific and engineering knowledge of earthquake effects on the built environment. This research will contribute to developing cost-effective design methodologies and technologies for mitigating these effects on soils, lifelines, existing structures, and new construction."
- Goal B, Objective 8: Develop tools to improve the seismic performance of critical infrastructure: "NEHRP will use the results of basic research in earthquake-resistant design and construction to develop technologies and measures suitable for system-wide mitigation in new and existing infrastructure lifelines... and critical facilities (e.g., facilities critical to public health, business continuity, or key economic or governmental functions)."

The NEHRP Strategic Plan, published in 2008, links infrastructure lifelines to critical infrastructure as defined by the Department of Homeland Security's *National Infrastructure Protection Plan*, 2006 (Reference 2). This critical infrastructure includes communications, energy, transportation, and water and wastewater systems.

NSF supports research on earthquake effects on lifelines through special program solicitations, core research programs, rapid response research (RAPID) grants, and the George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES) lifelines facility at Cornell University supported during fiscal years 2005 - 2014 under the NSF NEES operations umbrella award 0927178 to Purdue University. The attachment provides a list of active NSF awards that include a research focus on the impacts of seismic events on lifelines and recently expired NSF RAPID awards of short duration that investigated the impacts on lifelines of major seismic events during 2010 - 2011 in Haiti, Chile, Japan, and New Zealand.

Special Solicitations

As FY 2013 and FY 2015 activities, NSF program solicitations 12-610 and 14-581, Interdisciplinary Research in Hazards and Disasters (Hazards SEES)., are a joint activity among the Directorates for Geosciences (GEO); Computer and Information Science and Engineering (CISE); Engineering (ENG); Mathematical and Physical Sciences (MPS); Social, Behavioral and Economic Sciences (SBE); and the Office of Integrative and International Affairs (OIIA). Below is a synopsis of this solicitation:

> "The overarching goal of Hazards SEES is to catalyze well-integrated interdisciplinary research efforts in hazards-related science and engineering in order to improve the understanding of natural hazards and technological hazards linked to natural phenomena, mitigate their effects, and to better prepare for, respond to, and recover from disasters. The goal is to effectively prevent hazards from becoming disasters. Hazards SEES aims to make investments in strongly interdisciplinary research that will reduce the impact of such hazards, enhance the safety of society, and contribute to sustainability. The Hazards SEES program is a multi-directorate program that seeks to: (1) advance understanding of the fundamental processes associated with specific natural hazards and technological hazards linked to natural phenomena, and their interactions; (2) better understand the causes, interdependences, impacts and cumulative effects of these hazards on individuals, the natural and built environment, and society as a whole; and (3) improve capabilities for forecasting or predicting hazards, mitigating their effects, and enhancing the capacity to respond to and recover from resultant disasters.
>
> Hazards SEES seeks research projects that will productively cross the boundaries of the atmospheric and geospace, earth, and ocean sciences; computer and information science; cyberinfrastructure; engineering; mathematics and statistics; and social, economic, and behavioral sciences. Successful proposals will integrate across these

multiple disciplines to promote research that advances new paradigms that contribute to creating a society resilient to hazards. Hazards SEES intends to transform hazards and disaster research by fostering the development of interdisciplinary research that allows for appropriately targeted data collection, integration, and management; modeling (including predictive models for real-time decision making); visualization and simulation; data analytics and data-driven discovery; real-time sensing; cross-cutting knowledge development; and synthesis of applicable models and theory. Proposals must demonstrate the inclusion of the appropriate expertise to address the research questions, hypotheses, and problems being posed. Hazards SEES research projects should be designed around one or more locations, identifiable hazards, and/or themes. Furthermore, Hazards SEES research should train the next generation of scientists for interdisciplinary hazards and disaster research."

As an FY 2014 activity, NSF supported program solicitation NSF 14-524, Resilient Interdependent Infrastructure Processes and Systems (RIPS), through the Directorates for CISE, ENG, and SBE. The anticipated funding amount is $15,000,000 and up to 20 awards will be made. Awards will be made by end of FY 2014. Below is a synopsis of this solicitation:

"Critical infrastructures are the mainstay of our nation's economy, security and health. These infrastructures are interdependent. For example, the electrical power system depends on the delivery of fuels to power generating stations through transportation services, the production of those fuels depends in turn on the use of electrical power, and those fuels are needed by the transportation services.

The goals of the **Resilient Interdependent Infrastructure Processes and Systems** (RIPS) solicitation are (1) to foster an interdisciplinary research community that discovers new knowledge for the design and operation of infrastructures as processes and services (2) to enhance the understanding and design of interdependent critical infrastructure systems (ICIs) and processes that provide essential goods and services despite disruptions and failures from any cause, natural, technological, or malicious, and (3) to create the knowledge for innovation in ICIs to advance society with new goods and services. The objectives of this solicitation are:

- Create theoretical frameworks and multidisciplinary computational models of interdependent infrastructure systems, processes and services, capable of analytical prediction of complex behaviors, in response to system and policy changes.
- Synthesize new approaches to increase resilience, interoperations, performance, and readiness in ICIs.
- Understand organizational, social, psychological, legal, political and economic obstacles to improving ICI's, and identifying strategies for overcoming those obstacles.

The RIPS solicitation seeks proposals with transformative ideas that will ensure ICIs services are effective, efficient, dependable, adaptable, resilient, safe, and secure. Successful proposals are expected to study multiple infrastructures focusing on

them as interdependent systems that deliver services, enabling a new interdisciplinary paradigm in infrastructure research...Projects supported under this solicitation may undertake the collection of new data or use existing curated data depending on the category of award, and must recognize that a primary objective is integrative predictive modeling that can use the data to validate the models and which can be integrated into decision making."

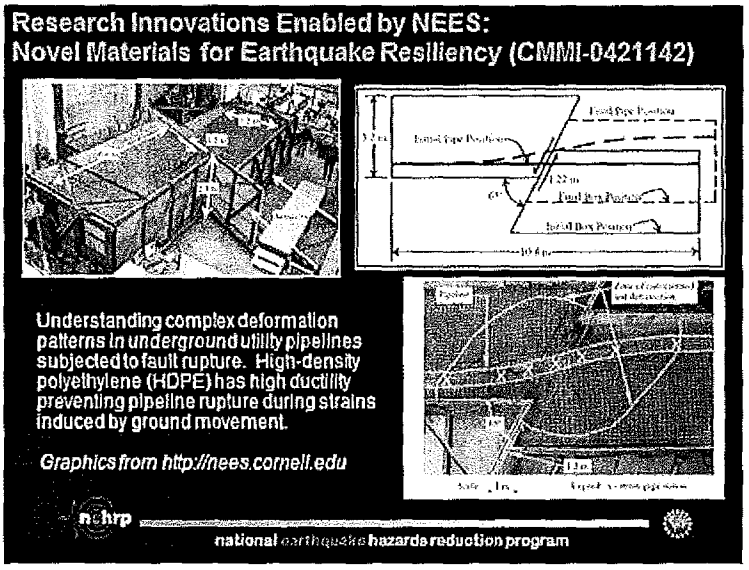
NSF Core Research Programs

Research on earthquake mitigation for lifelines has been supported from the following core research programs in the ENG Directorate, Division of Civil, Mechanical, and Manufacturing Innovation:

- Geotechnical Engineering (GTE)
- Hazard Mitigation and Structural Engineering (HMSE)
- George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES) Research (NEESR)
- Infrastructure Management and Extreme Events (IMEE)

NEES Lifelines Facility at Cornell University, Ithaca, New York, supported under NEES Operations Umbrella Award 0927178 to Purdue University, West Lafayette, Indiana

Located in Cornell University's Department of Civil Engineering, this facility has enabled large-scale testing to study the effects of large differential ground deformation on buried pipeline and conduit performance. The slide below show a test at the Cornell lifelines facility investigating the seismic capacity of high-density polyethylene (HDPE) pipelines used in water utility distribution systems.



References:

1. *Strategic Plan for the National Earthquake Hazards Reduction Program, Fiscal Years 2009-2013*, October 2008, http://www.nehrp.gov/pdf/strategic_plan_2008.pdf
2. Department of Homeland Security, *National Infrastructure Protection Plan*, 2006. http://www.chemicalsecurity.com/index/NationalStrategy/NationalInfrastructureProtectionPlan(2006).pdf. Note: The most recent version is dated 2013.

NSF Award	Research Award Title	Institution	Location		Investment
1441224	Collaborative Research: RIPS Type 2: Quantifying Disaster Resilience of Critical Infrastructure-based Societal Systems with Emergent Behavior and Dynamic Interdependencies	University of Maryland College Park	College Park	Maryland	$1,452,773
1441209	Collaborative Research: RIPS Type 2: Quantifying Disaster Resilience of Critical Infrastructure-based Societal Systems with Emergent Behavior and Dynamic Interdependencies	Johns Hopkins University	Baltimore	Maryland	$1,047,227
1437003	Three-Dimensional Isolation System for Building Resilience to Earthquake Hazard	University of Nevada, Reno	Reno	Nevada	$359,132
1436058	Collaborative Research: Optimal Design of Smart Damping for Structural Systems to Mitigate the Impacts of Natural Hazards	Clarkson University	Potsdam	New York	$68,885
1436018	Collaborative Research: Optimal Design of Smart Damping for Structural Systems to Mitigate the Impacts of Natural Hazards	University of Southern California	Los Angeles	California	$206,107
1435494	Evaluation of Earthquake-Induced Liquefaction Damage Potential to Infrastructure	Virginia Polytechnic Institute and State University	Blacksburg	Virginia	$255,316
1414903	EAPSI: Quantifying the Effect of Centralization on the Resilience of the Regional Healthcare System in the 2010-11 Canterbury Earthquake Sequence	Johns Hopkins University	Baltimore	Maryland	$5,070
1408486	Collaborative Research: An Intelligent Restoration System for a Self-healing Smart Grid	South Dakota State University	Brookings	South Dakota	$209,999
1408141	Collaborative Research: An Intelligent Restoration System for a Self-healing Smart Grid (IRS-SG)	Clemson University	Clemson	South Carolina	$170,000
1360664	Spider Orb-Web Inspired Cognitive, Fault-Tolerant Fiber	Clemson University	Clemson	South Carolina	$264,123

	Optic Sensor Network for SHM under Harsh Conditions				
1360041	Collaborative Research: Optimization of Remote Sensing Networks for Time-sensitive Detection of Fine Scale Damage to Critical Infrastructure	University of New Mexico	Albuquerque	New Mexico	$172,233
1361222	Collaborative Research: Optimization of Remote Sensing Networks for Time-sensitive Detection of Fine Scale Damage to Critical Infrastructure	San Diego State University	San Diego	California	$365,320
1351591	CAREER: A Performance-Based Multi-Objective Optimization Framework to Define Innovative Structural Concepts and Support the Seismic Design of Critical Buildings	Pennsylvania State University	University Park	Pennsylvania	$400,000
1344695	NEESR Planning/Collaborative Research: Simulation and Design Tools for Tsunami Bridge Engineering	Oregon State University	Corvallis	Oregon	$135,000
1344615	NEESR Planning/Collaborative Research: Simulation and Design Tools for Tsunami Bridge Engineering	University of Washington	Seattle	Washington	$315,000
1344705	NEESR Planning/Collaborative Research: Liquefaction Experiments and Analysis Projects (LEAP) for Validation	George Washington University	Washington	District of Columbia	$216,614
1344630	NEESR Planning/Collaborative Research: Liquefaction Experiments and Analysis Projects (LEAP) for Validation	University of California-Davis	Davis	California	$159,103
1344619	NEESR Planning/Collaborative Research: Liquefaction Experiments and Analysis Projects (LEAP) for Validation	Rensselaer Polytechnic Institute	Troy	New York	$161,325
1331412	Hazards SEES Type 2: Magnitude 9 Earthquake Scenarios - Probabilistic Modeling, Warnings, Response and Resilience in the Pacific Northwest	University of Washington	Seattle	Washington	$2,937,478

1306261	RAPID: Liquefaction and its Effects on Buildings and Lifelines in the 2010-2011 Canterbury, New Zealand Earthquake Sequence	Virginia Polytechnic Institute and State University	Blacksburg	Virginia	$101,916
1235573	Seismic Observatory for Community Resilience - A Program to Learn from Earthquakes	Earthquake Engineering Research Institute	Oakland	California	$240,000
1235526	Development and Validation of Performance Based Design Procedures for Kinematic Loading of Pile Foundations During Lateral Spreading	Brigham Young University	Provo	Utah	$220,492
1234228	Multi-Criteria Disaster Vulnerability Assessment: Critical Infrastructure, Human Behavior, and Public Policy	Johns Hopkins University	Baltimore	Maryland	$380,001
1208170	NEESR: Levees and Earthquakes: Averting an Impending Disaster	University of California-Los Angeles	Los Angeles	California	$651,066
1208026	NEESR: Performance Based Seismic Design of Geomembrane Liner Systems for Waste Containment	Arizona State University	Tempe	Arizona	$299,998
1207903	NEESR: Seismic Resilience of Pre-Tensioned Bridge Bents	University of Washington	Seattle	Washington	$999,998
1150462	CAREER: Passive Seismic Protective Systems for Nonstructural Systems and Components in Multistory Building	Howard University	Washington	District of Columbia	$400,000
1136040	Components, Run-time Substrates, and Systems: Medium: Holonic Multi-Agent Control of Intelligent Power Distribution Systems	Kansas State University	Manhattan	Kansas	$1,100,000
1134968	NEESR: Seismic Response of Shallow Underground Structures in Dense Urban Environments	University of Colorado at Boulder	Boulder	Colorado	$704,843
1129396	Seismic Response of Concrete Gravity Dams Subjected to Spatially Variable Excitations	Drexel University	Philadelphia	Pennsylvania	$259,932
1055640	CAREER: Innovative Confinement Technology for Strong Main Shock-	University of Illinois at	Champaign	Illinois	$400,062

	Aftershock Damage Mitigation	Urbana-Champaign			
1041498	NEESR-CR: Earthquake Response and Rehabilitation of Critical Lifelines	Cornell University	Ithaca	New York	$1,236,000
1031318	Risk-informed Management and Post-disaster Operations of Lifeline Networks by Rapid, Condition-based System Reliability Analysis	University of Illinois at Urbana-Champaign	Champaign	Illinois	$311,568
1030399	Exploring Polymer Cross-Linked Aerogels for Their Strength and Energy Absorption in Seismic Retrofit of RC Structures	Missouri University of Science and Technology	Rolla	Missouri	$295,000
0952402	CAREER: Assessment of Infrastructure Risk Under Natural Disasters in a Multiscale Probabilistic Framework	Stanford University	Palo Alto	California	$403,513
0927178	NEES Operations (one of the 14 experimental facilities supported is a lifeline/pipeline testing facility at Cornell University, Ithaca, New York)	Purdue University	West Lafayette	Indiana	$103,451,624
1142058	RAPID: Learning from Earthquakes - Performance and Resilience Data from the March 2011 Tohoku, Japan Earthquake on Bridges, Buildings, and Government and Community Response	Earthquake Engineering Research Institute	Oakland	California	$45,000
1138655	RAPID: Impact of Earthquakes on the Electricity Infrastructure	Missouri University of Science and Technology	Rolla	Missouri	$49,783
1137977	RAPID: Liquefaction and Its Effects on Buildings and Lifelines in the February 22, 2011 Christchurch, New Zealand Earthquake	University of California-Berkeley	Berkeley	California	$99,554
1125114	BRIGE: Preventing Imminent Failures of Pipeline Networks via Real Time Damage Detection and Location System	University of Illinois at Chicago	Chicago	Illinois	$173,559
1049340	Disaster Resilient Rural Communities: The Effect of Information Access on Rural	University of Colorado at Colorado	Colorado Springs	Colorado	$399,999

	Collective Efficacy	Springs			
1034831	RAPID: Geotechnical Engineering Reconnaissance of the M 8.8 Chile Earthquake of February 27, 2010	University of California-Berkeley	Berkeley	California	$96,894
1034793	RAPID: Seismic Performance Assessment of the Wharf and Pier at the Port de Port-au-Prince	Georgia Tech Research Corporation	Atlanta	Georgia	$85,000
1034667	RAPID: Haitian-Americans as Critical Bridges and Lifelines for Recovery and Rebuilding in Haiti	Florida Atlantic University	Boca Raton	Florida	$39,827
1025582	RAPID: Geotechnical Engineering Reconnaissance of the 2010 Haiti Earthquake	University of Texas at Austin	Austin	Texas	$25,200

Mason, David

From: Jester, Julia
Sent: Wednesday, September 24, 2014 9:56 AM
To: Macklin, Sheila V.
Subject: Re: Cleared QFR response from 7/29 NEHRP hearing

Yes

> On Sep 24, 2014, at 9:50 AM, Macklin, Sheila V. <smacklin@nsf.gov> wrote:
>
> Julia,
>
> Was the response cleared by OMB before you sent to the Committee?
>
> -----Original Message-----
> From: Jester, Julia
> Sent: Friday, September 12, 2014 2:42 PM
> To: Macklin, Sheila V.
> Subject: Cleared QFR response from 7/29 NEHRP hearing
>
> Sheila,
>
> Attached is the final response to the QFR from Rep. Bucshon. It is also saved in the appropriate folder on the S: drive. I think I left the transcript with you? Would you be able to scan the pages with modifications so we have that ready to send back to the Committee along with this?
>
> Thank you!
>
> Julia

1508

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States

House of Representatives

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

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May 3, 2013

The Honorable Cora Marrett
Acting Director, National Science Foundation
4201 Wilson Boulevard
Arlington, Virginia 22230

Dear Dr. Marrett:

On behalf of the Subcommittee on Research, I want to express my appreciation for your participation in the hearing entitled "An Overview of the National Science Foundation Budget for Fiscal Year 2014" on Wednesday, April 17, 2013.

You have received a verbatim electronic transcript of the hearing for your review. The Committee's rule pertaining to the printing of transcripts is as follows:

> *The transcripts of those hearings conducted by the Committee and Subcommittees shall be published as a substantially verbatim account of remarks actually made during the proceedings, subject only to technical, grammatical, and typographical corrections authorized by the person making the remarks involved.*

Transcript edits, if any, should be submitted no later than May 17, 2013. If no edits are received by the above date, we will presume that you have no suggested edits to the transcript.

I am also enclosing questions submitted for the record by Members of the Committee. These are questions that the Members were unable to pursue during the time allotted at the hearing, but felt were important to address as part of the official record. **All of the enclosed questions must be responded to no later than May 17, 2013.**

All transcript edits and responses to the enclosed questions should be submitted to us and directed to the attention of Melia Jones at melia.jones@mail.house.gov. If you have any further questions or concerns, please contact Ms. Jones at 202.226.2040.

Thank you again for your testimony.

Sincerely,

Larry Bucshon
Chairman
Subcommittee on Research

Enclosure: Member Questions

QUESTIONS FOR THE RECORD
THE HONORABLE LARRY BUCSHON (R-ID)
U.S. House Committee on Science, Space, and Technology
Subcommittee on Research

An Overview of the National Science Foundation Budget for Fiscal Year 2014

Wednesday, April 17, 2013

1. What are examples of NSF-related policy issues that you and the board currently disagree? Please elaborate.

2. The pressure by investigators to obtain research grants will increase, especially in this competitive research funding climate. I believe most investigators will apply for NSF grants with integrity and also conduct their research in a noble manner. However, the number of cases of research misconduct is growing. Do you believe that this situation will get worse with time? If yes, what is behind this growth? Please explain.

3. I am concerned that the emphasis on clean energy research may be at the expense of other potentially transformative research. How can we ensure that this will not become the case?

4. In your NSF budget, you have $63 Million being devoted to the INSPIRE program. Your testimony states that this investment will strengthen "NSF's support of interdisciplinary, potentially transformative research by complementing existing efforts." Which 'existing efforts' are you specifically targeting?

5. In your NSF Budget request, you have $14 million going to cognitive science and neuroscience. It seems a big part of this funding will be going towards workshops to identify specific gaps in our current understanding of the brain. Why are you taking this approach? Don't you think the National Academy of Sciences should commission a study? After all, acting in their capacity as our nation's main scientific advisory body, aren't these gaps what they are best tasked to determine? What alternative approaches could be used with this money? How are these proposed workshops going to be productive, with consensus being reached on the scientific framework?

6. The Administration's FY 2014 budget request includes a proposal to reduce or consolidate 114 STEM programs across the federal government. The proposal shifts a number of those programs being consolidated to NSF, and NSF is consolidating some of its own programs. How were programs evaluated to determine whether or not they should be consolidated or cut? Does NSF have the capacity to effectively and efficiently run all of the programs that are being brought from other agencies?

QUESTIONS FOR THE RECORD
THE HONORABLE DANIEL LIPINSKI (D-IL)
U.S. House Committee on Science, Space, and Technology
Subcommittee on Research

An Overview of the National Science Foundation Budget for Fiscal Year 2014

Wednesday, April 17, 2013

1. Dr. Marrett, the National Science Foundation (NSF) is proposing an increase in nearly $50 million in support for advanced manufacturing in fiscal year (FY) 2014. Can you describe NSF's contribution to the Administration's efforts in advanced manufacturing R&D? Specifically, can you describe NSF's role in and level of commitment to the National Network for Manufacturing Innovation?

2. Dr. Marrett, NSF is proposing a significant cut to the informal STEM education program (AISL) even as the overall Education and Human Resources budget grows. I understand this may be part of the larger Administration STEM overhaul that creates a new role for Smithsonian in federal informal STEM efforts, but I still have concerns.

   - How do you justify this cut in an otherwise growing budget? How will you work with the Smithsonian to help build their capacity to support informal STEM education and outreach across the nation? How will you work with science centers across the country as you refocus the AISL program?

   - Also, I worry this cut could diminish NSF's opportunities for branding, which increases public recognition and support for the NSF mission. Can you comment on that aspect of it too?

3. Dr. Marrett, as part of the broad overhaul of STEM education programs being proposed by the Administration, NSF has been designated the lead agency for federally supported undergraduate and graduate-level programs, including programs that have been managed within their respective mission agencies for years.

   - At the graduate level, the NSF Graduate Research Fellowship Program is being expanded to be a National Graduate Fellowship Program (NGFP). As mission agencies phase out their own graduate fellowship programs, how will you ensure that the mission-specific needs of those agencies continue to be met under NGFP? What interagency infrastructure is in place or will you have to establish to meet this goal?

- Likewise, how will you address consolidation at the undergraduate level in terms of making sure that the mission-specific needs of the agencies and the research communities they support are being met?

4. Dr. Marrett, last year the Astronomy Division carried out a community-based review of its full portfolio of facilities. Taking into consideration limited budgets and new telescopes coming online over the next several years, the reviewers recommended that NSF take steps to divest a number of older telescopes. I am hearing concerns from the community that the proposed schedule for divestment decisions by the end of 2013 may be unattainable even as stakeholders work together to develop new sources of funding to keep some of these telescopes operational.

   - What would be the consequences of granting additional time for potential consortia to develop more fully?
   - Can you tell us where things stand with respect to considering and implementing the Portfolio Review recommendations, including any schedule for management decisions on these facilities?
   - Finally, how will you seek community input on the implementation of the Portfolio Review?

AN OVERVIEW OF THE NATIONAL SCIENCE FOUNDATION BUDGET FOR FISCAL YEAR 2014

Wednesday, April 17, 2013

House of Representatives,

Subcommittee on Research

Committee on Science, Space, and Technology

Washington, D.C.

Committee Hearings

of the

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AN OVERVIEW OF THE NATIONAL SCIENCE FOUNDATION BUDGET FOR FISCAL YEAR 2014

Wednesday, April 17, 2013

House of Representatives,
Subcommittee on Research
Committee on Science, Space, and Technology
Washington, D.C.

The Subcommittee met, pursuant to call, at 2:25 p.m., in Room 2318 of the Rayburn House Office Building, Hon. Larry Bucshon [Chairman of the Subcommittee] presiding.

Chairman BUCSHON. Good afternoon. Welcome to today's hearing entitled, "An Overview of the National Science Foundation Budget for Fiscal Year 2014." In front of you are packets containing the written testimony, biographies, and truth in testimony disclosures for today's witnesses.

I now recognize myself for 5 minutes for an opening statement.

Thank you to everyone here today for this Research Subcommittee hearing. I am pleased to welcome Acting Director, Dr. Marrett, and President Arvizu to discuss NSF's priorities for fiscal year 2014. Thank you both for coming.

Before we begin today's hearing, I would like to make a few comments about the recent budget proposed by the President for 2014. Today our national debt stands at almost $17 trillion, and 62 cents of every dollar is spent on our mandatory spending or entitlement programs, and everyone pretty much agrees that these are the largest drivers of our debt. Since 2008, approximately 19 cents of every dollar has been spent on Medicare and Medicaid, and 4 years later currently we are spending 23 cents of every dollar on these programs. Without reform this trend will continue.

Before my time in Congress, as a cardio thoracic surgeon in Evansville, Indiana, I saw firsthand how these spiraling costs were crowding out funding for other federally-funded programs like scientific research and development.

Instead of in my view showing leadership, the President has spent his time in office defending a healthcare law that makes matters even worse. The Administration has not offered a pathway forward on our mandatory spending programs other than continually cutting the funding for provider reimbursement to hospitals and practitioners, risking access to quality healthcare for our Nation's seniors.

At this point I don't see any evidence the Affordable Care Act will lower medical costs in the future. Instead it continues to irresponsibly add to our yearly deficit and total national debt in spite of the rhetoric to the contrary.

Unfortunately, the proposed fiscal year budget from the Administration has a lot of accounting gimmicks. Because of the Administration's failed leadership and failed economic policies, we are left with a non-targeted cuts in sequestration and ongoing record deficits and debt. Washington's inability to address these fiscal issues is hampering the ability of our economy to recover from recession.

Hardworking Americans who stand to benefit from the research and technology our country develops may be the victims. House Republicans have tried to address these issues by passing responsible budgets for the last 3 years, however, we have not--we don't control Washington, D.C. The other budgets offered from our friends on the other side have

included higher taxes, more spending, and more importantly for this discussion, don't begin to address the significant drivers of our debt, and that is our mandatory programs. In addition, the budgets that have been proposed never balance.

I stress in my view if we do not address our mandatory spending programs, funding for all other federal programs will continue to feel the financial pinch.

Imagine the high-paying jobs that will result when today's basic science discoveries turn into tomorrow's marketable technologies. Tomorrow's prosperity depends on what we do here today.

And back to our present situation and the current year budget for the National Science Foundation. We must now focus on answering what is the appropriate role of the Federal Government in funding science research. I believe that asking this and related questions, by asking this and related questions we can create a stronger, more efficient National Science Foundation nimble enough to tackle the numerous scientific challenges of tomorrow. As a Nation we must focus our scientific priorities and stretch every dollar for maximum benefit in these tight financial times.

As an example, do we need to fund studies such as the International Criminal Court in Pursuit of Justice, $260,000 funded through NSF? I think that is a good discussion to

have. These can be luxury things to fund. It would be nice to fund if we have the money, but it is not something in my view that we need to fund. This type of research may be more appropriately funded through the private sector or other government agencies.

Our charge is to ensure the American taxpayer is getting value for their hard-earned dollars that we spend on research through NSF. I strongly support NSF funding in mathematics, physics, chemistry, biology, engineering, cyber security, and STEM education, among others. Although the scientific community is not facing ideal fiscal environments, I still believe that America's best and brightest scientists will continue to persevere and produce the innovations and discoveries of tomorrow. We should support the hardworking scientist who stays up all night to repeat their experiments and doggedly pursues their ideas because they believe they are onto the next great discovery and may answer the next big question in their chosen field.

I recently visited several universities and colleges in Indiana, including Purdue University and Indiana University, and talked to NSF-funded researchers, and I was impressed. I still have a great faith and optimism in the scientific community and that its strength will continue and improve.

But for American science to succeed we must be sure that the NSF remains focused on its scientific goals and missions.

I look forward to the thoughtful discussion that will ensue.

At this point I would also like to thank Ranking Member Lipinski and everyone participating in today's hearing.

[The statement of Mr. Bucshon follows:]

********** INSERT 1 **********

Chairman BUCSHON. With that I now recognize the Ranking Member, the gentleman from Illinois, Mr. Lipinski, for an opening statement.

Mr. LIPINSKI. Thank you, Chairman Bucshon, for holding this hearing, and I want to welcome Dr. Marrett and Dr. Arvizu.

Let me begin by saying that I understand that America faces a serious debt threat. We don't do anything to reign in our long-term debt our economic future will be imperiled. Solving this problem requires some budget cuts, but I hope that going forward we can make these cuts in a smart way that addresses the various near-term and long-term challenges that our Nation faces.

And during this we will have to set priorities. Sometimes when you set priorities, this will mean cutting, spending, and sometimes it may mean increasing investments in areas that deliver real returns for taxpayers by improving our quality of life, protecting our population from natural and manmade threats, and ensuring our economic competitiveness.

Therefore, I am pleased that the Administration's fiscal year 2014 budget request continues to emphasize science innovation and STEM education generally and the National Science Foundation in particular.

Even though NSF has fared well in recent appropriations

bills, continued uncertainty over funding levels has hurt scientific progress. The agencies and universities can't plan. Some of the best and brightest give up and leave their labs, and younger generation sees what their mentors are up against and choose a different path altogether.

Our own committee will have the opportunity to weigh in on budget and programmatic priorities across the agency as we consider an NSF Reauthorization Bill sometime in the next several weeks. So I appreciate this opportunity to learn more about the nature and scope of research and STEM education activities proposed in the budget.

Let me just comment on a few of the priorities described in the budget. First, you will not be surprised I am excited to see the proposed increase in the I-Corps Program. As I have said many times now, I strongly believe that this program bodies the NSF's original mission of both promoting the progress of science and advancing the national prosperity. Although it is only a fraction of a percent of NSF's budget, early results support my long-held belief that I-Corps will yield exponential benefits, helping turn NSF's research investments into new companies and jobs for the benefit of all Americans.

Last summer I hosted a field hearing in Chicago to learn more about this program and its early successes. For my new colleagues who haven't looked at this program in depth, it is

important to note that this program educates scientists on how to develop viable commercial products from their research. It connects them with like-mind venture capitalists and entrepreneurs.

The final decisions on whether or not to commercialize research still rests with scientists in question, and of course, with the private sector which would fund the ideas. Already we are seeing results with I-Corps graduates such as NEON, receiving venture capital funding for a product developed through the program. This public-to-private partnership is in the best tradition of U.S. science policy, and I look forward to working with the NSF as this program develops.

Second, I am pleased with the continued emphasis on Advanced Manufacturing NSF and several other agencies. We must regrow our American manufacturing base. It will not do it with the technologies and processes of yesterday, but the small and medium-sized industries that comprise a significant portion of our manufacturing capacity can't do it all on their own, and they certainly don't have the resources or capacity to invest in most far-reaching R&D. NSF plays a critical role in funding basic research with potential application to advanced manufacturing technologies and processes of the future.

There are many other interesting proposals in this

budget request, including the increased focus on big data, the expansion of the INSPIRE Program to support interdisciplinary research and NSF's plan to begin to implement the OSTP Policy Memorandum on public access to the results of federally-funded research. It is also good to see that all the current MREFC projects are on track, and NSF is moving ahead with the large synoptic survey telescope.

I will wrap up with a few comments and questions about the agency's proposals for consolidating many of its STEM education programs, both within the agency and as part of the Administration's federal-wide STEM reorganization. Mostly I would like to hear more details about all of these proposals because some of them seem to still be rough sketches.

For example, with respect to the Consolidated National Graduate Research Fellowship Program, I have no doubt that NSF's own graduate research fellowships will continue without disruption, but I wonder how NSF will work with the mission agencies to ensure that their mission-specific needs are being met through this new consolidated national program administered by NSF.

I would also like to understand better what is being proposed for graduate traineeships and what is new about the consolidated undergraduate program or if it is mostly a repackaging of existing programs. I suspect many of my colleagues will have STEM questions for you today also.

With that I want to thank, again, Dr. Marrett and Dr. Arvizu, for being here today. I look forward to your testimony and our discussion.

With that I will yield back.

[The statement of Mr. Lipinski follows:]

********** INSERT 2 **********

Chairman BUCSHON. Thank you, Mr. Lipinski.

I now recognize the Chairman of the full committee, Chairman Smith, for an opening statement.

Chairman SMITH. Thank you, Mr. Chairman, and I want to follow up on your good opening statement in regard to the National Science Foundation funding.

We are now in a situation where we must maximize every dollar being spent by every federal agency. Our focus should be on how the Federal Government, including the National Science Foundation, can maximize returns from taxpayer-funded research. How can the NSF better prioritize which areas of science and engineering it supports?

The NSF has great potential to help American science flourish and thus contribute to our economy and the wellbeing of our country. But in my view the NSF has funded several studies that should not have been approved, however, I do not think that we should pick winners and losers by micromanaging grant decisions at the NSF. It is the responsibility of the professionals at the NSF to exercise their best judgment and ensure that only proposals that benefit the taxpayer get funded. It is Congress' job to ensure accountability and transparency for the American taxpayer. How do we avoid micromanaging but achieve accountability at the National Science Foundation? And how we ensure an environment where the creativity and the determination of our very best

scientists is encouraged?

Mr. Chairman, let me stop there but say that I hope that our witnesses will be able to address some of these questions. They are not easy, and it requires, I think, a common understanding and appreciation for what the National Science Foundation does but also a recognition that we may be able to improve the process whereby the NSF grants are approved.

I yield back. Thank you.

[The statement of Mr. Smith follows:]

********** COMMITTEE INSERT **********

Chairman BUCSHON. Thank you, Mr. Chairman. At this time I would like to introduce our witnesses. Our first witness is Dr. Cora Marrett, the Acting Director of the National Science Foundation. She has served in this role since January, 2009. Prior to that Dr. Marrett served as the NSF--served the NSF as the Assistant Director for Education and Human Resources and the Assistant Director for the Social Behavioral and Economic Sciences. She has also held positions at the University of Wisconsin and the University of Massachusetts at Amherst. Dr. Marrett has a Bachelor of Arts from Virginia Union University and Master of Arts and a Doctorate from Wake Forest University. Welcome.

Our next witness is Dr. Dan Arvizu, Chairman of the National Science Foundation Board. In 2004, Dr. Arvizu was appointed by President George W. Bush for a 6-year term on the National Science Board and in 2010, was reappointed by President Barack Obama to a second 6-year term. In 2012, Dr. Arvizu was elected as Chairman of the NSB. Dr. Arvizu is the Director and Chief Executive of the Department of Energy's National Renewable Energy Laboratory. Dr. Arvizu has a Bachelor of Science degree in mechanical engineering from New Mexico State University and a Master of Science degree and Ph.D. in mechanical engineering from Stanford University.

As our witnesses should know, spoken testimony is limited to 5 minutes each, after which the members of the

committee will have 5 minutes each to ask questions.

I now recognize Dr. Marrett for 5 minutes to present her testimony.

STATEMENT OF THE HONORABLE CORA MARRETT, ACTING DIRECTOR, NATIONAL SCIENCE FOUNDATION; AND THE HONORABLE DAN ARVIZU, CHAIRMAN, NATIONAL SCIENCE BOARD

STATEMENT OF CORA MARRETT

Ms. MARRETT. Thank you, Chairman Bucshon, Ranking Member Lipinski, and members of the subcommittee. It is indeed my privilege to be able to be here with you today to present the National Science Foundation's budget for the 2014 fiscal year.

NSF is the only federal agency dedicated to support basic research and education in all fields of science and engineering. That wide-angle vision has permitted unprecedented developments over the past 60 years and seems especially imperative for the complex problems and the question that the Nation currently faces.

Our mission and our reach can be expressed quite simply. We empower the discoveries that keep our Nation at the forefront, the forefront of the world's innovation enterprise. So for more than 6 decades we have supported fundamental research and education that has pushed forward the frontiers of scientific knowledge.

We allocate 94 percent of our budget directly in support of research, education, and scientific infrastructure. That

means we work with a very lean 6 percent administrative overhead. We invest directly into the Nation's research and development enterprise by making approximately 10,000 merit-reviewed awards to researchers and educators in all disciplines.

It is only with a strong commitment and partnership with Congress and this subcommittee specifically that we have created and refined the world's gold standard for science funding. That standard having to be merit review. We greatly appreciate the longstanding support of the full committee, the subcommittee for the strong model that we have in place.

The request before you is for $7.6 billion. This is an increase of 500 million over fiscal year 2012. We know this is an era of fiscal restraints that requires difficult tradeoffs. The overall support for NSF reflects the Administration's clear determination to build on the Nation's history of success and leading-edge discovery and innovation.

Most of our funding goes into core fundamental research, but we also make major targeted investments that enable cutting-edge research. There encompass as we look at the infrastructure that is necessary, these encompass telescopes, ships, other facilities and capabilities. Some of our best examples draw on NSF's legacy of funding visionary computer science, and this is a part of a comprehensive portfolio of

advanced computational infrastructure, infrastructure, programs, and other resources.

In the last year we launched three new advanced facilities. Yellowstone at the National Center for Atmospheric Research in Wyoming, Stampede at the Texas Advanced Computing Center, thank you very much, Mr. Smith, for being there, Blue Waters at the University of Illinois with Mr. Lipinski. The recently-launched Alaska Region Research Vessel, Sikuliaq, will soon embark on its first science mission. It will explore the Arctic to advance our understanding of the climate and oceanography. Our priority investment in secure and trustworthy cyberspace offers a different kind of example of NSF's contribution to the Nation. This program will help protect the Nation's critical information technology infrastructure, including the internet, from a wide range of threats. We are educating the next generation cyber security workforce, helping to transition what has been learned in the laboratory into day-to-day practice.

The budget request also continues NSF's long history of support for the next generation of leaders in other fields of science, technology, engineering, and mathematics or STEM education. This is a part of the Administration's multiagency effort to increase the impact of federal investments in STEM achievement.

NSF will support the efforts of almost 340,000 researchers, post-doctoral fellows, teachers, and students. More than ever the future prosperity and wellbeing of Americans depend on sustained investments in science and engineering. NSF promises to continue to be central to that effort.

Mr. Chairman and members of the subcommittee, I hope this summary has given you an idea of how important the National Science Foundation is to our Nation's progress, and I look forward to the dialogue that will follow.

Thank you.

[The statement of Ms. Marrett follows:]

********** INSERT A **********

Chairman BUCSHON. Thank you for your testimony.

I now recognize Dr. Arvizu for 5 minutes to present his testimony.

STATEMENT OF DAN ARVIZU

Mr. ARVIZU. Thank you, Chairman Bucshon, Ranking Member Lipinski, and members of the subcommittee. I appreciate this opportunity to speak with you today in support of the National Science Foundation's fiscal year 2014 budget. I am Dan Arvizu, Chairman of the National Science Board and Director and Chief Executive of the Department of Energy's National Renewable Energy Laboratory, and with your concurrence I submit my written record, testimony to the record, please.

Before I go on with my testimony I would like to comment on the recent leadership transition here at the NSF. Dr. Subra Suresh, who many of you know, an extraordinary leader, will be missed, but I wanted to also acknowledge that Dr. Cora Marrett has more than capably managed a very smooth transition and continues the strong working relationship both with the Board and the NSF Senior Management. And I have worked closely with Cora now for more than 9 years, and I believe her experience and dedication to the Foundation will serve the Nation well.

Mr. Chairman, on behalf of the 25-member National Science Board and the engineering and science and education communities that we represent, I would like to thank the members of this subcommittee for their longstanding support of the National Science Foundation. My colleagues on the Board and I do not take this continued support for granted, and our top priority is to provide the strong governance, proper stewardship of this most-important taxpayer investment.

For over 60 years NSF has seeded our Nation's innovation ecosystem by funding the transformative research that underpins long-term scientific and technological progress. With the support of Congress NSF has always focused on funding the best science through a rigorous merit-review system and by encouraging scientists and engineers to submit their most innovative proposals.

Although businesses fund over 60 percent of total R&D in the U.S., only 5 percent of that goes to basic research. Here the Federal Government plays a critical, complimentary role accounting for more than half of all the basic research in this country. This is especially true for knowledge in technology-intensive or KTI industries that produce 1/4 of the U.S. GDP and employ about 20 million U.S. workers with very high-paying jobs.

The NSF 2014 budget request reflects a strategic

commitment to supporting the best basic research, economic growth, job creation through innovation, and globally-competitive science and engineering workforce. The Board believes that the priorities in this proposal reflect a clear commitment into investments that strengthen our Nation for the long term.

I would particularly ask for your support for full funding for the NSF's Agency Operation and Award Management Account. I note that although the number of proposals received at NSF has increased over 60 percent in the past decade, the Foundation still replies to roughly 78 percent of those within the first 6 months of having received them, which exceeds the goals that we have set for ourselves. The proposed increase would help NSF process an increasing number of proposals in a way that protects taxpayer dollars while keeping our overhead rate at the very lean 6 percent that Dr. Marrett mentioned.

I will refer you to more details in my written testimony for more of the other things that I would like to say, but I would like to take this opportunitY to briefly comment on the fiscal year 2013 Continuing Resolution. In that bill the bill restricts the NSF on what it could fund in political science. Well, NSF and the National Science Board fully will comply with the law, and I would like to understand that that is important to all of us. I would like to also raise

concerns about how these structures could undermine the Merit Review Process and the progress of science.

Although we recognize that it is Congress' responsibility to set funding priorities and clearly very attentive to that, the Board is unanimous and believes very strongly that legislatively-imposing restrictions on a class of research can run significant risks in not serving the national interest. The Foundation's Merit Review Policies which are allotted and emulated internationally hinge on being open to receive the best scientific ideas, having those ideas judged by independent experts, and accessed the soundness and the promise of what is proposed and making decisions based on potential scientific and societal value. To cut a whole class of science from consideration could have significant, unanticipated consequences.

For example, when NSF funded Elinor Ostrom's work, which I know many of you are aware of, on common property, it was not expected that her findings would challenge conventional wisdom, and her research concluded that common resources is sometimes best managed by not regulating them. I think maybe something that we all appreciate. Nor was it anticipated that this political scientist would eventually win the Nobel Prize in economics.

In closing, Mr. Chairman, I would like to, again, thank the subcommittee for their leadership on science and

engineering issues. We recognize the fiscal responsibilities confronting the committee and Congress, and we pledge to work close with the Director to set priorities. But even in the time of severe constraints, the Board believes that investments in science and technology capabilities, including our S&E workforce, are essential to our Nation's long-term prosperity and security.

So thank you for the opportunity to testify, and I look forward to your questions. That concludes my report.

[The statement of Mr.)krvizu follows:]

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Chairman BUCSHON. Thank you for your testimony. I thank the witnesses, both the witnesses for their testimony.

Reminding members that committee rules limit questioning to 5 minutes.

The Chair at this point will open the round of questions. I recognize myself for 5 minutes.

Dr. Marrett, I fully support the hypothesis-based data-driven research to better understanding traumatic brain injury, Alzheimer's, epilepsy, autism, and a whole host of other brain-related ailments. It is very important research as a medical professional.

However, I am concerned about the lack of focus and clarity in the present Brain Initiative, especially as it concerns the NSF. How will we ensure there will be a sufficient focus going forward and that we are not just fishing around for ideas?

Ms. MARRETT. Thank you for the question, and in fact, we are more than willing to get back with more details because this happened to have come to--it fits quite well into what was already on the NSF agenda. We have been investing in neuro and cognitive science for some time, gave a presentation to the Science Board to indicate the directions that we have in mind, and thus, what we intend to do in connection with the Brain Initiative will follow

through on what the program of research already has been at NSF.

So for us it is a wonderful way for being able to articulate and as you know quite well, the idea of being able to address questions about Alzheimer's, autism, those are far into the future. We do not have the models, the tools right now to get to that level. The amount of fundamental work that is required is something that we are very--we are investing in. It is not a matter then for us of a fishing expedition but as I said, we are more than willing to provide you details on what the NSF portfolio will be with reference to the Brain Initiative.

Chairman BUCSHON. Thank you, and one of the researchers at Purdue University I just met with is doing research on football helmets, which is obviously--been on the front page recently as it relates to chronic traumatic brain injury funded by the NSF.

The next question. In your budget you have 372 million being spent on clean energy research. This includes research related to smart grid, energy use, energy efficiency. How are you working with the DOE Office of Science to ensure that we don't duplicate research with our funding efforts? And are you encouraging collaboration between the appropriate offices at NSF and DOE to make sure that this doesn't happen?

Ms. MARRETT. We work very closely with DOE with several

offices from the Office of Science at DOE and support of CERN in Switzerland with the Office of High Energy Physics. The connections are very deep that we have. We pay a lot of attention to the matters of ensuring that there isn't the duplication, and in part why that is not all that difficult is, let me again note, our investments at the very fundamental and basic levels will mean that we need the connections with other agencies, other places if many of the ideas and the results are going to move into the larger sector. So DOE is a strong partner in so many of the things that we do including the area of clean energy.

Chairman BUCSHON. Thank you. Dr. Arvizu, can you talk to us a little bit about the role of--that private industry plays in terms of creating and retaining science and engineering jobs versus the types of positions funded with federal dollars? How do we ensure science and engineering workforce continues to grow, perhaps better focusing this responsibility on the private sector?

Mr. ARVIZU. Yes. Thank you, Mr. Chairman, for that question. I think it is very clear that one of the long-term benefits that you get from funding basic research is the societal benefit that ultimately finds its way into service for the public good.

There is a whole ecosystem of what it takes to get from basic research all the way out to commercial products and

hopefully things that are making a difference in the way we produce things and consume things.

There is a, in many respects, a series of barriers that sometimes mitigate the quick adoption of technology. So in the case of the work that NSF does with I-Corps, for instance, there we are trying to help researchers find those pathways which are typically more driven by the private sector through public private partnerships, many times state incubators, university research programs, where there actually are mechanisms already in place that the private sector would find access to venture capital, those kinds of things, that help that technology move more quickly.

And the work, I think, within the government's role and specifically for the National Science Foundation, is to help facilitate that. I think we don't want to lose track of the idea •that the mission objective of NSF is really to do fundamental work, to do basic discovery science.

Chairman BUCSHON. Thank you. I now recognize Mr. Lipinski for 5 minutes for questions.

Mr. LIPINSKI. Thank you, Mr. Chairman. I am going to surprise everyone, first of all, by not asking a ,question on I-Corps right now. If you were here this morning, you know I talked about that, I talked about an opening statement, but let's go to talking about funding for social behavioral and economic sciences, and of course, I have to disclose I do

have a Ph.D. in political science and at one time had an NSF grant, a very, very small one, when I was in grad school.

But as Dr. Arvizu had mentioned about the amendment in the House, well, the amendment, let's say we did have an amendment in the House to do funding for political science research, which it didn't wind up going through but then the Senate version that limited the grants to those promoting national security, economic interests, we had the majority leader of the House talk about, you know, questioning the funding of social sciences, and Dr. Arvizu, you pointed out Elinor Ostrom, political scientist, who got NSF funding, received NSF funding, won the Nobel Prize. I could point out NSF-funded research by L. Roth and others who did research in the kidney exchange matching program that led to over 125 kidney transplants since 2007, research that, you know, directly saved lives, and he received the 2012 Nobel Prize in economics for his work.

So there is a lot of social science work that we could talk about that does have an impact, a direct impact on people's lives. So I want to give Dr. Marrett the opportunity to talk about the value of social science research, why the NSF funds it, and other thing, first I want you to start off by telling us what percentage of NSF funding goes into the SEE Directorate.

So, Dr. Marrett.

Ms. MARRETT. All right. The--I will get you the exact percentage but of the $7 billion budget for NSF for the social behavioral economic sciences it is just over 259 million. So this is not the large fraction of the support in these fields.

Now, when I think about the social behavior economic sciences, let me start with our notion of what is important when we think of science. Science we especially emphasize has to do with using an approach that is systematic, orderly, it is theoretically driven, and it is the findings, there is replicability. So it is more in the approach that one takes than the phenomena that would be considered. That means that you can apply this approach to any number of areas, fields, questions, and that is the way in which we say then the social behavioral economic sciences follow the same model that one sees for the physical sciences, for the life sciences, for engineering at the National Science Foundation.

Now, what about the investments? It is possible to talk about the particular kinds of projects as we often do, but it is also very important of the link to this other concern we have, and that is attracting people's interest, attracting young people often, even though for the National Science Foundation and for decision makers, we often think about science and engineering being important for the innovation in the Nation. But I have said on more than one occasion, I

can't think of very many 10-year-olds who will say I want to be a scientist or engineer so I can innovate for the Nation. No. It is more about the attractiveness of the kinds of things they have a chance to explore, and that exploration that can take place, we call it the chance for the authentic .experiences, the authentic experiences can occur through any number of realms, and that is where we have discovered that the social behavioral sciences, along with, again, the life sciences, physical sciences, become important means through which any number of young people, older people as well, get to understand something about the way in which processes occur and can question, can understand the dynamics that can be at play.

So that is probably a longer way around to what was a very interesting question about what we have in mind, and that is why we remain so committed to the notion of we want to see that the best work is done in all fields because of the consequences that can be there, yes, for the problems the Nation faces, but also for the curiosity that we often have as human beings about the worlds we inhabit, the worlds that we create.

Mr. LIPINSKI. Well, very quickly, I am out of time, thank you, Dr. Marrett, but I wanted to--I came from an engineering background, had a couple degrees in engineering before I went into political science, but I understand that

there are issues. We were just talking about--had two bills on the Floor yesterday. One was Cyber Security Enhancement Act that I did with Mr. McCaul, and one of the important things to look at is, yes, we think about this as a technological issue, but one of the biggest issues in this in cyber security is internet hygiene, computer hygiene. That is what people are doing, the mistakes people make that humans are the weakest link in there, and that is getting into the social sciences and trying to figure out what--how we sure up security when it comes to human beings which could unravel the whole, whatever we do on the technological side.

So that--I will yield back.

Chairman BUCSHON. Thank you. I now recognize Mr. Stockman for 5 minutes.

Mr. STOCKMAN. I think you are going to find generally on both sides of the aisle we support you, and I think what we are trying to get at is when we go back to our home districts, I know you had a disagreement with some of the CR, but we have to go back, and we have to present to you what you put forth to our constituents, and so sometimes when these, out of 10,000 grants, some of these anomalies come up, it is a difficult challenge to present and defend, especially in these tight budgets.

My father, I took care of him for 8 years with Alzheimer's Disease, and he died. So when the President

announced his initiative, I was actually fairly excited until I heard on April 5 on NPR, and let me quote you here, Susan Fitzpatrick, who runs the leading foundation that finances brain research, it is called the James McDowell Foundation. Are you both aware of that?

And she says, "To be quite honest, I am befuddled, I was befuddled, I don't understand what the President's talking about." This is the lead person, and so I guess what I am asking you is if this goes out, there are 20 million people listening to it, and I go and have a town hall meeting, and I am sympathetic to your views, and I have to defend what you are doing, and yet we have someone that is the lead scientist saying you are doing the wrong thing, I am stuck in the middle. I am your messenger.

I guess what I want to know is--go ahead. I can tell you are wanting to go.

Ms. MARRETT. No. It is exactly why we want the kind of dialogue, because you are right, and if we have not been clear enough, you keep pushing us for that clarity. I heard that same NPR account and thought immediately I was going to turn to my colleague, Dan Arvizu, because the President of the McDonald Foundation was a former colleague of his on the National Science Board.

So I think in that case that was our failure probably to have included the colleague in as the developments were

unfolding. So it was not-- and knowing him I am sure that he would not take the position that this is completely unreasonable, but it is a matter of trying to bring a number of people to the table.

Dan?

Mr. ARVIZU. Yeah, and I would just add to that, you know, one thing that I think in terms of how you respond or otherwise communicate to constituents who are anxious to understand who does, you know, how are the decisions being made and what process are you using, one thing I will say is that the process of going through merit-based peer review and trying to understand what things to fund and what--how to set priorities is actually evolving as things, as we learn more, as we gain more understanding, as we gain more insights.

Everything is changing in a fairly rapid rate. I think there is no substitute for having the best minds come together and debate, discuss, otherwise disagree but ultimately come up with a process that serves the Nation and the country to move the societal benefits.

So we are trying to do that, and we are trying to improve. Certainly room for improvement in all the processes we have, but it is as Dr. Marrett has said, the gold standard so far.

Mr. STOCKMAN. But in that NPR story they said it was more of a PR stunt. Would you--have you reached out to these

732 ' folks and talked to them about--I mean, that is a pretty big
733 disagreement with the President.
734 Ms. MARRETT. Yes. As a matter of fact, we are going to
735 send you far more details. One of my colleagues sitting here
736 with me, John Wingfield, who is the Assistant Director for
737 the biological sciences, has the lead for the Foundation in
738 articulating, presenting what we have in our program and
739 would welcome every opportunity imaginable to be able to
740 communicate that, to convey, because as we said, we know we
741 receive funding from the public. We have to be able to
742 explain, to listen, to be able to share with that public. So
743 we do want to get to you more of those details.
744 Mr. STOCKMAN. Yeah. I would actually, if you could
745 write up how, you know, how it is decided, the kind of
746 formulated, how you guys go through the process. That would
747 be helpful to us, but--and I don't know if there are some
748 studies we can point out there which back in my district I
749 would have a hard time explaining, so I would appreciate the
750 formula and the mathematics or however it is structured so
751 that I can explain it to my own constituent.
752 And with that I yield back the balance of my time, Mr.
753 Chairman.
754 Chairman BUCSHON. Thank you. I now recognize Dr. Bera.
755 Mr. BERA. Thank you, Mr. Chairman. Thank you, Ranking

Member. Thank you, Dr. Marrett and Dr. Arvizu.

You know, as a biological sciences major, I spent a lot of time doing basic research, and as a physician I spent a lot of time in medical school doing research and as a faculty member and a former associate dean, have mentored many medical students that have gone through the research process.

So I understand that, you know, part of research is you do experiments. You don't always know what the expected outcome is going to be, and it often is that the biggest breakthroughs are the unexpected discoveries. And those clearly have, you know, we can go back through our history and look at a lot of those unintended discoveries that have really propelled our economy forward and our science forward.

I appreciate the fact that we have to be very conscious of how we are spending the taxpayer's resources. We have to be conscious of the debt and the deficit so we do have the resources to invest and make strategic investments, but it can't just be a discussion of cutting versus raising revenue.

It also has to be a discussion of where can we get the best return on our investment, and throughout NSF, the Science Foundation's history, we see these discoveries, you know. I will quote a simple example.

You know, in the 1990s the NSF led a multiagency project for digital library initiative. You know, there were two

young Stanford University grad students that participated in this. One, Sergey Brin, was funded by an NSF fellowship. I don't have--history is going to tell you what that research led to. It is a company called Google that is now worth over $200 billion and employs over 30,000 individuals. It is transformed how we live.

You know, there are countless examples of those unexpected discoveries that have spurned innovation and moved us forward. You know, we can look at advanced manufacturing. You know, it was NSF-funded research that produced one of the first 3D printers. You know, I had, recently had the ability to go visit my alma mater at the University of California Irvine and visit the engineering department, and it is amazing what they can do now, and the applications of the 3D printing and the advanced manufacturing is really going to propel us forward, both in my profession as a physician but across the board.

Dr. Marrett or Dr. Arvizu, can you give us a few other examples of areas that NSF has focused tackling some of these challenges for, you know, on the issue of agribusiness, on the issue of, you know, honeybees and so forth?

Ms. MARRETT. The list could be so long I hardly know where to start. We actually produce publications around exactly that. There is a whole process we have used called Traces in which you could trace back. Here is a given

development and what led to that. So you have seen that a lot in what we have shown in the whole area of cognitive tutors. That started with just some very fundamental work out of cognitive science that continued to be refined, that led finally to this whole notion that it is really--there is the accompanied, there are the things that are done financially out of that about how you improve the whole tutoring process.

We have cited time and again another that started with just some very basic research out of the conceptual notion of game theory that led to the use of the auctions, auctioning that radio spectrum, a process that has brought now billions of dollars to the U.S. government.

We have then any number of ways in which it is quite possible to have some outcomes you just never anticipated, and as all of the examples show, it usually takes time. So these aren't things that happen all of a sudden, that it is a matter usually of continued investment in areas, but there is no shortage of the kinds of examples, and my colleague is ready to offer some others.

Mr. ARVIZU. I will just give you the short version here. Lots of technology that relates to the internet, web browsers, Doppler radar, magnetic residence imaging, DNA, fingerprinting, barcodes to name a few. There is a host of others.

Mr. BER. Well, thank you. We, you know, in order for us to maintain this competitive advantage over the rest of the world, we are the most innovative country in the history of our planet. We have to continue making these investments to make sure we continue to lead the world in innovation, and with that I yield back, Mr. Chairman.

Chairman BUCSHON. Thank you.

I recognize now the Chairman of the full committee.

Chairman SMITH. Thank you, Mr. Chairman.

Chairman BUCSHON. Chairman Smith.

Chairman SMITH. I don't know if it is been covered or not, but I would like to go back to a subject that I raised in my opening statement, and ask both witnesses if I could for suggestions. Help us come up with a way where we can try to discourage the approval of National Science Foundation grants that don't benefit the American people or our economy or our science discoveries or any of those things that we would all agree upon. And I actually mentioned it this morning at a full committee meeting with Dr. Holdren, but you have these examples, and I think I have got 50 of them, but the two or three that I recall right now is the grant that was approved to study National Geographic photos of animals from 1988, to 2008. I love National Geographic. I love seeing the photos of animals, but should that be--study be conducted at taxpayer expense?

The other one was I think the labor force in China in the 16th, 17th, and 18th centuries. Is there something we can do to make sure and maybe it is the approval process, maybe it is expressing Congress' sentiments, what can we do to better the approval process so that the American people will agree that their taxpayer dollars are being spent in a worthwhile way?

And that is part of it but--and it is not to deny that almost anything can be justified or have scientific value, but when only one out of every seven grants are being approved, there ought to be a higher standard than the standard that allows proposals like that to be approved. And that is not to say they shouldn't occur. Those studies might well should occur, but it should be on somebody else's dime, perhaps, rather than the taxpayers, and I welcome your comments, Dr. Marrett.

Ms. MARRETT. Yes. I think it is a fascinating question, and it is one that we certainly wrestle with. would make a distinction, though, between the title of a project and what I think your basic concern is you asked about the benefits, and as I was explaining earlier, the benefits are not always known when that project is, in fact, being developed. The title then can be very misleading.

I like the example we often use of Google. This was brought up--the initial title for that activity was a backrub

that this was hardly--so if we had just been looking at titles I have a feeling that there would have been someone saying, what? The National Science Foundation is going to fund something called backrub.

Chairman SMITH. And that is well and good, and I can appreciate that, but in these cases I have read the several-hundred-word summary of these projects, and that is almost intellectual dishonesty if you are going to study something that you don't describe in two or 300 words. I assume that they meant what they said, but I also don't think you are saying that there aren't proposals that are approved that shouldn't be approved, and I realize they are a very small percentage.

And but that is just it. You don't want them to color the overall process, and if there is a rational, reasonable way to try to eliminate some of these proposals from being approved, I assume that you would support that, and if so, then, what would--how could the process be improved?

Ms. MARRETT. That is what I said. We are--we can come back to you--

Chairman SMITH. Okay.

Ms. MARRETT. --with suggestions and ideas because it is extremely complicated. In the list of projects that have sometimes been cited as having funny titles or a number of other things, you will see a number of them are dissertation

topics. They were graduate students, and I can just envision that the reviewers were saying, let's not give up on them. Let's see what might be developed out of that. That is why I am saying it is a complicated process to determine, to ensure that we don't in many ways make it difficult for the best ideas to evolve.

The other thing that we are more than willing to do is to have the conversations about how the process, as I have said earlier, how our whole process works; because it is a process in which we make special efforts to try to reach across the best of the experts to try to weigh in on what makes sense for all of what is being developed, but we welcome.

Chairman SMITH. Good. I am glad you admit we can improve the process, and we will follow up on that.

Dr. Arvizu.

Mr. ARVIZU. Yeah, and I will just quickly just piggyback a little bit on what Dr. Marrett has said. You know, right now we have two criteria; intellectual merit, broadening participation, and the Board conducted a review on those criteria just as recently as last year to think through what are all of the implications of that on the community broadly. What--how do we justify that the taxpayer, that the U.S. public is getting the best science, the best proposals, transformative research, to ensure that there is not built-in

biases that we don't understand.

And so we are very anxious to continue to improve that process, and to the degree there are things that can be done that will help remove perhaps those that fall into that category called questionable, certainly are very open and willing to--

Chairman SMITH. Mr. Chairman, if you will give me another couple of seconds here. I am a little bit over.

Would you all agree to add to the guidelines something along the lines of that any proposal approved would have to directly benefit the American people?

Mr. ARVIZU. So that--that sounds like a great statement. I am--

Chairman SMITH. I am thinking about those I have seen that had to do with people in China. Not that there is anything wrong with that, but I would like--

Mr. ARVIZU. Yeah.

Chairman SMITH. --to direct that--

Mr. ARVIZU. That has more direct benefit. I think the issue and the question really is how do you start down a path of limiting or otherwise rephrasing that criteria so that it catches the things that you want and perhaps eliminates the things that you don't. In that case I think it begins to sound or to us feel like it is compromising the integrity of the basic process.

Chairman SMITH. To say that--let me get this right. To say that National Science Foundation proposals paid for by the American taxpayer, it compromises to say that it should benefit Americans?

Mr. ARVIZU. I wouldn't--certainly not put it that way. I would say that if we have criteria that unduly limits the opportunity for societal benefit to actually be gained by--

Chairman SMITH. But shouldn't they be able to state what those societal benefits are?

Mr. ARVIZU. We should be able to do that, and we believe that the criteria that we have today actually get at that in as robust a way as we know how. Certainly open t

Chairman SMITH. And how do you explain all those proposals?

Mr. ARVIZU. We are certainly not perfect in a lot of respects, but I am not in a position where I can talk about the specifics.

Ms. MARRETT. I was going to ask would you mind--

Chairman SMITH. Who am I holding up here, Mr. Chairman? Who has questions left besides me?

Chairman BUCSHON. Ms. Lummis.

Chairman SMITH. Okay. I better--

Mrs. LUMMIS. And let me yield one of my minutes to you, Mr. Chairman.

Chairman SMITH. Okay. Thank you. Sorry. I hopefully

won't use that.

Dr. Marrett, did you want to reply?

Ms. MARRETT. I was simply going to ask would you mind if we--you were asking the Science Board to take a look at exactly that kind of a question. What would it mean to say that the research, that the specific benefits because we already--our funding is to the U.S. group of scientists and engineers.

Chairman SMITH. Yeah.

Ms. MARRETT. So we don't fund the international, and it is always the assumption that the benefits accrue to the U.S. population, but how one would try to formulate that more sharply I think my colleague from the Board is more than willing to say--

Chairman SMITH. So you are open to new--

Ms. MARRETT. --the Board can take that up.

Chairman SMITH. --guidelines. You are open to new guidelines?

Mr. ARVIZU. We are open certainly to continue to evaluate if those guidelines serve the national interest, and I would certainly be open to--

Chairman SMITH. The guidelines don't even say national interest, do they?

Mr. ARVIZU. I think the--yeah. I think the organic act that formulated the foundation says in something about the

national interest, I believe, and prosperity.

Chairman SMITH. Well, I haven't seen in all the write-ups I have read of these suspect proposals, I have never seen any reference to the national interest.

Mr. ARVIZU. Yeah. The guidelines that we use, I think that the Foundation uses, the two that I mentioned earlier, intellectual merit and broadening participation--

Chairman SMITH. It might be good if those who write the proposals mention that. I would recommend that anyway. Thank you, Mr. Chairman. Thank you for your time, Ms. Lummis, as well.

Chairman BUCSHON. I now yield to Ms. Lummis for her questions.

Mrs. LUMMIS. Thank you, Mr. Chairman.

First, Dr. Marrett, just to give you a head's up, my first question is about Clean Energy Initiative, second is about supercomputing, and the third is for Dr. Arvizu about recommendations on regulations that increase administrative costs at research institutes, research universities. Okay. So, Dr. Marrett first.

Does any of the $372 million requested for Clean Energy Initiatives go to the U.S. Global Change Research Program? Do you know? And if so, how much?

Ms. MARRETT. I can't give you the exact figures, but as you can tell from the budget the U.S. Global Change Research

Program is what we call a crosscut in that it is organized through the National Science and Technology Council out of the Office of Science and Technology Policy. So that has, that means that things are reported in a particular way for that program.

For the Clean Energy Initiative, that is a slightly different formulation that asks agencies what they are actually undertaking with reference to the clean energy. You wanted to know the amount that we have--are funding in the Global Change Research Program. The request for '14 is 205 million, and that program is to be a comprehensive research program, but I think your other question is a link between that and the Clean Energy, and if my colleagues here don't have the answer for me right now, they will have it either--in a short time.

Mrs. LUMMIS. And I appreciate that. I know that is a very specific question, so if you could follow up with my office on the answer to that question, you know you are your convenience. At your earliest convenience. That would be great, Dr. Marrett.

Now, turning to supercomputing, what portion of your budget deals with supercomputing or maybe I should put it this way. What is the budget for supercomputing?

Ms. MARRETT. Probably the easiest way to describe that is the budget for our--the--what is now the division for

cyber infrastructure. Now, that includes--but I would have to modify that a bit because that is not just about supercomputing, that especially moving in recent years to try to ensure that the infrastructure, the information infrastructure is going to be what is available and useful for all scientists and engineers. Supercomputing had--some of what was developing was for the very high-end user, and we had other than high-end users, but, again, the exact budget they will give me momentarily.

Mrs. LUMMIS. And I appreciate that because I know I am asking really specific questions.

Dr. Arvizu, question for you. I note that there was about a year ago a report called Research Universities and the Future of America, and it had in it ten recommendations, one of which, recommendation seven, reads as follows. "Reduce or eliminate regulations that increase administrative costs, impede research productivity, and deflect creative energy without substantially improving the research environment."

Can you describe the taskforce work, the taskforce on administrative burdens, and what it is found with respect to unnecessary burdens on research universities?

Mr. ARVIZU. Thank you, Congresswoman Lummis, for that question. That is a topic of great interest to us at the Board, and so we have put together a subcommittee that will

focus specifically on trying to understand that which you refer to is our Administrative Burden Subcommittee. The findings to date are still very, very preliminary. In other words, we have just started the investigations, we have held already some workshops. We will hold more. There are a number of Board members who are very active in the community and are very anxious and interested to get at that, but we will give you a full report on the findings of that taskforce as soon as they come available. Right now it is still in the early stages.

Mrs. LUMMIS. Great, and Mr. Chairman, for all three of these questions, which I know were specific, I would be really grateful if you would sort of flag that Congressman Lummis is interested in this, and it would be just really terrific if you would follow up with me certainly when your findings become more solidified rather than preliminary and--because I have a tendency to jump the gun a little bit, and I want to make sure you have time to be really confidence in your recommendations.

And, you know, Dr. Marrett, some thing. If you need a little extra time to get back to my office with these or your staff could, that would be just super.

Ms. MARRETT. I will tell you right now for the academic cyber, the Advanced Cyber Infrastructure Division that I was describing, the budget is 225 million, and I only wanted to

give that to you now because I failed earlier to thank you for being present at the Wyoming supercomputer opening. Thank you.

Mrs. LUMMIS. Well, we are very excited about it as you can well imagine. I just can't even contemplate the number of computations that those computers are capable of making every nanosecond, and the fact that atmospheric research is so important, we are truly excited and committed as a university conglomerate, all of the universities involved in academic research just think that this is an absolutely terrific thing. And we really want to thank the NSF for recognizing the importance of supercomputing and scientific research, particularly atmospheric research.

And when I was my state treasurer, I was on the very, very, frontend of helping fund that center and have toured the Boulder Mother Ship for NCAR, and it is really, really a wonder, an American accomplishment. So kudos to you all. Thank you.

I yield back.

Chairman BUCSHON. Thank you. We are going to go into a short--a second line of questioning, and you are in luck because there is only a few of us left.

And I yield 5 minutes to myself.

Dr. Marrett, we had a hearing as you probably know on open access issues to publically-funded scientific research

data, and I see in your NSF budget you have 2.5 million dedicated towards ensuring public access. That is actually a small amount, but there are some significant policy implications with that, I think.

What specifically do you hope to accomplish with this funding, and is $2.5 million enough to accomplish your goals, and then I will have a follow up.

Ms. MARRETT. Well, thank you. Obviously, 2.5 million is not enough to ensure public access to the publications that NSF supports and to the data. That is really there for the planning that we must undertake because that is--we have the question of what can we, in fact, achieve, and we are starting on the publication side, but another reason why there isn't a fully-flushed out proposal yet or plan yet is that all agencies have been asked by the Office of Science and Technology Policy to develop a plan.

So it would be premature to come in at this point with the full details when we are working on the plan for what we will have to submit. We will be developing more, and again, we will be open to giving you any--the information as it evolves.

Chairman BUCSHON. So the funding is specifically just in the--for the planning stages of--

Ms. MARRETT. That is right.

Chairman BUCSHON. --that. That is great, because I

think, you know, as a result of our hearing we found out that I think it is important if the taxpayers are funding research projects, I think for the taxpayers and the American people to have access to probably not only the results but now because it is--everything is on computers, the actual data that generated the results so that we can--because some of the ability to duplicate scientific studies and get similar results has been a controversial thing for a long time. And part of that has been, I think, is because people haven't had the access probably to the full data set that has been used by the researcher in the first place.

And so the follow up was probably inaccurate, and we saw that--we see that a lot in my medical profession of cardiac surgery where there have been multiple studies on all kinds of things that seem to contradict each other, but when actually you get into the weeds, they really are very similar or there was a missing piece of information that the follow-up researcher did not have access to.

So thank you for that answer, and I don't have any other questions.

I will now yield to Mr. Lipinski.

Mr. LIPINSKI. Thank you, Mr. Chairman. I want to go back to Chairman, what Chairman Smith was discussing. I just wanted to--maybe it is because I was the author of the NSF Reauthorization Bill last time, but I just wanted to bring up

something that we put in there, it is Section 526 of the final bill, the America COMPETES Reauthorization, the Broader Impacts Review Criterion.

And let me just read this here so everyone is aware of this, and we have this on the record. If you look there, under goals, "The Foundation shall apply a broader impacts review criterion to achieve the following goals."

So these are for anyone who is submitting a proposal is supposed to discuss how it meets one or more of these criterion. "One, increase economic competitiveness of the United States, two, development of globally-competitive STEM workforce, three, increase participation of women and under-represented minorities in STEM, four, increase partnerships between academia and industry, five, improved pre-K through 12 STEM education and teacher development, six, improved undergraduate STEM education, seven, increased public scientific literacy, and eight, increased national security." So we have bookend there, increased economic competitiveness and the increased national security there is number eight.

But so right now those are to be considered when any proposal is being reviewed by the NSF. So I just wanted to--I don't think I really had a question. I wanted to make sure that I brought that out there that this is already--we codified it for the first time in the Reauthorization, which

was in the COMPETES Reauthorization back in 2010.

So I just wanted to have that out there for the record. I don't know. There is no need for a comment, but if Dr. Marrett or Dr. Arvizu had anything to add to that, you are welcome to add it. If not, I can just move on.

Ms. MARRETT. I suppose my only comment is since Dr. Arvizu had said the Board would be willing to think about the benefits to the Nation, what those--the criteria are already, perhaps they don't say a benefit to the U.S., but that is really what they are directed towards. So that is the way I interpret your comments.

Mr. LIPINSKI. That is certainly what we intended and put those specific categories out there.

Mr. ARVIZU. Yeah, and I just want to clarify, and thank you for reading the sub bullets on each of those two criteria. I think those both found at least in the reviews that we have had to date, been sufficiently robust that we couldn't figure out how to improve on them. Certainly willing to listen to suggestions about how to improve them, but the last review went through this process and looked at it and said that really achieves the results that we were trying to accomplish.

Still, I am open to the idea that there would be opportunities to improve on that, but, again, it is a subject of debate and discussion. The Board is made up of 25

members. Each of them have a different perspective on how to approach scientific and intellectual merit, and I think to a large degree the value that the Board brings is the diversity of opinion, and when they come together and they codify this, and that kind of is the latest position that we take.

Certainly continuous improvement requires that we go back and revisit those on occasion.

Mr. LIPINSKI. And I certainly won't claim that I am perfect and we were perfect in putting this together in 2010, but certainly I think we certainly gave a lot of consideration to this, and if there are suggestions on how this can be improved, I think we should all be open to that.

I think with that I will yield back.

Chairman BUCSHON. Thank you. I would like to say in closing that--thank you for your testimony. It is valuable testimony to the committee. Also thank the other representatives from the National Science Foundation who are here today, and there is a whole row there and that as the Chairman of the subcommittee I fully support, obviously, scientific research, and I think that we want to make sure that as the Federal Government we are not short-sighted in our role as it comes--as it relates to funding basic science research. We have had a couple of hearings where people from the private sector that spend quite a bit of money on research did tell us how important the NSF still is and will

continue to be when it comes to funding basic science research for the future of our country, and thank you, again, for coming.

Thank the members of the committee. The members of the committee may have additional questions for you, and they will ask you to respond to those in writing. The record will remain open for two weeks for additional comments and written questions from the members.

The witnesses are excused, and the hearing is adjourned. Thank you.

[Whereupon, at 3:36 p.m., the Subcommittee was adjourned.]

UNITED STATES HOUSE OF REPRESENTATIVES
Committee on Science, Space, and Technology
Subcommittee on Research
Hearing on
An Overview of the National Science Foundation Budget for Fiscal Year 2014
April 17, 2013
Dr. Cora Marrett, Director (Acting), National Science Foundation
Questions for the Record Submitted by
Larry Bucshon

National Science Board

Question 1. What are examples of NSF-related policy issues that you and the board currently disagree? Please elaborate.

Answer: The National Science Board and the Director jointly pursue the goals and functions of the NSF. There are no policy issues on which there is significant disagreement.

Research Misconduct

Question 2. The pressure by investigators to obtain research grants will increase, especially in this competitive research funding climate. I believe most investigators will apply for NSF grants with integrity and also conduct their research in a noble manner. However, the number of cases of research misconduct is growing. Do you believe that this situation will get worse with time? If yes, what is behind this growth? Please explain.

Answer: Research misconduct includes fabrication, falsification, and plagiarism. Most of the research misconduct cases addressed by NSF fall into the category of plagiarism. NSF takes seriously all types of research misconduct and takes measures to prevent its occurrence. For example, NSF requires that organizations submitting proposals certify that they have a plan to provide training in ethical research and verify that the students and post-doctoral associates on NSF-funded awards have received the training. Additionally, NSF provides training to its staff and outreach to the research community. Selected NSF funding opportunities include ethics components on the promotion of ethical research, such as Ethics Education in Science and Engineering. Such measures are intended to address the multiple causes of research misconduct.

Clean Energy Research

Question 3. I am concerned that the emphasis on clean energy research may be at the expense of other potentially transformative research. How can we ensure that this will not become the case?

Answer: The National Science Foundation (NSF) funds fundamental potentially transformative research proposals from all disciplines of science and engineering. These proposals may be submitted in response to topical specific solicitations or to any of NSF's fundamental research programs. This structure ensures that NSF supports research in areas the scientific community considers currently promising. Clean energy research is only one general topic within a broad portfolio. The "emphasis" on clean energy research is mainly driven by the *unsolicited* proposals received addressing fundamental science and engineering questions and strong interest in the science and engineering research communities in this general topic area. NSF

partners with the research community through the peer-review process to ensure that the most meritorious, impactful, and potentially transformative research proposals are recommended for funding.

INSPIRE

Question 4. In your NSF budget, you have $63 Million being devoted to the INSPIRE program. Your testimony states that this investment will strengthen "NSF's support of interdisciplinary, potentially transformative research by complementing existing efforts." Which 'existing efforts' are you specifically targeting?

Answer: The INSPIRE program comprises proposal opportunities for ideas that are required ***both*** to be interdisciplinary and to exhibit potentially transformative research (IDR and PTR, respectively). It is complementary to existing efforts in that INSPIRE was created to handle proposals whose:

- Scientific advances lie in great part outside the scope of a single program or discipline, such that substantial funding support from a single distinct program or discipline is unlikely.
- Lines of research explore bold methodologies that are beyond well-established practices in accordance with expected progress in their fields.
- Evaluation through non-standard merit review processes might reveal prospective discoveries hidden at the interfaces of disciplinary boundaries.

Also, although NSF has specific solicitations for IDR or PTR in selected targeted areas of science, INSPIRE complements these since it is open to all areas of science supported by NSF and there are no favored topics. INSPIRE is an experimental activity that will be assessed over the next five years to determine if its various funding opportunities have resulted in support for proposals that normally would not be submitted to NSF.

Cognitive Science and Neuroscience

Question 5. In your NSF Budget request, you have $14 million going to cognitive science and neuroscience. It seems a big part of this funding will be going towards workshops to identify specific gaps in our current understanding of the brain. Why are you taking this approach? Don't you think the National Academy of Sciences should commission a study? After all, acting in their capacity as our nation's main scientific advisory body, aren't these gaps what they are best tasked to determine? What alternative approaches could be used with this money? How are these proposed workshops going to be productive, with consensus being reached on the scientific framework?

Answer: While some of the enhanced funding will certainly be used productively in workshops—which are important starting points for scientific collaboration and discussion across disciplines and in framing research agendas—most of the funds will not be used for that purpose. NSF is committed to making targeted investments in collaborative science and innovative technologies to accelerate discovery that will revolutionize our understanding of the brain. NSF is uniquely positioned to lead a broad multi-disciplinary effort that brings the imagination of scientists and engineers together to advance a comprehensive understanding of brain structure and function. Progress in this area holds an almost unlimited potential for improving our educational, economic, health, and social institutions and for enhancing the lives of Americans.

The proposed cross-foundation activity responds to a number of societal needs and scientific community challenges. The integration of research in cognitive science and neuroscience across scales has the potential to accelerate scientific discovery and innovation, promote advances in technology, and contribute to improved U.S. economic competitiveness.

In FY 2013, the Cognitive Science and Neuroscience Working Group, with representatives from six NSF directorates, drafted a Dear Colleague Letter (DCL) titled "Accelerating Integrative Research in Neuroscience and Cognitive Science (AIR-NCS)." The intent of this DCL is to direct researchers interested in integrative neuroscience to use existing funding mechanisms (EAGERs, Research Coordination Networks (RCNs), and INSPIRE) to further their scientific endeavors.

In FY 2014, NSF plans to enhance support (+$13.85 million) for an NSF-wide integrative activity on neuroscience and cognitive science. Support will continue for the EAGERs, RCNs, and INSPIRE, and will include research on understanding the brain, including mapping of circuits that drive behavior in a variety of organisms. A cross-foundation AIR-NCS solicitation will be released that builds on the foundation and themes in the FY 2013 DCL.

Consolidation of federal STEM education programs

Question 6. The Administration's FY 2014 budget request includes a proposal to reduce or consolidate 114 STEM programs across the federal government. The proposal shifts a number of those programs being consolidated to NSF, and NSF is consolidating some of its own programs. How were programs evaluated to determine whether or not they should be consolidated or cut? Does NSF have the capacity to effectively and efficiently run all of the programs that are being brought from other agencies?

Answer: NSF does not interpret the President's proposed STEM-education reorganization to mean that programs from other agencies will be "shifted" to NSF. Rather, NSF programs will be expanded and coordinated within new frameworks and will introduce additional approaches for improved impact and efficiencies. The *functions* of consolidated programs will be reviewed jointly by the lead and collaborating agencies during the implementation planning and transition into this new system of delivering STEM education. As appropriate, critical functions will then be incorporated into existing or new programs at the lead agencies. Under NSF leadership, cross-agency planning has already been underway among the agencies involved in the reorganization of programs in the areas of undergraduate education reform and graduate fellowships.

For the internal undergraduate consolidations at NSF, programs based in the Research and Related Activities (R&RA) directorates that have a full or partial focus on undergraduate education were identified as suitable for inclusion in the broader framework, Catalyzing Advances in Undergraduate STEM Education (CAUSE), to bring coherence to NSF's undergraduate STEM-education reform investment. The programs brought together under the CAUSE framework share common goals such as: improving the quality of undergraduate preparation in STEM; increasing the retention of undergraduates in STEM fields and the quantity of STEM graduates; and addressing issues of institutional capacity and scale. Key findings from past and ongoing evaluations, along with Committee of Visitor recommendations, will be carefully considered as CAUSE planning and implementation proceeds.

The CAUSE program will be managed by NSF's Directorate for Education and Human Resources' Division of Undergraduate Education (DUE). The scientific staff in DUE includes thirty program officers whose expertise span all STEM disciplines as well as research in undergraduate STEM education. DUE expertise will be augmented with program expertise from NSF's R&RA directorates that oversee programs included in the internal consolidation, and through collaborations with staff in undergraduate programs from other agencies. CAUSE will be anchored by the consolidation of three major DUE programs: Transforming Undergraduate STEM Education (TUES), Widening Implementation and Demonstration of Evidence-Based Reforms (WIDER), and the STEM Talent Expansion Program (STEP). Combining these three programs into a single program will enable significant efficiencies in reviewing proposals, project oversight, evaluation, and program design and improvement. NSF is confident it has and can amass sufficient scientific, education, and administrative capacity to lead this initiative within the proposed budget.

Several programs in the proposed STEM education reorganization are graduate fellowship programs at mission agencies. As the lead agency for STEM graduate fellowships under the reorganization, NSF has proposed expanding its Graduate Research Fellowship Program to include a set of "targeted opportunities" that will enable graduate fellows funded by NSF to participate in the mission-specific graduate experiences that would improve their career readiness and address national scientific needs. NSF's Division of Graduate Education is adequately staffed to design and manage the initial stages of this expansion, and will partner with colleagues across government who work together regularly on graduate fellowships.

Questions for the Record Submitted by
Daniel Lipinski

Advanced Manufacturing

Question 1. Dr. Marrett, the National Science Foundation (NSF) is proposing an increase in nearly $50 million in support for advanced manufacturing in fiscal year (FY) 2014. Can you describe NSF's contribution to the Administration's efforts in advanced manufacturing R&D? Specifically, can you describe NSF's role in and level of commitment to the National Network for Manufacturing Innovation?

Answer: NSF's core scientific and engineering programs have produced many fundamental advances that have enabled and continue to enable breakthrough manufacturing technologies, many implemented worldwide. Now, core research programs and special initiatives will achieve similar results by bringing research communities together to address critical manufacturing needs that cross disciplines. The Foundation's Cyber-Enabled Materials, Manufacturing, and Smart Systems (CEMMSS) portfolio will spur marketplace innovation, leading to high technology jobs and industrial growth in the United States. Many efforts will be highly coordinated with our interagency partners to avoid duplication and increase effectiveness of NSF funded efforts.

The Foundation's FY 2014 Request of $159.73 million includes major emphasis areas such as:

- Research to advance sensor- and model-based smart manufacturing, advanced robotics and materials, and nano-manufacturing;
- Research on Cyber Physical Systems (CPS) will transform static manufacturing systems into adaptive, "smart" systems that can sense and adapt to environmental change;
- Likewise, the multi-agency National Robotics Initiative (NRI) will help develop robots that work beside, interact cooperatively with, or assist people in performing a variety of tasks;
- In response to the Administration's Materials Genome Initiative (MGI) research will continue through NSF's Designing Materials to Revolutionize and Engineer our Future (DMREF) activity. Research focuses on the manufacturing aspects of the synergistic use of experiment, theory, computation, and data driven research approaches to more rapidly discover, process, and deploy useful materials, including bio-inspired materials.
- Manufacturing enterprise systems, manufacturing and construction machines, and materials processing and manufacturing of materials and biomaterials;
- Advanced semiconductor and optical device design, fabrication and processing, for application in biomedical, alternative energy, communications, computing and sensing systems;
- Fundamental research in chemical and materials syntheses and processing, especially at the nanoscale underpins and will accelerate developments in advanced manufacturing of commodity chemicals and functional materials.
- The National Nanotechnology Initiative (NNI) Signature Initiatives: Sustainable Nanomanufacturing and Nanoelectronics for 2020 and Beyond;
- Capabilities for the 21st century, specifically those associated with complex engineering systems design and manufacturing; and
- A variety of activities aimed at bolstering industry/university interactions, such the Industry/University Cooperative Research Centers (I/UCRC) program.

Concerning NSF's contribution to the Administration's efforts in advanced manufacturing R&D, and specifically, the Foundation's role in and level of commitment to the National Network for Manufacturing Innovation (NNMI), NSF has been participating in meetings with the National Economic Council (NEC), Office of Science and Technology Policy (OSTP), and senior leaders from various agencies to strengthen interagency coordination and improve efficiency and effectiveness of the U.S. Government's advanced manufacturing investments through coordinated and collaborative ventures. NSF feels that participation in these efforts significantly increases the impact of our basic research investments in areas cited above while increasing the relevance of our research programs.

NSF's greatest strength is its university-based research community. The pilot institutes planned under NNMI offer the opportunity to more tightly integrate NSF basic research activities and our STEM educational programs with the more focused and applied research and development activities occurring at the institutes. We plan to do this in ways that were recommended in the Advanced Manufacturing Partnership (AMP) report published by PCAST in July, 2012: *Report to the President on Capturing Domestic Competitive Advantage in Advanced Manufacturing.* Toward that end, NSF's role in the 2012 pilot institute and the additional three planned institutes is described below.

NSF supported the first pilot institute on additive manufacturing managed by the Department of Defense (DOD) through a $1.0 million direct investment with the goal of facilitating collaboration, enhancing opportunities for technology transition, and coordinating educational activities with existing NSF grantees. NSF is an active partner in this multi-agency management team. It is noteworthy that the fundamental research in additive manufacturing was supported by NSF in the early 1990s.

NSF will partner with DOD and the Department of Energy (DOE) to support three additional institutes (2 DoD, 1 DOE) that were described during the President's State of the Union address. NSF plans on investing directly in the two new DOD institutes, and we envision supplements to NSF Grantees' research to establish collaborations with institutes, including supplements to support students/post-docs working with/onsite at the institutes; establishment of linkages between institutes and existing NSF/ATE programs; as well as potentially placing students on site, sharing best practices, curricula development with industry, etc. In addition to these DOD and DOE efforts, NSF anticipates working closely with the Department of Commerce on additional institutes, if the full NNMI is authorized and funded by Congress.

Informal STEM Education

2. Dr. Marrett, NSF is proposing a significant cut to the informal STEM education program (AISL) even as the overall Education and Human Resources budget grows. I understand this may be part of the larger Administration STEM overhaul that creates a new role for Smithsonian in federal informal STEM efforts, but I still have concerns.

Question: How do you justify this cut in an otherwise growing budget? How will you work with the Smithsonian to help build their capacity to support informal STEM education and outreach across the nation? How will you work with science centers across the country as you refocus the AISL program? Also, I worry this cut could diminish NSF's opportunities for branding, which increases public recognition and support for the NSF mission. Can you comment on that aspect of it too?

Answer: NSF's unique role in informal STEM learning/engagement is to support research and development in order to develop an evidence base around exciting, innovative models for informal learning. This is accomplished through collaborations among educators, scientists, and other technical professionals, and is supported through multiple NSF programs, including Advancing Informal STEM Learning (AISL). The FY 2014 funding level proposed for AISL is to ensure its research focus on innovative learning and engagement strategies amidst the increasingly broad set of environments in which STEM learning occurs outside of school. Coordination of NSF programs that fund informal STEM-education [primarily AISL plus Discovery Research K-12 (DR-K12), Research on Education and Learning (REAL), Innovative Technology Experiences for Students and Teachers (ITEST), and Cyberlearning Learning Transforming Education (CTE)] with the public engagement and outreach programs of NSF-funded Research and Related Activities (R&RA) projects will not only achieve resource efficiencies but will provide real-time, ongoing test beds for understanding how STEM learning occurs beyond the school environment.

New "non-traditional" players in informal STEM education, such as the business community, private foundations, civic groups, technology developers, and other out-of-school entities, also create new opportunities to leverage resources through strategic collaborations. New social models, approaches to scientific research, and emerging technologies, such as citizen science, virtual networks, cyber-enabled learning, and educational gaming, create rich but unexplored opportunities to reach broad out-of-school and lifelong learning communities.

AISL investments will continue to advance the field by funding innovative projects that further understanding of how best to increase the STEM knowledge, practice, infrastructure, and professional capacity of people participating in informal STEM-learning settings. Those interventions can then serve as tested models, with strong evidence bases, for wider implementation and use at full scale through partnerships with other entities, such as the Smithsonian Institution, and be taken to scale through networks funded by the Department of Education.

Through the Office of Legislative and Public Affairs, NSF seeks opportunities to highlight all NSF-funded research. Those efforts would not be impacted.

Consolidation of federal Graduate and Undergraduate STEM Education programs

3. Dr. Marrett, as part of the broad overhaul of STEM education programs being proposed by the Administration, NSF has been designated the lead agency for federally supported undergraduate and graduate-level programs, including programs that have been managed within their respective mission agencies for years.

Question

- **At the graduate level, the NSF Graduate Research Fellowship Program is being expanded to be a National Graduate Fellowship Program (NGFP). As mission agencies phase out their own graduate fellowship programs, how will you ensure that the mission-specific needs of those agencies continue to be met under NGFP? What interagency infrastructure is in place or will you have to establish to meet this goal?**

- **Likewise, how will you address consolidation at the undergraduate level in terms of making sure that the mission-specific needs of the agencies and the research communities they support are being met?**

Answer: The President's proposed STEM-education reorganization, which designates NSF as the lead federal agency for STEM undergraduate and graduate education, expands and coordinates NSF programs within new frameworks that introduce additional approaches to achieve improved impact and efficiency. NSF staff will continue to collaborate with colleagues from agencies whose undergraduate programs and graduate fellowship programs are being realigned to fully understand the specific goals and operational features of those programs, as well as the agency assets (e.g. laboratories, facilities, scientists, and instruments) that have been available to participants in those programs. As much as possible, NSF will incorporate into these realigned programs (Catalyzing Advances in Undergraduate STEM Education or CAUSE, National Graduate Research Fellowships, and NSF Research Traineeships) the intentions and goals of programs from other agencies, and will be cognizant of how NSF's programs can meet the particular educational goals of science mission agencies. NSF staff will work collaboratively with other agencies to determine how participants in the NSF programs can have appropriate access to facilities and assets of other agencies as part of their preparation for the STEM workforce.

Although pre-planning had been underway, the White House organized a meeting of agencies after the release of the FY 2014 Budget to move forward in implementation planning of realigned programs, including the National Graduate Research Fellowship Program (NGRF). As described in the FY 2014 Budget, the NGRF design will include opportunities for fellows to obtain the technical and professional development specified by the mission agencies. In addition, NGRF administration will include mechanisms for mission agencies to be involved in selecting fellows in general, and, more specifically, for participation in specialized technical and professional development relevant to their agencies. The Interagency Working Group on STEM Graduate Fellowships and the NSTC Committee on Science, Technology, Engineering, and Mathematics Education (CoSTEM) are two interagency groups that provide infrastructure to help ensure the mission-specific needs of agencies are met. Meetings between NSF and individual agencies are underway to address considerations specific to each agency.

NSF's new CAUSE program is a natural evolution and consolidation of the Foundation's ongoing efforts to couple STEM disciplinary expertise with education-research expertise to better understand and improve undergraduate STEM learning and persistence of students from all groups and to support STEM workforce development. Developing the framework for CAUSE will be informed by input from others who have been managing undergraduate programs in their respective mission agencies. Conversations with those agencies are underway and will continue.

OMB hosted a meeting with representatives from NASA, the National Oceanic and Atmospheric Administration, the National Institutes of Health, and the Department of Defense to initiate conversations about goals, priorities, and ways to leverage each other's assets to support the implementation of the STEM reorganization, including in the area of undergraduate education. NSF staff have initiated subsequent meetings with USDA and the Department of Energy and will soon host a gathering of all federal agencies that have investments in undergraduate education. In addition, we will continue to engage with agencies one on one. Our conversations build upon and are guided by the extensive collaborative work that has been underway for several years through CoSTEM to leverage our collective expertise and assets to improve undergraduate STEM education.

Astronomy Portfolio Review

4. Dr. Marrett, last year the Astronomy Division carried out a community-based review of its full portfolio of facilities. Taking into consideration limited budgets and new telescopes coming online over the next several years, the reviewers recommended that NSF take steps to divest a number of older telescopes. I am hearing concerns from the community that the proposed schedule for divestment decisions by the end of 2013 may be unattainable even as stakeholders work together to develop new sources of funding to keep some of these telescopes operational.

Question: What would be the consequences of granting additional time for potential consortia to develop more fully?

Answer: NSF has stated publicly that decisions regarding divestment paths will need to be taken near the end of Calendar Year 2013 in order to realize savings in the FY 2017 budget. NSF also has stated publicly that this does not require fully formed consortia and signed Memoranda of Understanding by the end of 2013, but does require significant evidence of likely commitment levels beyond e-mail expressions of interest. Deferring divestment decisions will carry the realization of savings out to time frames beyond FY 2017.

Depending on the amount of delay, this most likely will result in one or more of the following:

(1) reduction of individual investigator funding rates to less than 10 percent, or complete cancellation of individual investigator programs in some years beginning in FY 2015-2016, depending on which budget scenarios are realized for MPS/AST;
(2) delay of the Mid-Scale Innovations Program that was the number two priority for large ground-based projects in the 2010 decadal survey and is included in the NSF FY 2014 Budget Request to Congress;
(3) inability to commit to operations of the Advanced Technology Solar Telescope (ATST) beginning in FY 2015;
(4) deferral of the construction start of the Large Synoptic Survey Telescope, also in the FY 2014 Budget Request, because of a lack of projected funding available for operations, which begin in 2018-2019.

Question: Can you tell us where things stand with respect to considering and implementing the Portfolio Review recommendations, including any schedule for management decisions on these facilities?

Answer: NSF has separated two telescopes, the Green Bank Telescope and the Very Long Baseline Array, from the primary management competition for the National Radio Astronomy Observatory (NRAO), in order to provide maximum flexibility for the development of funding partnerships. NSF is preparing solicitations for competition of the management of the National Optical Astronomy Observatory (NOAO) and of NRAO that describe the scope of those observatories beyond 2015. NSF has asked its observatory management organizations to solicit expressions of interest from potential partners, which in some cases have led to direct discussions between NSF and the possible partners or consortia. Some of these potential partners are university-based, and some are other federal agencies. NSF continues to hold to its schedule of making divestment decisions by the end of 2013.

Question: Finally, how will you seek community input on the implementation of the Portfolio Review?

Answer: The Portfolio Review was an inherently community-based process, with a broadly representative committee of community astronomers that solicited input from individual astronomers and from representatives of all the national astronomy facilities. Furthermore, the Portfolio Review instructions required them to accept the science and program priorities set by the National Academy decadal surveys, which were based on extensive community input and discussion. The results of the Portfolio Review, and the NSF plans as they develop, have been presented in multiple town hall meetings of the American Astronomical Society, to multiple standing National Academy advisory committees, to the Astronomy and Astrophysics Advisory Committee (AAAC, chartered by Congress), to a meeting of the country's astronomy department chairs, and via a web-based presentation to the entire community; in all these forums, ample opportunity was given to ask questions. Discussions regarding implementation have been held with the managing organizations of the national facilities as well as with representatives of tenant organizations that operate on NSF observatory sites.

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States

House of Representatives

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May 9, 2013

Dr. Farnam Jahanian
Assistant Director
Directorate of Computer and Information Science and Engineering
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Dear Dr. Jahanian:

On behalf of the Subcommittee on Research and the Subcommittee on Technology, we want to express our appreciation for your participation in the hearing entitled "Next Generation Computing and Big Data Analytics" on Wednesday, April 24, 2013.

You have received a verbatim electronic transcript of the hearing for your review. The Committee's rule pertaining to the printing of transcripts is as follows:

> *The transcripts of those hearings conducted by the Committee and Subcommittees shall be published as a substantially verbatim account of remarks actually made during the proceedings, subject only to technical, grammatical, and typographical corrections authorized by the person making the remarks involved.*

Transcript edits, if any, should be submitted no later than May 23, 2013. If no edits are received by the above date, we will presume that you have no suggested edits to the transcript.

We are also enclosing questions submitted for the record by Members of the Committee. These are questions that the Members were unable to pursue during the time allotted at the hearing, but felt were important to address as part of the official record. **All of the enclosed questions must be responded to no later than May 23, 2013.**

All transcript edits and responses to the enclosed questions should be submitted to us and directed to the attention of Melia Jones at melia.jones@mail.house.gov. If you have any further questions or concerns, please contact Ms. Jones at 202.226.2040.

Thank you again for your testimony.

Sincerely,

Larry Bucshon
Chairman
Subcommittee on Research

Thomas Massie
Chairman
Subcommittee on Technology

Enclosure: Member Questions

QUESTIONS FOR THE RECORD
THE HONORABLE CYNTHIA LUMMIS (R-WY)
U.S. House Committee on Science, Space, and Technology

Next Generation Computing and Big Data Analytics

Wednesday, April 24, 2013

1. The massive volumes of data generated daily across a range of industries and public sector organizations necessitate new methods to store and manage the data. The National Science Foundation (NSF) Computer and Information Sciences and Engineering Directorate (CISE) helps develop and maintain cutting-edge national computing and information infrastructure for research and education. This data must be analyzed to extract knowledge and promote discovery. Often this data resides in scattered locations.

For the nation to take advantage of the discovery that can be derived from big data, please explain how an effective infrastructure can be constructed to connect the entities developing and using Big Data to drive discovery. Additionally, please describe how the infrastructure, connections, and broadband would be developed to enable the entire community of research universities, in particular those like the University of Wyoming from EPSCoR states.

2. Within NSF, the Computer and Information Sciences and Engineering Directorate (CISE) helps develop and maintain cutting-edge national computing and information infrastructure for research and education. NSF has significant investment in computing infrastructure, including the NCAR-Wyoming Supercomputing Center, among others. These high performance computers are capable of processing complex data sets at a greater rate, enabling scientific research and discoveries.

The ability to analyze and utilize information from increasing quantities of data sets is crucial to advancing knowledge. Please describe the contributions these facilities are expected to make to the development and use of Big Data over the next three to five years.

QUESTIONS FOR THE RECORD
THE HONORABLE DEREK KILMER (D-WA)
U.S. House Committee on Science, Space, and Technology

Next Generation Computing and Big Data Analytics

Wednesday, April 24, 2013

There have been a number of big data reports generated recently by a number of industry leaders. I'm proud to say that companies, EMC and Isilon, which is headquartered in Washington State, have done a lot of great work on big data. EMC recently released their latest "Digital Universe" study, conducted by IDC. Amazingly, this study projects that the digital universe will reach 40 Zettabytes by 2020.

One of the issues I have been passionate about, both in the state legislature and in my first few months in Congress, is STEM education. It seems to be that many of these reports make a compelling case that there is a dire need for more data scientists.

I have two questions:

1. How are your organizations specifically addressing the need for more data scientists and employees with STEM backgrounds?

2. In your testimony, you both discuss how our nation is facing a data scientist shortage. What policies would you recommend Congress consider to address that shortage?

NEXT GENERATION COMPUTING AND BIG DATA ANALYTICS

Wednesday, April 24, 2013

House of Representatives,

Subcommittee on Research

joint with the

Subcommittee on Technology

Committee on Science, Space, and Technology

Washington, D.C.

Committee Hearings

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NEXT GENERATION COMPUTING AND BIG DATA ANALYTICS

Wednesday, April 24, 2013

House of Representatives,

Subcommittee on Research

joint with the

Subcommittee on Technology

Committee on Science, Space, and Technology

Washington, D.C.

The Subcommittees met, pursuant to call, at 10:04 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Larry Bucshon [Chairman of the Subcommittee on Research] presiding.

Chairman BUCSHON. All right. This joint hearing of the Subcommittee on Research and the Subcommittee on Technology will come to order.

Good morning, and welcome to today's joint hearing entitled "Next Generation Computing and Big Data Analytics. In front of you are packets .containing the written testimony, biographies and Truth in Testimony disclosures for today's witnesses.

Before I get started, since this is a joint hearing involving two subcommittees, I want to explain how we will operate procedurally so all members understand how the question-and-answer period will be handled. As always, we will alternate rounds of questioning between majority and minority members. The chairmen and ranking members of the Research and Technology Subcommittees will be recognized first. Then we will recognize members present at the gavel in order of seniority on the full Committee and those coming in after the gavel will be recognized in order of their arrival. I now recognize myself for 5 minutes for an opening statement.

Again, I would like to welcome everyone to today's hearing where we will examine how advancements in information technology and data analytics enable private and public sector organizations to provide greater value to their customers and citizens. Industry, academia, and government

are all interested in determining how to extract value, gain insights, and make better decisions based on the wealth of data that is generated today. In recent years, "big data" has become the popular term used to encompass this phenomenon.

TechAmerica, an information technology trade association, defines big data as "large volumes of high-velocity, complex and variable data that require advanced techniques and technologies to enable the capture, storage, distribution, management and analysis of the information."

Big data offers a range of opportunities for private industry to reduce costs and increase profitability. It can enable scientists to make discoveries on a previously unreachable scale. And it can allow governments to identify ways to serve its citizens more efficiently.

The McKinsey Global Institute predicts that effective information management can provide $300 billion in annual value to the U.S. health care sector alone. TechAmerica released a report last year highlighting how big-data initiatives can improve the efficiency and effectiveness of government services, and through the use of advanced computing power and analytic techniques, universities and federal laboratories can drive new research initiatives that will significantly increase our scientific knowledge base.

There are also various challenges associated with big data that the Committee will explore today. McKinsey has estimated that the U.S. will face a shortfall of 140,000 to 190,000 professionals with significant technical depth in data analytics, and a further shortfall of an additional 1.5 million managers and analysts who can work effectively with big-data analysis by 2018. Committee members will be interested to learn how industry, academia, and government are addressing this shortfall.

While the term "big data" is relatively new, public and private organizations have been investing in computing power and data analytics for a number of years. In March of last year, the Obama Administration announced a Big Data Research and Development Initiative, including $200 million in new funding across six different government departments and agencies. I am interested to learn how effectively these programs are being coordinated across the different federal agencies to ensure that taxpayer dollars are being leveraged effectively. Finally, privacy and security are major concerns when private and public organizations are collecting, analyzing and disseminating massive data sets.

We have an excellent panel of witnesses ranging across industry, academia and government. I would like to extend my appreciation to each of our witnesses for taking the time and effort to appear before us today. We look forward to your

testimony.

[The statement of Mr. Bucshon follows:]

********** INSERT 1 **********

Chairman BUCSHON. I will now yield to Mr. Lipinski for his opening statement.

Mr. LIPINSKI. Thank you. I want to thank you, Chairman Bucshon, and I want to thank Chairman Massie for holding this hearing. I want to welcome and thank the witnesses for being here.

Today's hearing gives us an opportunity to talk about the new tools and analytics that are being developed for big data. AS Chairman Bucshon stated, big data can be thought of as large volumes of complex and diverse types of data that change rapidly with time.

In basic scientific research in national security as well as in economic sectors ranging from energy to health care, big-data challenges are becoming fundamentally important. Effectively dealing with big data can impact how we do business and how we think about the world.

As a member of the Research Subcommittee for several years now, I have watched as the amount and complexity of data has grown by leaps and bounds. The field of astronomy is a great example. When the Sloan Digital Sky Survey started work in 2000, its telescope in New Mexico collected more data in a few weeks than had been collected in the history of astronomy, and that telescope will be surpassed when the Large Synoptic Survey Telescope begins scientific operations in 2020. LSST will photograph the entire sky

every few days, producing data at a rate almost 100 times greater than the Sloan Survey. But data is useless without the means to store and analyze it in an efficient manner.

The types of data are changing as well. Data has gone from being mostly numbers entered into Excel spreadsheets to data coming from sensors, cell phone cameras and millions of email messages. In fact, it is estimated that over 85 percent of data generated today are these kinds of unstructured data, data like videos or emails. The change in the volume and variety of data as well as how fast data is being produced and changed creates almost limitless opportunities. For example, since cybersecurity data is massive, varied, and changing quickly, big-data technologies have the potential to detect and prevent cyber attacks before they happen. I know that organizations like IBM are developing technologies to do just that. Additionally, big data could be used to establish new business models, create transparency, improve decision-making and reduce inefficiencies within businesses and government.

But along with the opportunities, there are a number of challenges. We need new tools and software packages to manage, organize, and analyze all these different kinds of data. Additionally, we will need an analytic workforce to ensure the gains of big data. These challenges necessitate involvement from government, academia and the private sector.

That is why I am happy to see all those sectors represented today.

The government has and will continue to play an instrumental role in this area. For instance, the Networking and Information Technology Research and Development program, or NITRD, created an interagency big-data group that is coordinating federal efforts in technologies, research, competitions, and workforce development for big data. We had a hearing on the NITRD program back in February, and I expect that we will be able to take a broader look at many of the same issues in tOday's hearing.

In some cases, agencies have teamed up to issue joint solicitations. For example, NSF and NIH ,have a joint big-data grant program that awarded nearly $15 million of grants to eight teams of researchers last year. These first award grants went to projects focused on designing new tools for big data and new data analytic approaches. We will be hearing more about these and other interagency activities from Dr. Jahanian in his testimony. We will also learn more about specific programs at NSF, one of the leading agencies in federal big-data efforts on both the analytics side and the computational resources side.

As I mentioned before, one of the areas being coordinated through NITRD is workforce development for big data. Several agencies, including NSF, have education

activities to support a new generation of big-data researchers. As we will likely hear from all of the witnesses, we face a looming shortage of workers with the skills needed to analyze and manage large, complex and high-velocity data sets. There is some overlap with the broader STEM skills we so often speak about in this committee, but there are also some unique skills required to address the big challenges of big data. We need to consider how to build those skills into STEM curricula, especially at the undergraduate and graduate levels. I look forward to hearing from our witnesses about the current educational efforts and what additional initiatives may be necessary.

And finally, since big data involves different types of data that can be produced and transferred quickly, there are concerns over privacy. We need to ensure that we strike the right balance between exploring and implementing all of the potential benefits of big data while also protecting individuals' personal information.

I look forward to hearing the witnesses' testimony and our discussion today, and I yield back the balance of my time.

[The statement of Mr. Lipinski follows:]

********** INSERT 2 **********

Chairman BUCSHON. Thank you, Mr. Lipinski. The chair now recognizes the chairman of the Subcommittee on Technology, Mr. Massie, for 5 minutes for his opening statement.

Mr. MASSIE. Thank you, Chairman.

Good morning. Today we are examining an issue that we hear a lot about. "Big data" is a popular new term that can mean a lot of different things. The scientific community, though, has generated and used big data before there was the term "big data." In fact, in 1991 this Committee authored the High Performance Computing Act, which organized the federal agency research, development and training efforts in support of advanced computing.

Individual researchers have always been faced with difficult decisions about their data: what to keep, what to toss, what to verify with additional experiments. And as our computing power has increased, so has the luxury of storing more data. Incorporating computer power to process more scientific data is transforming laboratories across the country.

At the same time, the ability to analyze large amounts of data across multiple networked platforms is also transforming theprivate sector. Through big-data applications, businesses have not only revealed previously hidden efficiency improvements in their internal operations,

but, more importantly, also uncovered entirely new types of businesses built around data that was previously not accessible due to its size and complexity.

Today's hearing will examine the hype around big data. Is the United States the most innovative Nation in big data? Is our regulatory system creating any burdens on businesses? Could public-private partnerships with the federal agencies be improved to allow for more data innovations?

I thank our witnesses today for their participation today and I look forward to hearing their testimony. Thank you. I yield back.

[The statement of Mr. Massie follows:]

********** INSERT 3 **********

Chairman BUCSHON. Thank you, Mr. Massie. The chair now recognizes Ms. Wilson for 5 minutes for her opening statement.

Ms. WILSON. First of all, I would like to thank both Chairman Bucshon and Chairman Massie for holding this joint hearing, and thank you all to our witnesses for being here today. Welcome.

This morning's hearing provides us with the opportunity to discuss one of the newest buzzwords in Washington, and you know we have many buzzwords here. This one: big data. This buzzword is not an exaggeration. A computer that used to take up the space of this entire room now fits in the palm of your hand. It is remarkable.

Just as computers have gotten immensely smaller, they have als8 gotten immensely more powerful. Instead of talking about megabytes, we are now talking about petabytes and zettabytes--quadrillions and sextillions of units of information. It boggles the mind. Collecting and storing this huge volume of data would have been impossible just a few years ago.

I am looking forward to your testimony and learning more about the benefits of big data to society. As I understand it, big data has potential to improve nearly all sectors of society. The National Cancer Institute is funding a prototype in biological big data that could lead to new

advances in cancer treatment. Companies and agencies are using big data to run controlled experiments that improve decision-making. Scientists at Florida International University in my district are using big data to advance understanding of topics including cybersecurity, social networks and cloud computing.

But there are challenges. In order to reap all the benefits of complex and broadly available data, we need new technologies and software. We also need a workforce, a workforce with the skills necessary to analyze data of such great volume and complexity. A recent study estimates that the United States is in need of 190,000 additional data scientists.

In thinking about this hearing on big data, I couldn't help but think about the tragic events last week in Boston. The marathon bombings may be one of the most photographed attacks in history. The Massachusetts State Police asked the public to share the photos and videos taken on that awful day. Now all of this digital information has been and is being used by the Boston Police Department and the FBI in their investigation. It appears that this data has been instrumental in helping to identify the individuals who were involved.

Examples like this one demonstrate how important it is that we develop and attain the tools and the skills people

need to analyze tremendous amounts of complex data. Big data can not only lead to amazing scientific discoveries; it can also save lives.

As we learn more about these opportunities and challenges today, I hope our witnesses will offer recommendations on how th Federal Government can help create the new tools, software and workforce needed to realize the full potential of big data.

Chairman Bucshon, Chairman Massie, thank you again for holding this hearing, and I yield back the balance of my time.

[The statement of Ms. Wilson follows:]

********** INSERT 4 **********

Chairman'BUCSHON. Thank you, Ms. Wilson.

If there are members who wish to submit additional opening statements, your statements will be added to the record at this point.

It is now time to introduce our panel of witnesses. Our first witness is Dr. David McQueeney, the Vice President of Technical Strategy and Worldwide Operations at IBM Research. In this capacity, he is responsible for setting the direction of IBM's overall research strategy across 12 worldwide labs and leading the global operations and information systems teams. Dr. McQueeney's background covers a wide range of disciplines, spending about half of his career as a researcher in research executive and half in IBM's customer-focused areas. He holds an M.S. and Ph.D. in solid-state physics from Cornell University and an A.B. in physics from Dartmouth College. Welcome.

Our second witness is Dr. Michael Rappa, the Executive Director of the Institute for Advanced Analytics and Faculty Member of the Department of Computer Science at North Carolina State University. Dr. Rappa has 25 years of experience as a professor working across academic disciplines at the intersection of management and computing. He began his teaching career at the University of Minnesota where he earned his doctorate degree. Welcome.

And our final witness is Dr. Farnam Jahanian, the

Assistant Director for the Computer and Information Science and Engineering Directorate at the National Science Foundation and a frequent visitor to our subcommittee. He oversees the CISE's mission to uphold the Nation's leadership in computer and information science and engineering. He also serves as Co-chair of the Networking and Information Technology Research and Development, or NITRD, Subcommittee of the National Science and Technology Council Committee on Technology, providing overall coordination for the activities of 14 government agencies. Dr. Jahanian holds a master's degree and a Ph.D. in computer science from the University of Texas at Austin. Welcome again.

As our witnesses should know, spoken testimony is limited to 5 minutes each after which members of the Committee have 5 minutes each to ask questions. Your written testimony will be included in the record of the hearing.

I now recognize our first witness, Dr. McQueeney, for 5 minutes for his testimony.

STATEMENTS OF DR. DAVID MCQUEENEY, VICE PRESIDENT, TECHNICAL STRATEGY AND WORLDWIDE OPERATIONS, IBM RESEARCH; DR. MICHAEL RAPPA, EXECUTIVE DIRECTOR OF THE INSTITUTE FOR ADVANCED ANALYTICS, DISTINGUISHED UNIVERSITY PROFESSOR, NORTH CAROLINA STATE UNIVERSITY; AND DR. FARNAM JAHANIAN, ASSISTANT DIRECTOR FOR THE COMPUTER AND INFORMATION SCIENCE AND ENGINEERING (CISE) DIRECTOR, NATIONAL SCIENCE FOUNDATION (NSF)

STATEMENT OF DAVID MCQUEENEY

Mr. MCQUEENEY. Good morning, Mr. Chairman, ranking members, members of the Subcommittees. Thank you for the opportunity to testify today. My written testimony covers next-generation computing, big data and analytics, workforce development and the role of government. In my 5 minutes, I will focus on areas where I can offer critical insights from my personal experience.

Computing today is undergoing profound change. We are moving from computing based on processors that are programmed to follow a predesigned sequence of instructions to cognitive computing systems based on massive amounts of data evolving into systems that can learn. This new approach will new require new strategies in hardware and in software and improved skills to maintain U.S. leadership. Cognitive systems will digest and exploit massive data volumes. Tools

such as mobile phones, videos and social networks generate as much data in 2 days in 2013 as in all of human history prior to 2003.

Advanced analytics can be thought of as tools for infusing all this data to make decisions on facts rather than intuition. The challenge is to transform latent data into actionable information to decide what to do next. For example, the Memphis Police Department is using data analytics to map crime hotspots and find patterns. As a result, they have been able to reduce crime by 30 percent with no increase in overall police manpower.

To run advanced analytics, it is essential to have the most powerful computing systems. However, current supercomputing systems are reaching performance levels that will stagnate without significant innovation. We must move to the next generation of large-scale computing called exascale computing, a thousand times faster than today's petascale machined.

The United States needs to invest now in the research and development for exascale systems to maintain strategic and economic leadership. Government-funded research on domain skills, especially at our national laboratories, should target systems for modeling, simulation and analytics on big data.

Before 2005, the United States had a clear lead in the

global supercomputing race. Today, we are still ahead but the rest of the world is catching up rapidly. To stay ahead will require new skills and knowledge and new types of 'decision-making. Nearly 2 million IT jobs will be created by 2015 in the United States to support big data, and the job candidates with analytic skills will get these jobs.

Industry is developing many collaborative skills programs, as enumerated in my testimony. I highlight our announcement today with Rensselaer Polytechnic Institute to offer a graduate degree program in the fall of 2013, the master of science in business analytics.

Privacy must be considered in the design of big-data systems. Big data does not require the sacrifice of personal privacy. When personal information is used, design-in processes such as IBM's Privacy By Design can protect privacy. When people understand how information is used, have the ability to set data usage policies and enjoy benefits of the analysis, they tend not to have privacy concerns.

The government's role should focus on research and skills. First, federal research investment in high-performance computing is critical to big data. Industry needs university-based exploratory research into numerous areas including system design, flexible software defined environments and IT infrastructure.

Second, IBM strongly supports the reauthorization of the Department of Energy High End Computing Revitalization Act of 2004 to be offered by Representative Hultgren. This bill will improve high-end computing R&D at the DOE and strengthen government industry partnerships for exascale platforms. IBM has a long history of successful partnerships with DOE. This partnership established computational simulation as an essential tool for scientific inquiry and led to world leadership in the United States in high-performance computing. The challenge ahead is to continue this growth. Past federal investments in HP-related research, particularly at DOE's national labs, have underpinned mission-critical supercomputers at DOD, NASA, NOAA and in the intelligence agencies.

Third, the professional science masters program supported by NSF is particularly relevant as it provides advanced training in science or mathematics and develops workplace skills valued by employers. Finally, Congress should reauthorize the Carl D. Perkins Act and the federal work-study program and restructure them to align workforce needs and big data.

In conclusion, there exists today a tremendous abundance of data about our world. New cognitive computing capabilities will help determine which countries and businesses will thrive. The United States should support

advanced computing and build its workforce to seize the future.

Thank you, and I welcome your questions.

[The statement of Mr. McQueeney follows:]

********** INSERT A **********

Chairman BUCSHON. Thank you, Dr. McQueeney.

I now recognize Dr. Rappa for 5 minutes for his testimony.

STATEMENT OF MICHAEL RAPPA

Mr. RAPPA. Good morning, Chairman Bucshon, Chairman Massie, Ranking Member Lipinski, Ranking Member Wilson and other members of the Subcommittee. I appreciate the opportunity to be here this morning to speak with you about data analytics and the role institutions of higher learning can play in advancing the field.

I am going to draw this morning today testimony on my own behalf as a professor and director of a research institute, educational institute for over the past 25 years.

I think it is important to start with the fact that the world is changing around data very, rapidly and our ability to productively use it becomes a very central part of what we do as a society today, as has been heard already. A generation ago, data was scarce, expensive, time consuming to collect and difficult to analyze. Today, data is everywhere.

Advances in computer technology and powerful analytic tools make it possible not only to collect vast quantities of data but also analyze and draw insights from data to solve pressing problems from increasing operational efficiency to

combating fraud to better health care, to protecting national security. Data is everywhere. The question is, how well are we prepared to use it. We have the data, the technology, the methods and tools, all of which continue to advance. The national challenge, in my view, going forward will be our ability to educate a data-savvy workforce that has the analytical skills to put data into action. Estimates of the talent gap as we have heard are large and growing.

This is a dire but solvable problem. As we have shown at NC State, working closely with employers and focusing on their needs, we can produce the kind of talent that is so desperately needed today. We do it quickly in just 10 months with a domestic student population ranging from their early 20s to their late 50s, many of whom are returning to school. We have done this now for 6 years economically with consistently high student outcomes using a sustainable and scalable business model based on self-financed tuition.

What it comes down to is creative innovation, how we organize graduate education, allowing us to engage with employers more productively to yield high-quality results in the skills and readiness of our graduates.

I encourage the Committee to focus its attention on workforce needs, to encourage the government to seek out innovation in higher education and to promote new and novel learning models. This is a solvable problem. With the

proper incentives, focused resources, open collaboration with industry, we can produce the analytics professionals needed to extract value from big data and to move the economy forward. As I said, we have done this ourselves now for 6 straight years to great effect. We will graduate a class in a matter of another week, 80 students in the master of sciences and analytics program, with already 95 percent of them placed in jobs. They are literally the most sought after and highest-paid graduates of the university.

So we can do this. It is a solvable problem. Thank you again for your time. I will be glad to answer any questions.

[The statement of Mr. Rappa follows:]

********** INSERT B **********

Chairman BUCSHON. Thank you for your testimony.

I now recognize our final witness, Dr. Jahanian, for 5 minutes for his testimony.

STATEMENT OF FARNAM JAHANIAN

JAHANIAN. Good morning, Chairman Massie, Chairman Bucshon, Ranking Members Wilson and Lipinski, and members of the Subcommittee. It is my pleasure to be back here to discuss the next generation of computing and big-data analytics.

Today we leave in an era of data and information enabled by advanced technologies that surround us. Data is generated by modern experimental methods, scientific instruments such as telescopes and particle accelerators, large-scale simulators, Internet transactions, email, video images, clickstreams and widespread deployment of sensors everywhere.

Approximately 90 percent of the data in the world today were created in the last 2 years alone. However, when we talk about big data, it is important to emphasize not only the enormous volume of data being generated but also the velocity, heterogeneity and complexity of data that now confronts us.

Why is big data important? Several others have alluded to this already. Data represents a transformative new

currency. Big data is increasingly important to all facets of our Nation's discovery and innovation ecosystem. First, insights and more accurate predictions from large and complex collections of data are creating opportunities in new markets, driving the creation of IT products and services and boosting the productivity of businesses. Second, advances in our ability to store, integrate and extract meaning and information from data are accelerating the pace of discovery in almost every science and engineering discipline. Third, big data has the potential to solve many of the Nation's most pressing challenges from health care and education to cybersecurity and public safety, yielding enormous societal benefits and ensuring sustained U.S. competitiveness.

Let me share with you just a few examples of the promise of big data. These are all grounded in research that is funded by the Federal Government or by the private sector, the work that is done in the private sector. By integrating biomedical, clinical and scientific data, we can predict the onset of diseases and identify unwanted drug interactions. By coupling roadway sensors, traffic cameras, individual GPS devices, we can reduce traffic congestion and generate significant savings in time and fuel. By accurately predicting natural disasters such as hurricanes and tornadoes, we can employ lifesaving and preventative measures that mitigate their potential impact. By correlating

disparate data streams through text mining, image analysis and face recognition, we can enhance public safety and public security. By integrating emerging technologies such as MOOC and inverted classrooms with knowledge from research about how people learn, we can transform formal and informal education.

What does this mean for scientific discovery? Data-driven discovery, also called the fourth paradigm, is revolutionizing scientific exploration and engineering innovations. It enables extraction of new knowledge, provides novel approaches to driving discovery and decision-making, yields increasingly accurate predictions and provides deeper understanding of causal relationship based on advanced data analysis.

What is government doing to ensure we harness this potential? As it was mentioned already, in 2011 U.S. Networking and Information Technology Research and Development program, also called NITRD, formed a big-data senior steering group to identify, initiate and coordinate big-data research and development activities across the government to ensure that federal agencies, the scientific research enterprise and public maximally benefit from data-driven discovery. In March 2012, the National Big Data R&D Initiative was launched, focusing the steering committee group's focus on the tools, technologies and human capital

needed to move from data to knowledge to action. We see exciting new partnership opportunities with the private sector, state and local governments, academia and nonprofits.

At NSF, we have identified four major investment areas that address current challenges and promise to serve as the foundation of comprehensive long-term agenda: first, investment in foundational research to advance big-data techniques and technologies; second, support for building new interdisciplinary research communities;, third, investment in education and workforce development; and finally, development and deployment of cyber infrastructure to capture, manage and analyze and share digital data.

I should add that NSF's investment in cyber infrastructure includes advanced computational resources that support data-enabled science. In particular, the newly dedicated Blue Waters, Stampede and Yellowstone supercomputers will expand our Nation's computational capabilities significantly.

In summary, big data represents enormous opportunities for our Nation. Investments in big-data research and education will advance the frontier of knowledge, further fostering innovation, creating new economic opportunities and yielding new approaches to addressing national priorities.

Thank you again for this opportunity. I would be happy to answer any questions.

[The statement of Mr. Jahanian follows:]

********** INSERT C **********

Chairman BUCSHON. Thank you for your testimony. would like to thank all the witnesses for their testimony. am reminding members that Committee rules limit questioning to 5 minutes, and the chair at this point will recognize himself for 5 minutes to start the questions.

First, Dr. Jahanian, the Administration announced his Big Data Research and Development Initiative in March 2012 including $200 million in new commitments for big-data research initiatives. However, the National Science Foundation, Department of Defense, Department of Energy and other agencies have had significant research programs and data analytics that predated the initiative. How has the Administration's initiative changed the ways these agency research programs are coordinated and are we effectively managing and leveraging our research investments across agencies?

Mr. JAHANIAN. Thank you for your question. You are absolutely right that it is not that suddenly last March we woke up and said boy, data is really important, we need to do something about it. There has been significant investment by the federal sector and private sector in areas having to do with data. The challenges we face are many--stewardship of digital data and software, for example. Many data sets, as was mentioned, are too poorly organized or also unstructured. Many data sets are heterogeneous. The utility of data is

also limited by our ability to interpret them. Many data are being collected at a scale that we can't even store them, let alone analyze them. Also, large and linked data sets may be exploited to identify individuals and so there are also the privacy issues. So there are enormous challenges that we face.

As you alluded to, on March 29, 2012, OSTP in concert with a number of federal agencies launched the national Big Data Research Initiative. It expands the scope of our activities in several directions, for example, state-of-the-art core technologies that we need to collect, store, preserve, manage and analyze data, harnessing these technologies to accelerate pace of discovery, supporting responsible stewardship, for example, and sustainable business models for big data.

There are a number of cross-coordination that is taking place under NITRD. Let me start with NSF. All NSF directorates, for example, are participating in this. A multidisciplinary panel of experts are making recommendation on funding of this. Furthermore, big data is being coordinated through a senior steering group that reports to the assistant directors at NSF for all the coordination because it involves every science and engineering discipline.

As far as the Federal Government is concerned, Big R&D Initiative is coordinated through the NITRD subcommittee, as

you know. I chair the subcommittee. There is a senior steering group that regularly meets to coordinate the activities on many of the fronts that I alluded to There are also enormous opportunities not only in terms of joint solicitations but there are a number of workshops that we are holding jointly with other agencies including NIH, NIST, DOE, DOD to advance the frontiers of knowledge and exploration in big data.

I should also mention that when it comes to this initiative, we can't forget that the private sector plays a significant role. When we think about innovation and discovery ecosystems, not only are we talking about universities, we are talking about scientists and engineers, you know, a rich, talented labor force, investment in research and education, and of course, a vibrant private sector. So there are a number of programs that we have at NSF that attempt to connect the dots when it comes to transfer of knowledge.

Chairman BUCSHON. Thank you. I am glad to hear there is quite a bit of coordination at the federal level because I think all of us are concerned about that, and again, investing the taxpayer dollar wisely.

Dr. Rappa, I also serve on the Education and Workforce Committee, and I have got children age 9 through 20, four of them, and I have a really strong interest in how we get young

people interested in different fields of study, and obviously we have a tremendous challenge not only with this area but many others, and do you think that--what are your ideas on how we engage young people in understanding what opportunities there are in this area and what the jobs of the future might hold? I mean, how do we do that? Because, you know, when you go to a high-school class, and I talk to a lot of high-school class, people say, you know, not many people come up when you ask them what they want to be, you know, they want to analyze big data. So how do you do that? What is your recommendation?

Mr. RAPPA. Well, thank you very much for your question, and I understand exactly what you are saying, and I think that things are changing. You know, I think it is exactly true that your average 8-year-old doesn't say they want to grow up, for example, to be a statistician. It is not common, unless they are really interested in sports. Then you see a sort of nexus there because of the relationship. But I think what is changing is that it is really about producing education, in my case, at the graduate level, reaching further into the pipeline down into undergraduate education and even touching upon high school where people begin--where students begin to understand how data is really used in action. So it is really about creating, not just sort of creating knowledge or understanding but also applying

that knowledge. And when our students--our whole education is driven around the application of that knowledge, and so students really understand and increasingly undergraduates understand that this kind of graduation education is going to lead them to a very interesting, compelling professional life.

Chairman BUCSHON. Well, thank you, because I think that we do--you know, we do need to have this type of information gravitate down, even to middle-school kids to get them interested, and there is a program in Indianapolis called Project Lead the Way who I know very well that is beginning to do that at the high-school level, and it is showing some success.

But my time is expired, so I would love to talk more about that but at this point I am going to yield to Ms. Wilson for 5 minutes for her questions.

Ms. WILSON. Thank you, Mr. Chair.

Along those lines, can you tell me either one of you what skills are necessary for the big-data workforce? I heard you say something about an analytical something. And also as you are speaking, I would like to hear from you what role can community colleges play in preparing the next-generation workforce for big data.

Mr. RAPPA. Thank you very much for your question. would like to try my hand at that. So what is sort of

interesting and novel about what we have done around the education, we really started from scratch in building an entire new graduate degree program, and we really wanted to address this question of what skills were needed, and we focused ourselves really looking at the employer as the customer in a sense, the person, the individuals who buy our product and the students and really tried to understand the skills that they need, and really where that brings you is that there is these technical skills which are important in programming, in math and statistics, but employers really want much more than that. They want individuals who can work well in teams, who can communicate these insights to decision makers, who can actually use the tools and apply the knowledge in an organizational context, and so we have structured the whole education to build a very balanced set of skills as opposed to what I think is really the conventional approach in graduate education and to some extent undergraduate education to focus on the technical skills almost exclusively. And so really what we need to do is sort of approach the whole student. Now, I think community colleges can play a very important role because you can really begin to channel pipelines where students can go and get the prerequisite knowledge that they need, the early levels of math and statistics, before they go on to graduate education. Thank you.

Mr. MCQUEENEY. I would just like to comment that a lot of the focus in the past has been on the graduate level of education, as Dr. Rappa just talked about, and while we continue to have a strong need for Ph.D.'s and computer science and electric engineering and mathematics, the biggest skill gap that we see is at the masters level, quite frankly, of people who may not have the mathematical skills to create an entire new type of analysis of data but who have more than basic IT skills who actually can understand the implications of using different analytical techniques given a problem, given a data set with certain statistical properties, what would be the appropriate analytical technique to use, and when you apply that technique, how could you be sure that the results would be reliable and proper, and so a lot of our focus has been on creating an intermediate level of skill that has the basic understanding of how to use these tools even if it would fall on someone with more of a Ph.D. level of training to create new analytical approaches.

Mr. JAHANIAN. Representative Wilson, I want to echo something that has been said. If you think about big data, let us just step back. There are three related problems that goes beyond big data. It includes all of our IT workforce, computer science, computational science and so on. These problems have to do with underproduction, which everybody recognizes, underrepresentation and then pipeline issues.

Chairman Bucshon already alluded to this, that we need to worry about our high schools, we need to worry about pipeline. I have three kids, and I know where we lose our kids, it is not in masters or Ph.D., we lose the interest of our kids in high schools and middle schools, so that has to be fixed, and there are a number of programs that we have initiated, pilot programs that try to address that issue.

Let me share with you one anecdotal sort of evidence the data on this. Annualized Bureau of Labor Statistics data that predicts that each year we need about 140,000 job openings. We will have 140,000 job openings in computing and broadly speaking IT-related jobs but we are only producing about 100,000 including masters, Ph.D., undergraduate and community colleges. In fact, many of these jobs would be available to individual who have 2-year or 4-year degrees.

Another data point that I want to share with you is that 62 percent of all newly created STEM job openings between 2010 and 2020 will be in computing and IT. Let us not forget that. And that includes data, that includes computational skills and many of the other skills that the other witnesses alluded to. Thank you.

Ms. WILSON. In my 16--oh, 10, 9, 8--what would you suggest that we begin to--how do we begin to get children interested in these sort of skills? I know every little child has an iPad. They can work these computers better than

adults. What do you think we can do to stimulate that all the way from K-12 and into the community colleges so we will have more IT graduates? Do you suggest we buy each one--we outfit classrooms with iPads, or what do you think?

Mr. MCQUEENEY. I think there is an intrinsic curiosity in younger folks about a lot of the tools they use to communicate with each other that have tremendously greater scalability than the tools that I use to communicate with my friends.

Ms. WILSON. Right.

Mr. MCQUEENEY. So the essence of what is a large community's opinion on a topic of interest could involve the opinions of thousands or millions of people and so I think a lot of the young folks I talk to when I visit K-12 programs or, you know, in programs like e-week, they have an intrinsic sense not only of the device and the technology but they have a sense of the reach of that device and technology which is the beginning of an appreciation of really what we are talking about with big data, that there are trends that they can reach with that device, and I think that fires their imagination in a very powerful way.

Chairman BUCSHON. Thank you. I will now recognize Mr. Massie, Chairman Massie, for his questioning.

Mr. MASSIE. Thank you, Chairman.

So one of the questions that I have as we deal with the

interface between government and private industry here is, are you aware of any government data sets that we need to get more into the public domain for usage? For instance, I think we have done a pretty good job about getting some of the mapping stuff out there but some of that map information is old, goes back to the 1940s and 1950s, and I know the government has been paying for LIDAR mapping, which is a high-resolution terrain mapping, and I am kind of concerned that that is not getting out there. Are you aware of that, and are there any other data sets that would be useful to the public that the public has paid for that we might want to work on getting out to the public?

Mr. MCQUEENEY. I think the government has done an excellent job and had many initiatives that were very focused on getting that valuable data out so it could be used. You mentioned LIDAR. I know that one of the uses that is very promising for LIDAR is to do something like an inventory of the forests in the country, to actually be able to conduct a definitive inventory. Right now, the agencies that are responsible for that use a statistical sampling technique but in a world where you can take LIDAR images and process that enormous data volume, you are able to move then from a statistical sampling basis, which is all we could do before, to a more definitive approach to get a very, very good picture of one of the more valuable natural resources that

needs tremendous amounts of stewardship. So I think that is an example of a data set that could be extremely valuable. But I think in general, the government is very well and properly focused on getting those valuable data sources out. Weather would be another--basic weather data would be another good example that can be built on to add extra value.

Mr. MASSIE. Are the other witnesses aware of any data sets that we need to promote more?

Mr. JAHANIAN. I want to highlight a couple of things. I am sure you are aware of data.gov, which is a Web site that makes a lot of government data sets available, and the goal here is to increase public access to high-value machine readable data sets that is generated by the government. Hopefully it will create new economic values. There are also a number of activities in encouraging the private sector, entrepreneurs to develop applications on top of that data. It is not just making the data available but also making the data valuable so there are a number of essential activities related to that.

There was a recent Wall Street Journal article actually that highlighted'at least a dozen different kind of government data sets that have been made available from labor and health violations to flu incidents, energy prize, offshore activities, solar information and so on and so on that are interesting. From the National Science Foundation's

point of view, I should mention that as you may know, we have a number of large facilities--LSST was mentioned, Neon, which is another facility that collects a lot of data, will be collecting a lot of data. The science and engineering community needs that data, and many federal agencies are working very hard to make that data available. There are a number of issues having to do with open access that go beyond the scope of this question.

Mr. MASSIE. Let me ask a follow-up question to that. So big data like any other data could be misused, altered, hacked, illegally accessed, and sometimes it may just be an honest mistake. We share data that we probably shouldn't have, for instance, where some farm data that got out there and it could really compromise our food safety if people know where all the food sources are. How do we balance, you know, the desire for privacy, actually the constitutional right to privacy, with sharing all of this data now that everybody is under a microscope?

Mr. RAPPA. I thank you for your question, and I would like to sort of just turn it a little bit because we do work--each year we work with about 16, 17 organizations that share data under a confidentiality agreement including three government agencies in which we put teams of students working on very complex analytics projects, and so while I applaud, and I think it is very important and I do think the

899 government is doing a good job at sharing data openly, it is
900 a very important thing to do, I think there is also an
901 opportunity to engage the academic community in other ways to
902 help understand that data, which might mitigate some of these
903 issues around the privacy element.
904 Mr. MASSIE. Dr. McQueeney?
905 Mr. MCQUEENEY. Yes, that is an excellent question.
906 Thank you for that. One of the things that we can do is to
907 get data about the data. We call it metadata. So we analyze
908 the data and we don't just look at what information we can
909 get from the data but we describe the data perhaps in terms
910 of its sensitivity--is this more or less sensitive from a
911 point of view of privacy or security or secrecy--and we can
912 then tag those data sets with metadata that describes the
913 implications of using that data and then we can build into
914 the systems that handle the data policies that look not only
915 at the data but the metadata that describes what are the
916 contents and what are the implications of sharing and
917 combining that data and so we can actually build into the
918 foundation of big-data systems the ability to interpret
919 policies that we have set in a very conscious and clear-eyed
920 way and as they process the data they can be respectful of
921 that metadata. The medical community has actually done a lot
922 of very good work around patient confidentiality while still
923 getting very good pattern analysis of different kinds of

outcomes.

Mr. MASSIE. Thank you very much. My time expired. I appreciate your answer and concern for that question, Mr. Chairman.

Mr. BUCSHON. Thank you, Mr. Massie. I now recognize Dr. Bera for 5 minutes for his questions.

Mr. BERA. Thank you, Mr. Chairman, and thank you for the series of hearings that we have had on the Subcommittee. It has been great.

You know, big data is incredibly important and how we manage data and with the rapidity of how the world is changing. I mean, when I think back to being a high-school student, and for me it was, you know, going and looking at the index cards, walking down and looking in the encyclopedia. Now, when my daughter, you know, she has vast access, or when I do rounds in the hospital, you know, we would have to race down to the library to get information but now before we are even finished presenting, the medical students or the residents can just look at the latest data on, you know, a device like this and get access to the most accurate and timely information. So it is incredibly important that we make these investments to not only manage the data, to sort that data and then to make sure it is accessible. It is a critical priority that we have that workforce both at the professional level but then also at the

management level and, you know, I think the number that I read was we need about 1.5 million managers. So there is a huge need but also a huge opportunity.

When I think back to the talent that has been impacted in the last 4 years in the recession, you know, there are a large number of extremely intelligent and talented individuals in their 30s and 40s who have been hit hard. You know, these are folks like myself that were trained for a 20th-century workforce but now we find ourselves in a 21st-century economy.

Dr. Rappa, are there some best practices--and these aren't individuals that need to get a graduate degree, you know, they are talented individuals--where we could take them and quickly train them for this new economy? Are there examples?

Mr. RAPPA. Right. So we do offer it as a graduate degree but we do this in 10 months, and indeed, a good, fairly substantial, larger portion of our population are people who are returning from--or coming from the workforce to go through this and some of them are in exactly the position that you say. They were transitioning, their companies were faltering. And so the key really with this is short duration. Ten months is actually a very reasonably good time because you could build the skills that you need. If it is too short, you can't accumulate the skills but the

key thing is that you have really demonstrated ROI on that education because that person who is coming in to do that has to know that they have a very high probability of getting a job when they leave and at a particular salary rate so that they can justify the investment and time, and that is really what we have done.

Mr. BERA. Dr. McQueeney, are there potentially any examples--you know, again, a lot of these folks are also paying their mortgage, they have to, you know, continue to foot their bills--of possibly even, you know, doing an advanced work-study type of program where you recruit this talent and they are getting on-the-job training as opposed to a traditional school model?

Mr. MCQUEENEY. Yes. In fact, there is a related topic here that I think is quite interesting, which is the application of big data and analytics back on to the educational process itself. You have been the great upsurge in videos that attempt to replace traditional brick-and-mortar classroom attendance, coursework. You have seen a number of startup companies formed in this space. If you look at the education process, each of us really learns quite differently. Some of us may learn more from hearing or from seeing or from working problems, and great teachers, great professors are sensitive to how their different students learn and are capable of presenting material in

alternate ways to make sure they reach all the students. With electronic delivery of course materials and monitoring of student progress, we generate digital exhaust, if you will, that describes how that student is learning, how that student responds to the instruction, and for the parts of the instruction that are delivered electronically, we actually have the ability to do analytics and to do an optimization process so that each of us on the panel might not get the same length of lecture on five different topics. It might be adjusted to our historical learning patterns.

So we have worked with a number of universities and other, you know, non-traditional educational institutions to apply the big-data and analytics techniques to the education and training process itself.

Mr. BERA. Great. In my last 30 seconds, so we have access to data. I think one element that we should also be conscious of is the quality of the data because there certainly is very good-quality data but at the same time there is very poor-quality data that is out there and, you know, any of you who want to comment on how we monitor quality?

Mr. RAPPA. I think most data starts off as bad data, for the most part, unless it is being collected in a highly careful way. And so it is, you know--I think just as we hear about big data today, we are going to hear about bad data in

the future. Most projects start out where you have enormous front end to them to really understanding cleaning and cultivating that data to make it useful, and that is an important part of the educational process.

Mr. JAHANIAN. I would just add that there are a number of techniques that have been developed and are in development dealing with data exploration, data cleaning and so on. Furthermore, when we talk about large-scale data sets, there are statistical techniques that are being applied that really take care of the noise, take care of some of these inconsistencies, and that is one of the attractions of big data.

Mr. BERA. Great. Thank you.

Mr. MASSIE. [Presiding] Thank you, Mr. Bera. I now recognize Mr. Schweikert from Arizona for 5 minutes.

Mr. SCHWEIKERT. Thank you, Mr. Chairman.

This is one of those types of conversations, you know, we could all sit around and buy you some well-catfeinated coffee and talk for hours and still have no idea if we made any progress.

Doctor, is it McQueeney?

Mr. MCQUEENEY. Yes.

Mr. SCHWEIKERT. First, you are with IBM?

Mr. MCQUEENEY. Yes.

Mr. SCHWEIKERT. In your testimony, help me do a little

ferreting out here. Hardware technology or IT talent, what is your biggest bottleneck right now?

Mr. MCQUEENEY. There are bottlenecks in a number of areas. If I looked at the hardware itself, the biggest challenge getting from the petascale to the exascale is actually the power dissipation of the systems. The new technology work that we are doing is to get the computations more efficient in terms of floating point operations per watt so that if you assembled a system a thousand times bigger than today's supercomputers you could house it and cool it.

Mr: SCHWEIKERT. You don't want to take down the power grid?

Mr. MCQUEENEY. The power grid may not in fact be able to supply enough power if we didn't make some innovations. That is a good point.

Mr. SCHWEIKERT. But hasn't your company actually been one of the leaders at producing some of those breakthroughs?

Mr. MCQUEENEY. In fact, we have, and in fact, a lot of that history goes back to work that started with the Department of Energy many years ago, and this bears on an interesting historical point. In a time when we are concerned about making investments efficiently, if I go back to the beginning of the ASCII program with the Department of Energy to do the nuclear weapons stockpile stewardship program, the Department of Energy scientists did a very

careful analysis of what were the core algorithms, the core analytics, if you will, in today's language, that needed to be done at a certain level to provide the mission that they needed to provide, and they found that the current path at that time of supercomputing was going to take 5 years to produce a machine that they needed in 1 or 2 years. The analysis they did was thorough enough to reveal that there weren't bottlenecks everywhere but at that time there were bottlenecks mostly in the inner process or communication. So they made a very thoughtful, very surgical investment in accelerating just the piece that was needed to close their mission gap, which was the beginning of a very long run of government-industry collaboration.

Mr. SCHWEIKERT. But you are in some ways heading towards where my question is. So if that bottleneck, in today's world, do I find the technology if I went out to the private sector around the world that is competing and producing high-end supercomputing or is it coming out of a government lab? And I know the pop culture terminology is "public-private partnership" but the reality, they do operate in pretty substantially different silos.

Mr. MCQUEENEY. The real forcing function for a breakthrough is a critical mission need. So in the case of high-performance computing, it has often been a government agency with a critical mission that--

Mr. SCHWEIKERT. But they were doing a specific request for how they wanted to manage their data?

Mr. MCQUEENEY. That is correct, and once that technology is available, it can be consumed very rapidly in lots of other applications that could take great advantage of it but didn't have a compelling enough need to get over that hurdle. That is when the disbursal of technology starts.

Mr. SCHWEIKERT. Just as an aside, only because I had some acquaintances who were--I used to be an old SQL programmer so I am way out of date now. IBM was actually running a fascinating large data project where they were doing sweeping data sets through the world's social media and gathering it and looking for trends. Can you in 30 seconds or so tell me your knowledge on that?

Mr. MCQUEENEY. Yeah, we have analyzed the public social media sources with several of our customers and we can gain a lot of insights. For example, you know, retailers can gain insights about trends and their clients. Transportation agencies can gain insights about likely traffic congestion. There are many sources of public data both social media and other forms that can be analyzed to reveal patterns about how people conduct their daily activities that are very useful for optimizing the public infrastructure.

Mr. SCHWEIKERT. Forgive me, I am blind as a bat without these. Is it Dr. Rappa?

Mr. RAPPA. Yes.

Mr. SCHWEIKERT. Isn't my single biggest problem in big data right now is noise that when I put data set after data set after data set and build on it, that just small incremental errors actually create really bad decisions on the end?

Mr. RAPPA. Well, I think part of the education around handling big data deals very squarely with the quality of the data and how to clean it and cultivate it to reduce the noise, to--

Mr. SCHWEIKERT. But you and I can go over a long series of public policies, both state, national, you know, military, others, where we built it on really gigantic analyzed data sets and it was wrong.

Mr. RAPPA. Well, I think that, you know, the challenge here is education. So as I alluded to earlier, we have teams of students--

Mr. SCHWEIKERT. Is it education or developing educational skepticism?

Mr. RAPPA. It is developing the education around how to squarely understand the inherent challenges in data. Data is not born clean. It isn't born ready to be analyzed.

Mr. SCHWEIKERT. And when you and I build our model, the way we wait, you know, because we start plugging in human factors that, you know, you and I bring our biases and we--

Mr. RAPPA. And this is why we really need a focused education squarely around how do you draw insights from data because there are these inherent problems in data, especially as you scale them up, as you combine different data sets, as you combine different types of data.

Mr. SCHWEIKERT. Thank you, Doctor, and Mr. Chairman, thank you for tolerating. It is just one of my great fears. And look, I am a data freak. I mean, you have got to see the servers and stuff I have at home. But I have learned when we make big-time public policy on something we all know is right, we keep making huge, very costly mistakes.

Chairman BUCSHON. Thank you, Mr. Schweikert. I now recognize Mr. Hultgren from Illinois for 5 minutes.

Mr. HULTGREN. Thank you, Mr. Chairman. Thank you all for being here. First of all, I just want to thank Dr. McQueeney too. I appreciate your mention and your support for the exascale computing bill I am currently authoring. am very excited about the potential there and see some huge shift in our national computing capabilities and I am very excited about that, so I appreciate your mention and support of that.

I do have a few questions, and first I guess I would address this one to Dr. McQueeney and also Dr. Jahanian. Is that right? I am sorry. I wonder if you could comment briefly on where the United States stands in your opinion in

worldwide computing leadership? I know the metric of the fastest supercomputer is one metric but what do you use as a metric for big data to determine which countries are using it most effectively?

Mr. MCQUEENEY. The common thing that is cited in these discussions is the top 500 supercomputers list. That is something that is compiled twice a year, as you well know, and we have usually been at the top of that list. We have continued to be the majority of the systems on that list but other countries have noticed the success that we had in, you know, government leading the way on high-performance computing breakthroughs. Once those systems are built, they find hundreds and thousands of other applications, each with a client that might not have been able to fund that breakthrough themselves but can certainly utilize it. Other countries have popped up on the top of that list because they are interested in emulating the success we have had in leading the way with innovation and then seeing that innovation used broadly across the commercial sector. So the top 500 list is a very technical, perhaps very geeky measure of who is on top, and I would say that we are still in a leadership position there but it has been stronger in the past than it is today.

If you turn to more of a business view, you would want to look at the companies that were taking the best advantage

of data sources, either to drive value in their companies or to provide benefits such as public safety or health benefits, and there again I think we are in a good position but it is a very different kind of skill, a conversation we didn't quite finish before about the skill to build these large systems is a very focused, very large-scale, very capital-intensive activity but the skills to use these systems are more focused on creativity and are actually better done by large groups of small teams. In fact, you know, the NSF has been a leader in fostering that kind of innovation where thousands and thousands of groups can build innovative applications and take advantage of these systems.

Mr. HULTGREN. Thanks. Dr. Jahanian?

Mr. JAHANIAN. Yes, just a couple of quick comments. There is no question that we continue to maintain our leadership worldwide in this area, and there is no doubt that continued investment in this area is extremely important to the future of the country. As I mentioned just a few minutes ago, NSF's investment in Blue Waters, Stampede as well as the Yellowstone supercomputing centers represent a range of investments that we make in high-performance computing, addressing the needs of not only top 5 percent of application that have exceptionally high computational needs but also a broad spectrum of researchers across the country in science and engineering who would need computational resources.

A couple of comments. Just look at Blue Waters, for example, which is at University of Illinois. A couple of data points about it. It has--if you could--just the computing power of it, if you could multiply two numbers together every second, it would take 32 million years to do what Blue Waters does in one second. That is astonishing power, for example, of Blue Waters. In terms of storage capacity, memory capacity and so on, similar kind of scale.

The second point that I want to make is, we view computation and data to be two sides of the same coin. You really need to address both. So when we talk about computational capabilities, we also have to worry about cyber infrastructure to manage, to curate, to serve data to science and engineering community, and the investment in cyber infrastructure has to be balanced between the computation side of it as well as management and curation of data.

Mr. HULTGREN. Let me have--my time is running out but I have a follow-up question to the two of you as well if you could both comment in the time I have. It seems to me that exascale computing is focused on solving discrete problems that necessitate massive computing power and speed. Are these different problems than those we are addressing through big-data analytical tools and how do these two terms, how are they different, how are they similar?

Mr. MCQUEENEY. Historically, we have tended to talk

about them differently, but as we project how the exascale systems will be built and how they will be used and we look at the growing importance of big-data analytic systems, we see that the platforms on which these systems will both depend will be much more common than separate, and in fact, we see that there is no conflict between investments in classically what we have called HPC and what we are now calling big-data analytics, and both are changing actually. The way we use an exascale system will not be the same way that we use a petascale system. There isn't time here to go into it, but it actually morphs into a direction that is much more common with what we will do in big data and analytics.

Mr. JAHANIAN. I would just add that many of the problems that the business community needs, the science and engineering community needs are being addressed today through different kind of computational architectures that doesn't necessarily require today to have exascale computing including weather modeling, a number of other applications that has been mentioned. So it is really important to consider the investment in exascale computing in the spectrum of investment that we make to support computational and data needs of the entire science and engineering community and of course the private sector.

Mr. HULTGREN. Thank you so much. Chairman, thank you. I yield back.

Mr. MASSIE. I now recognize Mr. Lipinski from Illinois for 5 minutes.

Mr. LIPINSKI. Thank you, Mr. Chairman. I am glad that Dr. Jahanian mentioned Blue Waters there. We were just there not that long ago, but since you covered that, I can move on to a different area.

Dr. McQueeney, in your testimony you talk about how the Federal Government needs to invest in big data if the United States is going to maintain its leadership and competitive edge in this area. The needs and potential benefits of big data for the Federal Government align closely with those of private industry in a number of areas. If that is the case, how can the Federal Government more effectively partner with industry to achieve common goals and do you believe that industry has sufficient input in the Federal Government's research agenda as it relates to big data?

Mr. MCQUEENEY. I do think we have sufficient input. I think we have excellent dialogs with the relevant agencies and national laboratories, and I think the roles are complementary. I go back to the story about the early days of the ASCII program where through a collaboration we realized that the key piece of a supercomputing system that needed to be accelerated was not the entire investment. We could ride on the commercial investments for most of the components of the supercomputing systems at that time except

for one, which was the high-bandwidth switching between processors. And so that kind of thoughtful connection between the leaders in commercial computing and the leaders on the government side has been able historically to identify which areas are critical to attain government mission imperatives and where we can leverage commercial technology and where we need to accelerate that in a surgical fashion. So it has, in our view, been a very good partnership based on very high-bandwidth technical communications, understanding of applications and knowing when the government should be leveraging commercial investments and when they need to accelerate parts of that investment to attain unique mission goals, and again, as I have said before, once those barriers are crossed in terms of either the scalability of the system or the internal bandwidth of the system, it opens up thousands of new applications where there were ready problems to be analyzed but those applications weren't large enough to drive that breakthrough. So that is how the effect works of the leadership coming from some of the government agencies and then being realized broadly across industry. That is the essence of where this leadership has come from so successfully over the years.

Mr. LIPINSKI. I want to follow up with Dr. Rappa on that. Dr. Rappa, you discussed the importance of public-private partnerships to realizing the benefits of big

data and stated specifically that we must intensify and accelerate the national investment in proven models. What characteristics make a public-private partnership successful and what models should we be investing to? What were you referring to there?

Mr. RAPPA. Well, I think first of all, we have been doing this now for 6 years and so I think we do have a fairly interesting, novel model for producing talent in this field with a kind of proven track record based on data, based on market value of the graduates, but I think it comes really, you know, partly from the university community, partly from the academic community. Obviously we have a set of missions to educate students but we need to also I think do that by trying to really understand .the employer, what are they looking for when they hire talent, what are the kinds of skills that they need in order to be effective on the job, and I think employers need to sort of be open to working with the academic community. You know, there is a certain amount of dissidence that naturally occurs because there are two different worlds with different missions but I think it is really--I think we have shown that it is possible with organizational innovation, with a focused effort, with a sense of openness to engage the private sector in a very positive way, not just at NC State but at other universities. There are many, many examples now that I hope we are

providing some leadership on but that other universities are working with our model but also presuming other creative models to do this. There are probably about two dozen around the country already.

Mr. LIPINSKI. Thank you. Dr. Jahanian, anything you want to add about public-private partnerships?

Mr. JAHANIAN. Yes, indeed. There is no question that when we think about the innovation ecosystem in this country, it includes academia, it includes the private sector, it includes government investment and a talent-rich workforce. The private sector is investing heavily in cloud computing, as you know. It is investing heavily in making computational resources also available. I think there are opportunities for the federal investment to leverage that and make some of that available of course that is commercially available today to our researchers, to our scientists and engineers who could rely on those systems. We have announced a number of partnerships, one with IBM and Google, another one with Microsoft that make some of those resources available to the research community.

Dr. McQueeney already mentioned this, that there is high-bandwidth communication between the private sector and various federal agencies. I can tell you from NSF's perspective, it is very, very rich collaboration. On my advisory committee, I have a number of senior leadership from

private sector who serve on my advisory committee advising us on our portfolio, on our investments in addition to academics who serve on my advisory committee.

The final comment that I want to make is, there are a number of programs at NSF, and I know you are familiar with all of them, including SBIR, including I-Corps and so on that focus on transfer of knowledge from lab to practice. Federal Government invests heavily in advancing frontiers of knowledge. For us to accelerate that programs such as I-Corps, SBIR and so on serve a tremendous purpose, and here again, there are opportunities to engage the private sector and accelerate the transfer of knowledge to practice to benefit the Nation. Thank you.

Mr. LIPINSKI. Thank you.

Mr. MASSIE. Thank you, Mr. Lipinski. I now recognize Mr. Bridenstine from Oklahoma for 5 minutes.

Mr. BRIDENSTINE. Thank you, Mr. Chairman.

I also serve on the House Armed Services Committee, and I am aware that the Department of Defense is moving towards cloud-based computing solutions, and this of course creates some consternation about security issues, cyber hacking, other cyber crimes, and I was wondering if any of your organizations are involved in helping the Department of Defense work through these issues and what those solutions might be, if you could share with us on that?

Mr. MCQUEENEY. Sure, if I could start? You are quite right to raise the concern about security for any systems used by the Defense Department especially, although it would be true for all federal agencies. And when you move to a cloud computing model, there is an extra imperative to be concerned about security, and if you think of it in terms of the DOD might think of it, if that environment should be compromised by an enemy, it is a bigger piece of resource than an individual machine so it requires special vigilance. Now, the good news technically is, the way we handle virtualization, which is the foundation of how cloud computing is delivered from a compute virtualization point of view, there are actually sophisticated techniques that can provide additional security in a virtualized environment than we can provide even when using things running on bare metal. We have additional abilities to instrument the operation of that cloud and to very rapidly detect any kind of pattern of behavior that is indicative of a threat.

We did a project a number of years ago with the U.S. Air Force and they graciously let us ride a short press release on it where we built a cloud-computing environment that was at the cutting edge a few years ago. We instrumented it very thoroughly with watching the package flowing on the interconnected network that built the cloud in question and we very carefully isolated it from the rest of the world,

introduced known cyber attacks into it and were able to show that if we knew the patterns of command and control, as the defense folks might say, of these cyber attacks, we could actually spot them assembling themselves and interrupt them before they had a chance to launch. So having tremendous control over the environment out of which we were getting compute resources gave us abilities to do additional security and additional monitoring, even if we assumed the security was not perfect and could be breached, could we essentially in real time detect that breach and interrupt it before it stopped. I thought that was a very forward-looking piece of work that was driven by the Air Force CIO's office.

Mr. BRIDENSTINE. Excellent. Go ahead.

Mr. JAHANIAN. As you alluded to, these new environments, whether it is mobile platforms or cloud computing, are introducing new challenges, and we recognize that attackers and defenders are coevolving and there are enormous challenges to protecting our critical infrastructure and our cyber infrastructure.

I wanted to mention NSF's Secure and Trustworthy computing program, which is a research program addressing many of the challenges that we alluded to, and this is a research program that addresses not only the technology issues but also transition to practice. Furthermore, the NITRD research and development subcommittee has a working

group that focuses on coordination of activity across various agencies on cybersecurity and there is rich dialog involving various agencies on that issue.

Mr. BRIDENSTINE. Excellent. Are there any other things that the Department of Defense could do to help you guys with the objective of securing cloud computing for the Department of Defense?

Mr. RAPPA. So I am current co-director project with a colleague at NC State, which is science of security project that is done in collaboration with Carnegie-Mellon University and University of Illinois, and we are trying to bring together large groups, multidisciplinary groups of faculty to really try to understand the underpinning of the security problem and how to produce science around it. It is a very long-term challenge but it is one which I think has to start with getting the faculty across different disciplines focused on it and certainly I think it has been a tremendous opportunity and I look forward to moving into the future.

Mr. MCQUEENEY. Yeah, Dr. Rappa makes a very interesting point, to close the loop here. The cyberseourity problem is itself a big-data and fast-data problem, and in fact, with some of the advanced persistent threats that we see today, which depend on breaching an infrastructure and then laying dormant for several months, what the attacker is trying to do is to wait out how long you keep your log file data so that

when they launch themselves, it is difficult to do forensics, and so what we have learned is that these log files are actually the essence of the big data you need to do pattern analysis, pattern discovery on forensics, you know, should any attack occur. So in fact, most of the science behind big data including data at rest and large-scale computation and fast data that are eating very high-speed streams is directly relevant to the subject of cyber defense.

Mr. BRIDENSTINE. Thank you.

Mr. MASSIE. Thank you, Mr. Bridenstine. If the ranking member is amenable to this, I think we will do another round of questions?

Ms. WILSON. Yes.

Mr. MASSIE. Did you have something to introduce into the record?

Ms. WILSON. I do. Thank you, Mr. Chair. Mr. Kilmer has lots of conflicts. As we saw him come to the meeting, he had to leave, and I want to ask unanimous consent on behalf of Mr. Kilmer to introduce a report on big data from IDC into the record, and then I have a question.

Mr. MASSIE. Without objection, so ordered. It will be set into the record.

[The information follows:]

********** COMMITTEE INSERT **********

Ms. WILSON. Thank you. This question is for everyone. We have all had several discussions lately about the value of NSF-funded research to society and how we might certify that value based on the grant proposal. I think we might use big data instructively here. It is an incredibly interdisciplinary field where tools are developed in the pursuit of one narrow research question, let us say in the social sciences might have profound applications across many fields of science and even in many sectors of the economy that can't possibly be anticipated at the time of the proposal. What is the potential for data analytics being developed in one little seemingly irrelevant corner having unintended benefits to other fields and societal applications? And if you have concrete examples, that would be even better for us to understand. Thank you.

Mr. JAHANIAN. Okay. I guess I will start. There is no question there are all sorts of explorations that we are doing in the area of big data that we can't even begin to see the potential impact of it. I will give you an example. NSF has been investing and other agencies with the private sector in what is known as the area of machine learning. These investments have taken place for at least 20 or 30 years. In fact, IBM has also led efforts in this area. I can tell you that it is investment of last 20 or 30 years that has come to fruition such that these machine learning algorithms that

essentially allow us to look at these large data sets and identify trends and be able to adapt essentially that have broad range of applications from weather forecasting to financial modeling to biomedical research and so on have had tremendous, tremendous impact and now we use these techniques as if they are off-the-shelf essentially solutions available that you can buy. These are through years of investment that we have made that have come to fruition, so that is an example of that.

We are investing in all sorts of area in natural language understanding, in information retrieval, in various algorithms and approaches to automated scalable approaches to reasoning that could be applied to understanding relationship between gene sequence structure and biological functions. These are all essentially kinds of investments that we are making that some of us we could see how it comes to fruition.

Some of it relies on decades of investment that we have already made in computational techniques and data-intensive techniques.

Mr. MCQUEENEY. If I could offer you an example from the medical world, one of the critical problems in medicine is the loss of premature infants due to infections, and physicians have struggled for a long time with identifying the onset of an infection at a very early point because as these infections can grow exponentially, the earlier you can

intercept them, the more likely you are to have a lifesaving benefit for someone who is very vulnerable such as a premature infant. We have done work with the Toronto Hospital for Sick Kids where a physician up there had an idea that all the instrumentation in the NICU that is--you know, you have probably been in a hospital room or intensive-care room, all the instruments around the bed, someone comes in every half an hour and writes down those numbers but the instruments are producing readings continuously, and this physician had the idea that if we kept allthat data and we stored all that data as it came out of the machines in real time, which was a tremendous aggregation from a velocity of data point of view and correlated with the eventual issues that these premature infants had, we might be able to detect patterns using techniques such as machine learning that we were just hearing about that would give us an early identification of an upcoming infection, the ability to treat it before it got out of control, and her theories were absolutely correct. There were signatures in the data that gave up to 24 hours advance notice of an onset of an infection that was time for the doctors to in many cases provide some kind of lifesaving therapy. So there is an example of very, very deep mathematics, computer science being applied to a problem where the data was being produced every day by these instruments and it wasn't being captured

and it wasn't being looked at and it wasn't being correlated with results to produce a fantastic outcome.

Mr. RAPPA. I would just sum up by saying that really big data is part of a decades-long process that really started with computerization in the 1940s and 1950s and eventually got interconnected through the Internet in the 1970s, 1980s and 1990s that the world that we are turning into, data is going to be everywhere. It is going to affect exactly what happens here. It is going to affect hospitals, universities, every corner of the economy literally, and so we need to take approaches to that to try to develop understanding around big data, how it is applied, how the tools of analytics are applied across, you know, virtually every sector of the economy, and so I would take a very broad view, not looking at it as specifically, you know, a realm of computer technology or some other sort of isolated realm but looking at it as, you know, unfortunately as the big thing it is.

Mr. JAHANIAN. May I offer another example as I was thinking about it? I am reminded of the work by Daphne Koller and her collaborators at Stanford on classifying breast cancer via image analysis. As you know, 40,000 women die from this disease each year. By extending essentially image analysis techniques to hundreds of, I should say thousands and thousands of biopsy images, they were able to

identify a subset of cellular features. Out of 6,000 possible features, they were able to essentially identify a few of them that were predictive of survival time among breast cancer patients. What is really surprising is that the feature that they identified, it wasn't just from--the best feature, I should say, that predictor of the survival, was not from the cancerous tissue itself but it was from the surrounding one, and that has led to new kinds of treatments.

It has led to new kinds of diagnosis techniques and also a very personalized treatment that could aim to improve survival times in patients. That is a very, very concrete example.

Another example is the work that Google had done during H1N1 virus. I will be very brief about this. Before they actually discovered a vaccine, we wanted to track the spread of disease. Google engineers used data that had nothing to do with the virus directly from billions of essentially web searches from around the world together from publicly available, flu essentially historic data on flu trends to predict the spread of flu virus down to small regions in the country--or across the world, rather. This is a remarkable essentially application of data that one would have never thought could be applicable to something like H1N1 virus.

Ms. WILSON. Thank you very much.

Mr. MASSIE. Thank you, Ms. Wilson. Thank you for that

very excellent example of how we can use-a private company can find information in the data.

We got a little bit out of order so the last question is going to be mine. I reserve 5 minutes for myself. And the question I want to ask is, we have heard about banks that are too big to fail, and we also know that the Internet is now too big to fail. We recently in the House passed a CISPA bill which is somewhat controversial but some people felt it was necessary to do because the Internet was so big and pervasive in our lives. So my question to you is, are there any big-data sets that are too big to fail? In other words, are there ones that are pervasive that we have let through osmosis become--we have become too dependent upon or maybe not too dependent but we are dependent upon these data sets, for instance, weather, you know, and early warning systems? Not all of those, I imagine, are government systems. Some of them are private but possibly the government is relying on these systems and so I would be remiss if I didn't ask this question now before something fails, but tell us what is too big to fail right now? What would we bail out, and is there sufficient redundancy in the collection, storage and access of these data sets? Thank you.

Mr. MCQUEENEY. Well, first, I would just like to say that we were delighted to support that cyber bill, and I congratulate you on such broad bipartisan support in the

House for getting that acted upon.

Data sets have the property that they can often be subdivided and often be replicated, and so we have a lot of techniques by which we can assure the continuity of data if we take the time to do it, and if there were vary valuable historical records on things like long-term weather trends that were only stored in one place, that actually could be a concern because that is literally irreplaceable data. But essentially all of the IT techniques needed to take those large data sets and segment them and replicate them in different secure places so they could be re-created do exist but I think you raise an interesting point, that it is worthwhile to periodically check that we are being appropriately vigilant with the digital archives that are so valuable.

Mr. MASSIE. Dr. Jahanian?

Mr. JAHANIAN. I don't have a specific example. What I can tell you is that similar to the issue of cybersecurity, as Nation's critical infrastructure and more generally the Internet is playing a vital role in integrating the economic, you know, political, societal fabric of our society, we are going to become more and more dependent on data, and data is going to play an increasingly significant role in our day-to-day lives, and for that reason, I think the same sort of issues that apply to all sorts of IT solutions that we

take for granted will increasingly be applied to data.

From a research and engineering community's point of view, it is not just failure of the data but making that data accessible and also making the data accessible to broad community of scientists and engineers is an issue that we are quite concerned about.

Mr. MASSIE. Thank you very much. I was part of the bipartisan on CISPA, opposing CISPA actually, but that is okay.

I want to thank the witnesses for their valuable testimony and the members for their questions today. The members in the Committee may have additional questions for you, and we will ask that you respond to those in writing. The record will remain open for 2 weeks for additional comments and written questions from the members.

The witnesses are excused and this hearing is adjourned.

[Whereupon, at 11:35 a.m., the Subcommittees were adjourned.]

Chairman BUCSHON. Thank you for your testimony.

I now recognize our final witness, Dr. Jahanian, for 5 minutes for his testimony.

STATEMENT OF FARNAM JAHANIAN

JAHANIAN. Good morning, Chairman Massie, Chairman Bucshon, Ranking Members Wilson and Lipinski, and members of the Subcommittee. It is my pleasure to be back here to discuss the next generation of computing and big-data analytics.

Today we live in an era of data and information enabled by advanced technologies that surround us. Data is generated by modern experimental methods, scientific instruments such as telescopes and particle accelerators, large-scale simulators, Internet transactions, email, video images, clickstreams and widespread deployment of sensors everywhere.

Approximately 90 percent of the data in the world today were created in the last 2 years alone. However, when we talk about big data, it is important to emphasize not only the enormous volume of data being generated but also the velocity, heterogeneity and complexity of data that now confronts us.

Why is big data important? Several others have alluded to this already. Data represents a transformative new

currency. Big data is increasingly important to all facets of our Nation's discovery and innovation ecosystem. First, insights and more accurate predictions from large and complex collections of data are creating opportunities in new markets, driving the creation of IT products and services and boosting the productivity of businesses. Second, advances in our ability to store, integrate and extract meaning and information from data are accelerating the pace of discovery in almost every science and engineering discipline. Third, big data has the potential to solve many of the Nation's most pressing challenges from health care and education to cybersecurity and public safety, yielding enormous societal benefits and ensuring sustained U.S. competitiveness.

Let me share with you just a few examples of the promise of big data. These are all grounded in research that is funded by the Federal Government or by ~~the private sector,~~ the work that is done in the private sector. By integrating biomedical, clinical and scientific data, we can predict the onset of diseases and identify unwanted drug interactions. By coupling roadway sensors, traffic cameras, individual GPS devices, we can reduce traffic congestion and generate significant savings in time and fuel. By accurately predicting natural disasters such as hurricanes and tornadoes, we can employ lifesaving and preventative measures that mitigate their potential impact. By correlating

disparate data streams through text mining, image analysis and face recognition, we can enhance public safety and public security. By integrating emerging technologies such as MOOC s and inverted classrooms with knowledge from research about how people learn, we can transform formal and informal education.

What does this mean for scientific discovery? Data-driven discovery, also called the fourth paradigm, is revolutionizing scientific exploration and engineering innovations. It enables extraction of new knowledge, provides novel approaches to driving discovery and decision-making, yields increasingly accurate predictions and provides deeper understanding of causal relationship based on advanced data analysis.

What is government doing to ensure we harness this potential? As it was mentioned already, in 2011 U.S. Networking and Information Technology Research and Development program, also called NITRD, formed a big-data senior steering group to identify, initiate and coordinate big-data research and development activities across the government to ensure that federal agencies, the scientific research enterprise and public maximally benefit from data-driven discovery. In March 2012, the National Big Data R&D Initiative was launched, focusing the steering committee group's focus on the tools, technologies and human capital

Chairman BUCSHON. Thank you for your testimony. would like to thank all the witnesses for their testimony. am reminding members that Committee rules limit questioning to 5 minutes, and the chair at this point will recognize himself for 5 minutes to start the questions.

First, Dr. Jahanian, the Administration announced his Big Data Research and Development Initiative in March 2012 including $200 million in new commitments for big-data research initiatives. However, the National Science Foundation, Department of Defense, Department of Energy and other agencies have had significant research programs and data analytics that predated the initiative. How has the Administration's initiative changed the ways these agency research programs are coordinated and are we effectively managing and leveraging our research investments across agencies?

Mr. JAHANIAN. Thank you for your question. You are absolutely right that it is not that suddenly last March we woke up and said boy, data is really important, we need to do something about it. There has been significant investment by the federal sector and private sector in areas having to do with data. The challenges we face are many--stewardship of digital data and software, for example. Many data sets, as was mentioned, are too poorly organized or also unstructured. Many data sets are heterogeneous. The utility of data is

also limited by our ability to interpret them. Many data are being collected at a scale that we can't even store them, let alone analyze them. Also, large and linked data sets may be exploited to identify individuals and so there are also the privacy issues. So there are enormous challenges that we face.

As you alluded to, on March 29, 2012, OSTP in concert with a number of federal agencies launched the national Big Data Research Initiative. It expands the scope of our activities in several directions, for example, state-of-the-art core technologies that we need to collect, store, preserve, manage and analyze data, harnessing these technologies to accelerate pace of discovery, supporting responsible stewardship, for example, and sustainable business models for big data.

There are a number of cross-coordination ~~that is~~ taking place under NITRD. Let me start with NSF. All NSF directorates, for example, are participating in this. A multidisciplinary panel of experts are making recommendations on funding of this. Furthermore, big data is being coordinated through a senior steering group that reports to the assistant directors at NSF ~~for all the coordination~~ because it involves every science and engineering discipline.

As far as the Federal Government is concerned, Big R&D Initiative is coordinated through the NITRD subcommittee, as

you know. I chair the subcommittee. There is a senior steering group that regularly meets to coordinate the activities on many of the fronts that I alluded to. There are also enormous opportunities not only in terms of joint solicitations but there are a number of workshops that we are holding jointly with other agencies including NIH, NIST, DOE, DOD to advance the frontiers of knowledge and exploration in big data.

I should also mention that when it comes to this initiative, we can't forget that the private sector plays a significant role. When we think about innovation and discovery ecosystems, not only are we talking about universities, we are talking about scientists and engineers, you know, a rich, talented labor force, investments in research and education, and of course, a vibrant private sector. So there are a number of programs that we have at NSF that attempt to connect the dots when it comes to transfer of knowledge.

Chairman BUCSHON. Thank you. I am glad to hear there is quite a bit of coordination at the federal level because I think all of us are concerned about that, and again, investing the taxpayer dollar wisely.

Dr. Rappa, I also serve on the Education and Workforce Committee, and I have got children age 9 through 20, four of them, and I have a really strong interest in how we get young

Mr. MCQUEENEY. I would just like to comment that a lot of the focus in the past has been on the graduate level of education, as Dr. Rappa just talked about, and while we continue to have a strong need for Ph.D.'s and computer science and electric engineering and mathematics, the biggest skill gap that we see is at the masters level, quite frankly, of people who may not have the mathematical skills to create an entire new type of analysis of data but who have more than basic IT skills who actually can understand the implications of using different analytical techniques given a problem, given a data set with certain statistical properties, what would be the appropriate analytical technique to use, and when you apply that technique, how could you be sure that the results would be reliable and proper, and so a lot of our focus has been on creating an intermediate level of skill that has the basic understanding of how to use these tools even if it would fall on someone with more of a Ph.D. level of training to create new analytical approaches.

Mr. JAHANIAN. Representative Wilson, I want to echo something that has been said. If you think about big data, let us just step back. There are three related problems that goes beyond big data. It includes all of our IT workforce, computer science, computational science and so on. These problems have to do with underproduction, which everybody recognizes, underrepresentation and then pipeline issues.

Chairman Bucshon already alluded to this, that we need to worry about our high schools, we need to worry about the pipeline. I have three kids, and I know where we lose our kids, it is not in masters or Ph.D., we lose the interest of our kids in high schools and middle schools, so that has to be fixed, and there are a number of programs that we have initiated, pilot programs that try to address that issue.

Let me share with you one anecdotal sort of evidence ~~the~~ data on this. Annualized Bureau of Labor Statistics data ~~that~~ predicts that each year we ~~need~~ about 140,000 job openings. We will have 140,000 job openings in computing and broadly speaking IT-related jobs but we are only producing about 100,000 including masters, Ph.D., undergraduate and community colleges. In fact, many of these jobs would be available to individuals who have 2-year or 4-year degrees.

Another data point that I want to share with you is that 62 percent of all newly created STEM job openings between 2010 and 2020 will be in computing and IT. Let us not forget that. And that includes data, that includes computational skills and many of the other skills that the other witnesses alluded to. Thank you.

Ms. WILSON. In my 16--oh, 10, 9, 8--what would you suggest that we begin to--how do we begin to get children interested in these sort of skills? I know every little child has an iPad. They can work these computers better than

needs tremendous amounts of stewardship. So I think that is an example of a data set that could be extremely valuable. But I think in general, the government is very well and properly focused on getting those valuable data sources out. Weather would be another--basic weather data would be another good example that can be built on to add extra value.

Mr. MASSIE. Are the other witnesses aware of any data sets that we need to promote more?

Mr. JAHANIAN. I want to highlight a couple of things. I am sure you are aware of data.gov, which is a Web site that makes a lot of government data sets available, and the goal here is to increase public access to high-value machine readable data sets that ~~is~~ are generated by the government. Hopefully it will create new economic values. There are also a number of activities in encouraging the private sector, entrepreneurs to develop applications on top of that data. It is not just making the data available but also making the data valuable so there are a number of essential activities related to that.

There was a recent Wall Street Journal article actually that highlighted at least a dozen different kind of government data sets that have been made available from labor and health violations to flu incidents, energy prize, offshore activities, solar information and so on and so on that are interesting. From the National Science Foundation's

of data sources, either to drive value in their companies or to provide benefits such as public safety or health benefits, and there again I think we are in a good position but it is a very different kind of skill, a conversation we didn't quite finish before about the skill to build these large systems is a very focused, very large-scale, very capital-intensive activity but the skills to use these systems are more focused on creativity and are actually better done by large groups of small teams. In fact, you know, the NSF has been a leader in fostering that kind of innovation where thousands and thousands of groups can build innovative applications and take advantage of these systems.

Mr. HULTGREN. Thanks. Dr. Jahanian?

Mr. JAHANIAN. Yes, just a couple of quick comments. There is no question that we continue to maintain our leadership worldwide in this area, and there is no doubt that continued investment in this area is extremely important to the future of the country. As I mentioned just a few minutes ago, NSF's investment in Blue Waters, Stampede as well as the Yellowstone supercomputing centers represent a range of investments that we make in high-performance computing, addressing the needs of not only the top 5 percent of applications that have exceptionally high computational needs but also a broad spectrum of researchers across the country in science and engineering who would need computational resources.

A couple of comments. Just look at Blue Waters, for example, which is at University of Illinois. A couple of data points about it. ~~It has--if you could--just the computing power of it,~~ If you could multiply two numbers together every second, it would take 32 million years to do what Blue Waters does in one second. That is astonishing power, for example, of Blue Waters. In terms of storage capacity, memory capacity and so on, there is a similar kind of scale.

The second point that I want to make is, we view computation and data to be two sides of the same coin. You really need to address both. So when we talk about computational capabilities, we also have to worry about cyber infrastructure to manage, to curate, to serve data to science and engineering community, and the investment in cyber infrastructure has to be balanced between the computation side of it as well as management and curation of data.

Mr. HULTGREN. Let me have--my time is running out but I have a follow-up question to the two of you as well if you could both comment in the time I have. It seems to me that exascale computing is focused on solving discrete problems that necessitate massive computing power and speed. Are these different problems than those we are addressing through big-data analytical tools and how do these two terms, how are they different, how are they similar?

Mr. MCQUEENEY. Historically, we have tended to talk

about them differently, but as we project how the exascale systems will be built and how they will be used and we look at the growing importance of big-data analytic systems, we see that the platforms on which these systems will both depend will be much more common than separate, and in fact, we see that there is no conflict between investments in classically what we have called HPC and what we are now calling big-data analytics, and both are changing actually. The way we use an exascale system will not be the same way that we use a petascale system. There isn't time here to go into it, but it actually morphs into a direction that is much more common with what we will do in big data and analytics.

Mr. JAHANIAN. I would just add that many of the problems that the business community needs, the science and engineering community needs are being addressed today through different kind of computational architectures that doesn't necessarily require today to have exascale computing including weather modeling, a number of other applications that have been mentioned. So it is really important to consider the investment in exascale computing in the spectrum of investment that we make to support computational and data needs of the entire science and engineering community and of course the private sector.

Mr. HULTGREN. Thank you so much. Chairman, thank you. I yield back.

providing some leadership on but that other universities are working with our model but also presuming other creative models to do this. There are probably about two dozen around the country already.

Mr. LIPINSKI. Thank you. Dr. Jahanian, anything you want to add about public-private partnerships?

Mr. JAHANIAN. Yes, indeed. There is no question that when we think about the innovation ecosystem in this country, it includes academia, it includes the private sector, it includes government investment and a talent-rich workforce. The private sector is investing heavily in cloud computing, as you know. It is investing heavily in making computational resources also available. I think there are opportunities for the federal investment to leverage that and make some of that available of course that is commercially available today to our researchers, to our scientists and engineers who could rely on those systems. We have announced a number of partnerships, one with IBM and Google, another one with Microsoft that make some of those resources available to the research community.

Dr. McQueeney already mentioned this, that there is high-bandwidth communication between the private sector and various federal agencies. I can tell you from NSF's perspective, it is very, very rich collaboration. On my advisory committee, I have a number of senior ~~leadership~~ leaders from the

private sector who serve on my advisory committee advising us on our portfolio, on our investments in addition to academics who serve on my advisory committee.

The final comment that I want to make is, there are a number of programs at NSF, and I know you are familiar with all of them, including SBIR, including I-Corps and so on that focus on transfer of knowledge from lab to practice. Federal Government invests heavily in advancing frontiers of knowledge. For us to accelerate that programs such as I-Corps, SBIR and so on serve a tremendous purpose, and here again, there are opportunities to engage the private sector and accelerate the transfer of knowledge to practice to benefit the Nation. Thank you.

Mr. LIPINSKI. Thank you.

Mr. MASSIE. Thank you, Mr. Lipinski. I now recognize Mr. Bridenstine from Oklahoma for 5 minutes.

Mr. BRIDENSTINE. Thank you, Mr. Chairman.

I also serve on the House Armed Services Committee, and I am aware that the Department of Defense is moving towards cloud-based computing solutions, and this of course creates some consternation about security issues, cyber hacking, other cyber crimes, and I was wondering if any of your organizations are involved in helping the Department of Defense work through these issues and what those solutions might be, if you could share with us on that?

introduced known cyber attacks into it and were able to show that if we knew the patterns of command and control, as the defense folks might say, of these cyber attacks, we could actually spot them assembling themselves and interrupt them before they had a chance to launch. So having tremendous control over the environment out of which we were getting compute resources gave us abilities to do additional security and additional monitoring, even if we assumed the security was not perfect and could be breached, could we essentially in real time detect that breach and interrupt it before it stopped. I thought that was a very forward-looking piece of work that was driven by the Air Force CIO's office.

Mr. BRIDENSTINE. Excellent. Go ahead.

Mr. JAHANIAN. As you alluded to, these new environments, whether it is mobile platforms or cloud computing, are introducing new challenges, and we recognize that attackers and defenders are coevolving and there are enormous challenges to protecting our critical infrastructure and our cyber infrastructure.

I wanted to mention NSF's Secure and Trustworthy CYBERSPACE ~~computing~~ program, which is a research program addressing many of the challenges that we alluded to, and this is a research program that addresses not only the technology issues but also transition to practice. Furthermore, the NITRD research and development subcommittee has a working

Ms. WILSON. Thank you. This question is for everyone. We have all had several discussions lately about the value of NSF-funded research to society and how we might certify that value based on the grant proposal. I think we might use big data instructively here. It is an incredibly interdisciplinary field where tools are developed in the pursuit of one narrow research question, let us say in the social sciences might have profound applications across many fields of science and even in many sectors of the economy that can't possibly be anticipated at the time of the proposal. What is the potential for data analytics being developed in one little seemingly irrelevant corner having unintended benefits to other fields and societal applications? And if you have concrete examples, that would be even better for us to understand. Thank you.

Mr. JAHANIAN. Okay. I guess I will start. There is no question there are all sorts of explorations that we are doing in the area of big data that we can't even begin to see the potential impact of it. I will give you an example. NSF has been investing and other agencies with the private sector in what is known as the area of machine learning. These investments have taken place for at least 20 or 30 years. In fact, IBM has also led efforts in this area. I can tell you that it is investment of last 20 or 30 years that has come to fruition such that these machine learning algorithms ~~that~~

essentially allow us to look at these large data sets and identify trends and be able to adapt essentially, that have a broad range of applications from weather forecasting to financial modeling to biomedical research and so on have had tremendous, tremendous impact and now we use these techniques as if they are off-the-shelf ~~essentially~~ solutions available that you can buy. These are through years of investment that we have made that have come to fruition, so that is an example of that.

We are investing in all sorts of area in natural language understanding, in information retrieval, in various algorithms and approaches to automated scalable approaches to reasoning that could be applied to understanding relationships between gene sequence structure and biological functions. These are all essentially kinds of investments that we are making that some of us we could see how it comes to fruition.

Some of it relies on decades of investment that we have already made in computational techniques and data-intensive techniques.

Mr. MCQUEENEY. If I could offer you an example from the medical world, one of the critical problems in medicine is the loss of premature infants due to infections, and physicians have struggled for a long time with identifying the onset of an infection at a very early point because as these infections can grow exponentially, the earlier you can

identify a subset of cellular features. Out of 6,000 possible features, they were able to essentially identify a few of them that were predictive of survival time among breast cancer patients. What is really surprising is that the feature that they identified, it wasn't just from--the best feature, I should say, that ~~the~~ predictor of survival, was not from the cancerous tissue itself but it was from the surrounding ~~one~~ tissue, and that has led to new kinds of treatments.

It has led to new kinds of diagnosis techniques and also a very personalized treatment that could aim to improve survival times in patients. That is a very, very concrete example.

Another example is the work that Google had done during H1N1 virus. I will be very brief about this. Before they actually discovered a vaccine, we wanted to track the spread of disease. Google engineers used data that had nothing to do with the virus directly from billions of essentially web searches from around the world together from publicly available, flu essentially historic data on flu trends to predict the spread of flu virus down to small regions in the country--or across the world, rather. This is a remarkable ~~essentially~~ application of data that one would have never thought could be applicable to something like H1N1 virus.

Ms. WILSON. Thank you very much.

Mr. MASSIE. Thank you, Ms. Wilson. Thank you for that

QUESTIONS FOR THE RECORD
THE HONORABLE CYNTHIA LUMMIS (R-WY)
U.S. House Committee on Science, Space, and Technology
Next Generation Computing and Big Data Analytics
Wednesday, April 24, 2013

1. The massive volumes of data generated daily across a range of industries and public sector organizations necessitate new methods to store and manage the data. The National Science Foundation (NSF) Computer and Information Sciences and Engineering Directorate (CISE) helps develop and maintain cutting-edge national computing and information infrastructure for research and education. This data must be analyzed to extract knowledge and promote discovery. Often this data resides in scattered locations.

For the nation to take advantage of the discovery that can be derived from big data, please explain how an effective infrastructure can be constructed to connect the entities developing and using Big Data to drive discovery. Additionally, please describe how the infrastructure, connections, and broadband would be developed to enable the entire community of research universities, in particular those like the University of Wyoming from EPSCoR states.

The Division of Advanced Cyberinfrstructure (ACI) in NSF/CISE supports three major programs that emphasize the development of computational infrastructure and participation in Big Data activities: The first program is Data Infrastructure Building Blocks (DIBBS); the second is Campus Cyberinfrastructure - Network Infrastructure and Engineering (CC-NIE); and the third is Cyberinfrastructure Framework for 21st Century Science and Engineering (CIF21). All three programs support research and discovery efforts in data as well as helping campuses to obtain the infrastructure connections and facilities required to participate in Big Data. They are discussed below.
The DIBBS Program focuses on how to develop, implement, and support the new methods, management structures and technologies to store and manage the diversity, size, and complexity of current and future data sets and data streams. DIBBS has three types of awards:

- Conceptualization awards support design specifications for creating a sustainable data infrastructure that will be discoverable, searchable, accessible, and usable to the entire research and education community;
- Implementation awards support development and implementation of technologies and infrastructure that addresses elements of the data preservation and access; and
- Interoperability awards develop frameworks that provide consistency or commonality of design across communities and implementation for data acquisition, management, preservation, sharing, and dissemination.

The CC-NIE Program invests in improving and re-engineering networks at the campus level to support a range of data transfers supporting computational science and computer networks and systems research. CC-NIE has two major types of awards:

- Data Driven Networking and Infrastructure for the Campus and Researcher; and
- Network Integration and Applied Innovation awards.

The CIF21 effort has participation from every NSF Directorate. CIF21 focuses on foundational research, infrastructure support and deployment, and community building. Since CIF21 supports the entire cyberinfrastructure eco-system, it also supports projects involving data, computational science and building research communities.

NSF EPSCoR supports programs that focus on connectivity and cyberinfrastructure for Big Data. These are discussed below, specifically focusing on EPSCoR activities in Wyoming.

Connectivity: Wyoming is a founding member of the Front Range Gigapop (FRGP) in Denver, which provides 10Gbit/sec connectivity between the University of Wyoming and institutions in Colorado, including NCAR, as well as connectivity to the Abilene Network and National LambdaRail. A significant amount of the nation's long-haul telecommunications fiber transits through Wyoming's southern quarter along the mainline of the Union Pacific railroad and Interstate 80. Major telecommunications centers as well as the National Center for Atmospheric Research (NCAR) – Wyoming Supercomputing Center are located in Cheyenne. Fiber connectivity along with the availability of electrical power and favorable climate for data center operation is making southeastern Wyoming an important IT hub.

Managing Big Data: Wyoming has an NSF EPSCoR award that pilots an effective cyberinfrastructure that connects EPSCoR entities developing and using Big Data to drive discovery. The RII Track-2, CI-Water, allows a consortium of Utah and Wyoming researchers to acquire and develop hardware and software cyberinfrastructure to support the development and use of large-scale, high-resolution computational water resources models to enable comprehensive examination of integrated system behavior through physically-based, data-driven simulation. Successful integration requires data, software, hardware, simulation models, tools to visualize and disseminate results, and outreach to engage stakeholders and impart science into policy, management, and decisions. The computational requirements of stochastic methods to consider uncertainties, fine spatial and temporal resolutions to improve accuracy, and representation of dynamic processes that include feedbacks among system components demand use of state-of-the-art high-performance computing (HPC). CI-WATER is working to develop a robust and distributed CI consisting of integrated data services, modeling and visualization tools, and a comprehensive education and outreach program that will revolutionize how computer models are used to support water resources research in the Intermountain West and beyond.

2. Within NSF, the Computer and Information Sciences and Engineering Directorate (CISE) helps develop and maintain cutting-edge national computing and information infrastructure for research and education. NSF has significant investment in computing infrastructure, including the NCAR-Wyoming Supercomputing Center, among others. These high performance computers are capable of processing complex data sets at a greater rate, enabling scientific research and discoveries.

The ability to analyze and utilize information from increasing quantities of data sets is crucial to advancing knowledge. Please describe the contributions these facilities are expected to make to the development and use of Big Data over the next three to five years.

ACI supports national efforts in advanced and cutting edge computational facilities including the recently announced facilities in Texas (Stampede) and Illinois (Blue Waters). While both of these facilities support very high performance and complex data problems, the Blue Waters facility has the largest data storage and management system in the world. When these facilities are in full production, they will permit investigators across the country to engage in innovative research demanding petascale capabilities.

ACI also supports the XSEDE project, which manages and operates 17 different high performance systems across the nation with a common interface to ensure that researchers can get what they need without having to contact each site. XSEDE also manages the allocation process that provides researchers with the resources they need. Usage of these facilities is done via peer review so that the best research is supported.

The NCAR Wyoming Supercomputing Center (NWSC) provides high-performance CI that will enable researchers to perform high-resolution simulations of weather phenomena, global and regional climate, coastal oceans, sunspots, subsurface flow, and more. Earth System research and education will be transformed by the NWSC, as the next generation of Earth science researchers and computational scientists will be attracted by the importance of the problem and the scale of the facilities available to them. Current and planned education, outreach, and training programs built around the facility will help to broaden the impact of the NWSC project on both regional and national scales. Integration of the NWSC with other NSF high-performance CI will provide important linkages with other resource providers and will directly support NSF's vision of a transformative national petascale cyberinfrastructure for science and engineering. Finally, the NWSC has the potential to contribute to economic development in the State of Wyoming in the form of well-paying jobs, workforce training opportunities, and in the transformation of the state into a destination of choice for other high-technology enterprises. Through the facility partnership with Wyoming, these benefits can be extended to other EPSCoR states as well.

NCAR aims to improve researchers' abilities to analyze and utilize information via various efforts focused on data manipulation and visualization (e.g., Globally Accessible Data Environment, GLADE, http://www2.cisl.ucar.edu/resources/glade; data analysis and visualization, http://www2.cisl.ucar.edu/resources/software/dav).

QUESTIONS FOR THE RECORD
THE HONORABLE DEREK KILMER (D-WA)
U.S. House Committee on Science, Space, and Technology
Next Generation Computing and Big Data Analytics
Wednesday, April 24, 2013

There have been a number of big data reports generated recently by a number of industry leaders. I'm proud to say that companies, EMC and Isilon, which is headquartered in Washington State, have done a lot of great work on big data. EMC recently released their latest "Digital Universe" study, conducted by IDC. Amazingly, this study projects that the digital universe will reach 40 Zettabytes by 2020.

One of the issues I have been passionate about, both in the state legislature and in my first few months in Congress, is STEM education. It seems to be that many of these reports make a compelling case that there is a dire need for more data scientists.
I have two questions:

1. How are your organizations specifically addressing the need for more data scientists and employees with STEM backgrounds?

NSF has focused for many years on developing the STEM workforce through investments in its research and education programs and projects. Increasingly, the development of skills in the use of large data sets is a critical part of the training needed for the STEM workforce. Collectively, STEM programs support, for example, curriculum development, strategies to increase student retention and success in STEM, and student support through scholarships and fellowships. As part of the merit review of these projects, they have to show evidence that the measures taken will ensure effective learning.

Many of these programs focus on undergraduate and graduate students in formal and informal education settings. In addition, across NSF – in all the science directorates – research projects support graduate students as research assistants. Increasingly, these assistantships require data-intensive research, often involving large-scale data sets. These hands-on learning opportunities are critical in helping to develop a workforce with sophisticated and real experience in deploying these skills.

In the FY14 Budget Request, NSF proposes STEM-C Partnerships (i.e., STEM with an emphasis on computing) as one of its primary approaches to advance K-12 teacher and student development of computational skills. NSF also supports research that develops and evolves the knowledge base that informs improvements in the preparation of the workforce. (See http://www.nsf.gov/about/budget/fy2014/pdf/25_fy2014.pdf.)

2. In your testimony, you both discuss how our nation is facing a data scientist shortage. What policies would you recommend Congress consider to address that shortage?

Congress should continue to support STEM education at all levels – from kindergarten through lifelong learning. In particular, NSF is looking to invest in evidence-based and evidence-generating approaches to achieve specific educational outcomes. While anecdotal evidence may point to a variety of policy options, NSF, working in partnership with private and public sector stakeholders, is laying the foundation for policies and programs that are rooted in empirical evidence. In particular, retraining efforts, and initiatives that are aligned with the changing needs of business and industry, may be promising areas for strategic investment.

The Honorable Michael M. Honda
Subcommittee on Commerce, Justice, Science, and Related Agencies
Questions for the Record
Hearing on National Science Foundation FY 15 Budget
Witness: Dr. Cora Marrett

1. Often, startup companies and researchers have trouble transitioning discoveries and inventions from the lab to the market. The NSF Innovation Corps program is purposed with connecting NSF-funded research with the technological, entrepreneurial, and business communities to help bridge this gap between discoveries and downstream technological applications. How do the Innovation Corps and the "Nodes" and "Sites" that NSF supports work with researchers to "build, utilize, and sustain a national innovation ecosystem that augments the development of technologies, products, and processes that benefit the Nation"? How else is the NSF helping researchers transition their innovations from the lab to the marketplace?

2. I often hear from technology leaders in Silicon Valley that the government and this country must get more serious on cyber security. The number of attacks is increasing dramatically and as our lives, personal data and the Nation's critical infrastructure become more connected online, we put ourselves ever more at risk to large scale destructive breaches and attacks. A key step to addressing these cyber threats is bringing academics, government agencies, internet/telecommunication companies, and cyber security companies together in a safe haven environment to share experience and strategies to more effectively combat this growing problem. I have introduced legislation (the Excellence in Cybersecurity Act) that would create centers of excellence around the country to bring together industry leaders with government agencies to identify and analyze existing and future cyber security challenges faced by various industries, to create solutions and promote best practices to address such challenges, and to collaborate with individuals in those industries to share knowledge. How is the NSF's Secure and Trustworthy Cyberspace (SaTC) program addressing the issue of cyber security? Will the SaTC program partner with cyber security industry leaders and try to find industry specific solutions by sharing experience and knowledge?

3. I commend the NSF for its important and historic role in advancing the Nation's competitiveness through support of advanced computing infrastructure and the science and engineering applications it enables. In view of NSF's considerable expertise in high-performance computing for open science, what is NSF's vision for its leadership role in the broader federal context of science-supporting agencies? In particular, how is NSF planning for, and how committed is it to, its vision for maintaining and modernizing its world-class big data and high-performance computing infrastructure, software, and applications that support all areas of scientific research and education, including the most demanding "grand challenge" science problems, accelerating transition to practice?

The Honorable Adam B. Schiff
Subcommittee on Commerce, Justice, Science, and Related Agencies
Questions for the Record
Hearing on National Science Foundation FY 15 Budget
Witness: Dr. Cora Marrett

1. As you know, the America COMPETES Act of 2007 authorized an NSF program to support Hispanic-Serving Institutions (HSIs). Despite language in the reauthorization of America COMPETES Act of 2010 directing the NSF to maintain support for each of its existing programs for minority-serving institutions -- including HSIs – an HSI-specific program has not yet been established.

   In both FY 2013 and 2014, the Committee weighed in on the issue and asked the NSF to report back on plans to establish an HSI-focused program and how existing and planned efforts will meet the specific needs of HSIs through NSF's other programs. Subsequently, the NSF reported on the logistical difficulties of establishing and managing such an initiative and then "proposed a multi-pronged approach… to meet the needs of HSIs by building on prior efforts and focusing on efforts to build capacity, especially in community colleges… including opportunities to increase the participation, retention, and graduation of Hispanics in STEM".

   While programs dedicated to Historically-Black Colleges and Universities (HBCUs) and Tribal-Serving Institutions (TSIs) have been in place at the NSF for over a decade, Hispanic-Serving Institutions (HSIs) remain one of the most crucial cohorts of minority-serving institutions yet to receive targeted NSF infrastructure development funding in the areas of science, technology, engineering, and math. Recognizing that NSF funding to HBCUs and TSIs have proven essential to the demonstrated success of strengthening STEM initiatives at these institutions and assisting in preparing a strong STEM workforce in a time of utmost need, it would be remiss for us not to continue encouraging and working with the NSF to assist HSIs as well.

   Can you elaborate on the logistical difficulties of establishing and managing a dedicated HSI program at the NSF, and explain why, in light of the existing program models for other minority-serving institutions that the NSF has managed for over ten years, these difficulties could or could not be overcome?

2. Can you update the Committee on the progress of the NSF's proposed initiatives to meet the needs of HSIs that the Foundation committed to undertaking in its August 2013 report to the Committee? In particular, how has the NSF proceeded to assist STEM initiatives in community colleges?

3. Has the NSF considered the possibility of creating, or at the very least beginning outlining a plan to create, an HSI-focused program in FY 2015 and to what extent has this been discussed?

The Honorable Jose Serrano
Subcommittee on Commerce, Justice, Science, and Related Agencies
Questions for the Record
Hearing on National Science Foundation FY 15 Budget Request
Witness: Dr. Cora Marrett

1. NSF has specialized undergraduate education programs for Blacks and Native Americans, but not specialized programs for Latinos. Since fiscal year 2010, there has been appropriations report language directing the NSF to address the needs of HSIs. The House passed bill for Fiscal year 2013 repeated report language that stated: *"The Committee has previously asked NSF to consider the concept of creating a program within EHR to focus on Hispanic Serving Institutions (HSIs). NSF shall provide to the Committees on Appropriations a report outlining how the needs of HSIs will be addressed in fiscal year 2013 and any plans to establish an HSI-focused program in fiscal year 2014. This report shall be submitted no later than 120 days after the enactment of this Act."* Although the House bill became stuck in the Senate, there are still several years of pending instructions in this area.

   While I appreciate the efforts NSF is making in expanding opportunities to underrepresented minorities, including through the establishment of a new program in this year's budget, I am troubled that NSF has not established a dedicated Hispanic Serving Institutions - Undergraduate program. Latinos are now the largest minority group in the United States, and are severely underrepresented in the STEM fields. More importantly, Congressional instruction was very clear in this regard.

   In addition to report language, the America COMPETES Act, P.L. 110-69 authorized the creation of a Hispanic-Serving Institutions Undergraduate Program at the NSF for $30 million.

   Earlier this month, 21 of my colleagues and I sent a letter to President Obama restating our support for the creation of a dedicated HSI STEM program within the NSF and encouraging the Administration to work with Congress as the America COMPETES Act Reauthorization approaches.

   What is the status of the report? Why has the NSF refused to comply with Congressional instruction?

The Honorable Frank R. Wolf
Chairman, Subcommittee on Commerce, Justice, Science, and Related Agencies
Questions for the Record
Hearing on National Science Foundation FY 15 Budget Request
Witness: Dr. Cora Marrett

1. NSF's recent budget requests have placed a lot of emphasis on graduate-level fellowship programs, with much smaller increases requested for traineeships. Why has NSF chosen to focus its resources in this way? How do you respond to critics who believe that fellowship and traineeship opportunities need to be better balanced with one another in your budget?

2. In fiscal year 2014, NSF unsuccessfully proposed to consolidate 3 of its undergraduate STEM programs into a new initiative called Catalyzing Advances in Undergraduate STEM Education (CAUSE). Now the fiscal year 2015 request consolidates those same 3 programs into a new initiative called Improving Undergraduate STEM Education (IUSE). What is the difference between last year's CAUSE initiative and this year's IUSE proposal?

3. NSF's budget requests imply that the agency thinks the CyberCorps: Scholarships for Service program has too much money. Are there significant differences in the annual funding rates for this program versus other major NSF programs or the agency-wide average? Are there significant differences in NSF's ability to efficiently obligate funding for CyberCorps versus other major NSF programs?

4. The budget request projects that 11,400 awards will be made in fiscal year 2015, an increase of 100 awards over the fiscal year 2014 projection. How is this possible when the request for Research and Related Activities is a decrease and the increase proposed for Education and Human Resources is primarily needed to pay for higher Graduate Research Fellowship stipends?

5. The projected agency-wide funding rate for fiscal year 2015 is 22%, the same as fiscal year 2014. In your opinion, what is a healthy agency-wide funding rate that would indicate sufficient budgetary resources available to all programs?

6. Last year, you indicated that NSF was seeking to address the unusually low funding rate in the Engineering Directorate, but the budget request does not appear to do anything to improve it. How does the budget request address the problem of low funding rates in Engineering?

7. At the hearing, NSF indicated that it does not calculate or track a research-specific inflation factor similar to NIH's Biomedical Research and Development Price Index. In the absence of an NSF-specific inflation estimate, what was the general inflation factor assumed for fiscal year 2015 in the President's budget request? How does this inflation factor compare to the 1.2% increase requested for NSF?

UNITED STATES HOUSE OF REPRESENTATIVES
Committee on Appropriations
Subcommittee on Commerce, Justice, Science, and Related Agencies
Hearing on
National Science Foundation FY 15 Budget Request
March 27, 2014
Dr. Cora Marrett, Acting Director, National Science Foundation
Questions for the Record Submitted by
Frank R. Wolf

Education and Human Resources (EHR) Programs

Question 1. NSF's recent budget requests have placed a lot of emphasis on graduate-level fellowship programs, with much smaller increases requested for traineeships. Why has NSF chosen to focus its resources in this way? How do you respond to critics who believe that fellowship and traineeship opportunities need to be better balanced with one another in your budget?

Answer: NSF recognizes the importance of appropriately balancing its investments in graduate education. As is noted in the FY 2015 Request, the agency is addressing this through the development of a five year strategic plan for its investments in graduate students and graduate education. This plan builds on four related efforts: 1) the recommendations of the National Science and Technology Council's Committee on Science, Technology, Engineering, and Mathematics Education (Co-STEM) 5-Year Strategic Plan[1] 2) on-going interagency discussions about leveraging assets; 3) recent national reports on graduate education[2,3,4,5] and 4) NSF-wide efforts to ensure that its many forms of investment in graduate education form a coherent agency strategy. A key driver of this effort is the recognition that graduate training in STEM must continue to evolve in order to provide a supply of scientists and engineers who not only meet the needs of the emerging STEM enterprise, but who have the knowledge, skills, and preparation to advance it, both within and outside of academia.

Question 2. In fiscal year 2014, NSF unsuccessfully proposed to consolidate 3 of its undergraduate STEM programs into a new initiative called Catalyzing Advances in Undergraduate STEM Education (CAUSE). Now the fiscal year 2015 request consolidates those same 3 programs into a new initiative called Improving Undergraduate STEM Education (IUSE). What is the difference between last year's CAUSE initiative and this year's IUSE proposal?

Answer: As a part of continuing efforts to stimulate innovations in undergraduate education, in FY 2014 NSF merged three undergraduate STEM education programs – Transforming

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[1] National Science and Technology Council, Committee on STEM Education (2013) *Federal Science, Technology, Engineering and Mathematics (STEM) 5-Year Strategic Plan* www.whitehouse.gov/sites/default/files/microsites/ostp/stem_stratplan_2013.pdf.
[2] Council of Graduate Schools (2012) *Pathways through Graduate School and Into Careers*, http://pathwaysreport.org/rsc/pdf/19089_PathwaysRept_Links.pdf
[3] National Institutes of Health (2012) *Biomedical Research Workforce Working Group Report*, http://acd.od.nih.gov/biomedical_research_wgreport.pdf
[4] American Chemical Society (2012) *Advancing Graduate Education in the Chemical Sciences*, www.acs.org/content/dam/acsorg/about/governance/acs-commission-on-graduate-education-summary-report.pdf
[5] National Research Council (2012) *Research Universities and the Future of America*, www.federalrelations.wisc.edu/docs/FutureofAmericaU.pdf

Undergraduate Education in STEM (TUES), STEM Talent Enhancement Program (STEP), and Widening Implementation and Dissemination of Evidence-based Reforms (WIDER) – into an umbrella program description, Improving Undergraduate STEM Education (IUSE). IUSE, an NSF program, provides grantees with greater flexibility to integrate multiple approaches to increase attraction to STEM; to increase persistence and retention in STEM of all students; to improve the quality of the undergraduate STEM learning experience; and to prepare both a quality STEM workforce and a STEM literate citizenry. Over the past year, NSF has made considerable progress toward a stronger, more cohesive infrastructure for delivering undergraduate STEM education programs. IUSE provides a core that in fiscal year 2015 will lead to greater effectiveness, efficiency, and impact. The coherency of IUSE supports the development of common metrics and evaluation to measure the impact of NSF awards on undergraduate education.

In the fiscal year 2014 budget, NSF's request to integrate undergraduate STEM programs was presented in a broader cross-government context of Catalyzing Advances in Undergraduate STEM Education (CAUSE). In this broader context, undergraduate programs across federal agencies were proposed for reorganization. Respecting the request of Congress, this cross-government reorganization did not occur as originally proposed. NSF has continued with internal efforts, however, notably the integration of these three undergraduate programs at NSF through the IUSE program description.

Question 3. NSF's budget requests imply that the agency thinks the CyberCorps: Scholarships for Service program has too much money. Are there significant differences in the annual funding rates for this program versus other major NSF programs or the agency-wide average? Are there significant differences in NSF's ability to efficiently obligate funding for CyberCorps versus other major NSF programs?

Answer: The budget requests for the CyberCorps: Scholarships for Service (SFS) program have been in keeping with an assessment of the growth of the field and the capacity of the training community so that highly meritorious programs could be identified and funded.

NSF has been asked by Congress to enhance funds available for the program by an additional $20.0 million in each of fiscal years 2012, 2013, and 2014. As a result, the additional projects funded have expanded the original SFS mandate, which called for maintaining 300 students on SFS scholarships, to the 470 that the program currently supports. It is expected that already-funded projects will increase this number to 600 students during the next few academic years. At the same time, the number of universities offering SFS scholarships increased from 35 in 2011 to 54 in 2014. In FY 2011, the funding rate for the SFS program rose to levels significantly higher than the NSF average (35 percent for SFS vs 22 percent for NSF overall); however, the SFS institutional capacity is now at the point that the SFS funding rate is anticipated to be closer to the NSF average (in FY 2013 the SFS funding rate was 25 percent versus 22 percent for NSF overall).

In keeping with the enhanced capacity that has been developed in the field, the FY2015 NSF budget request for the SFS is $25.0 million. An additional $20.0 million is provided through the Administration's Opportunity, Growth, and Security Initiative (OGSI). In FY 2014, $45.0 million is allocated for SFS.

Number of Awards and Funding Rate

Question 4. The budget request projects that 11,400 awards will be made in fiscal year 2015, an increase of 100 awards over the fiscal year 2014 projection. How is this possible when the request for Research and Related Activities is a decrease and the increase proposed for Education and Human Resources is primarily needed to pay for higher Graduate Research Fellowship stipends?

Answer: In FY 2015 NSF estimates making 11,400 awards, a one percent increase over the 11,300 awards estimated for FY 2014. This increase is due to a combination of additional education grants and a small increase to the percentage of continuing grants in FY 2015. NSF can shift the balance of standard versus continuing awards to increase the overall number of new awards made in a given year in order to mitigate impact to funding rate under scenarios of increasing proposal pressure and/or decreasing funding. Keep in mind, however, that because continuing grants require out-year commitments, they encumber future funding that could otherwise be used to make new awards. Repeatedly increasing the share of continuing grants over a number of years would increase the total 'mortgage' owed and could actually have a detrimental effect on future funding rates if high mortgage levels prevent a sufficient number of new awards from being made.

Question 5. The projected agency-wide funding rate for fiscal year 2015 is 22%, the same as fiscal year 2014. In your opinion, what is a healthy agency-wide funding rate that would indicate sufficient budgetary resources available to all programs?

Answer: Since NSF issues awards based on the availability of funds there is no target or 'healthy' funding rate. The funding rate is determined by a number of factors in addition to the budgetary resources available, such as the number of proposals submitted, the quality of proposals, the size of awards, and the balance between standard awards and continuing awards.

Question 6. Last year, you indicated that NSF was seeking to address the unusually low funding rate in the Engineering Directorate, but the budget request does not appear to do anything to improve it. How does the budget request address the problem of low funding rates in Engineering?

Answer: In a climate of constrained budgets, addressing this issue is quite challenging. Each of the Foundation's research directorates plays an important role in national and emerging priorities worthy of support. The FY 2015 budget request recognizes the importance of balancing these issues. The Directorate for Engineering (ENG) continues to seek innovative ways of addressing this issue, including making some changes in business processes, which has helped increase funding rates. Two engineering research divisions have gone from two annual proposal submission windows to a single submission window and all divisions have revised the focus of their program descriptions. As a result of these changes, the directorate has seen a decrease of over 10 percent in the total number of research proposals received since FY 2010. In addition, ENG achieved a funding rate of 18 percent in FY 2014, equivalent to three other Research & Related Activities directorates. This is an increase of one percentage point over FY 2012 and 3 percentage points over FY 2010 and FY 2011. We will continue to pay close attention to this issue in future fiscal years.

NSF Inflation Factor

Question 7. At the hearing, NSF indicated that it does not calculate or track a research-specific inflation factor similar to NIH's Biomedical Research and Development Price Index. In the absence of an NSF-specific inflation estimate, what was the general inflation factor assumed for fiscal year 2015 in the President's budget request? How does this inflation factor compare to the 1.2% increase requested for NSF?

Answer: NSF does not use an across-the-board inflation factor to formulate its budget requests. However, there may be unique instances where a factor is used for planning purposes, such as for large facilities and MREFC projects. In those instances, NSF uses economic assumptions that are shared across government.

Questions for the Record Submitted by
Jose E. Serrano

Hispanic-Serving Institutions Program

NSF has specialized undergraduate education programs for Blacks and Native Americans, but not specialized programs for Latinos. Since fiscal year 2010, there has been appropriations report language directing the NSF to address the needs of HSIs. The House passed bill for Fiscal year 2013 repeated report language that stated: "The Committee has previously asked NSF to consider the concept of creating a program within EHR to focus on Hispanic Serving Institutions (HSIs). NSF shall provide to the Committees on Appropriations a report outlining how the needs of HSIs will be addressed in fiscal year 2013 and any plans to establish an HSI-focused program in fiscal year 2014. This report shall be submitted no later than 120 days after the enactment of this Act." Although the House bill became stuck in the Senate, there are still several years of pending instructions in this area. While I appreciate the efforts NSF is making in expanding opportunities to underrepresented minorities, including through the establishment of a new program in this year's budget, I am troubled that NSF has not established a dedicated Hispanic Serving Institutions - Undergraduate program. Latinos are now the largest minority group in the United States, and are severely underrepresented in the STEM fields. More importantly, Congressional instruction was very clear in this regard. In addition to report language, the America COMPETES Act, P.L. 110-69 authorized the creation of a Hispanic-Serving Institutions Undergraduate Program at the NSF for $30 million. Earlier this month, 21 of my colleagues and I sent a letter to President Obama restating our support for the creation of a dedicated HSI STEM program within the NSF and encouraging the Administration to work with Congress as the America COMPETES Act Reauthorization approaches.

Question 1. What is the status of the report? Why has the NSF refused to comply with Congressional instruction?

Answer: The aforementioned HSI report is being drafted and will be submitted by the required deadline of May 17, 2014. NSF will address funding of HSIs through its existing programs in order to meet the specific needs of HSIs, as required by the joint explanatory statement.

Questions for the Record Submitted by
Michael M. Honda

Transitioning Innovations from the Lab to the Marketplace

Question 1. Often, startup companies and researchers have trouble transitioning discoveries and inventions from the lab to the market. The NSF Innovation Corps program is purposed with connecting NSF-funded research with the technological, entrepreneurial, and business communities to help bridge this gap between discoveries and downstream technological applications. How do the Innovation Corps and the "Nodes" and "Sites" that NSF supports work with researchers to "build, utilize, and sustain a national innovation ecosystem that augments the development of technologies, products, and processes that benefit the Nation"? How else is the NSF helping researchers transition their innovations from the lab to the marketplace?

Answer: The purpose of NSF I-Corps is to support NSF-funded researchers who, with teams, are interested in transitioning their research out of the lab. I-Corps awards are based on the maturity of the effort (i.e., whether the research is ready to leave the lab), strength of the team, and anticipated market value. The teams selected for I-Corps awards will receive additional support – in the form of mentoring and funding – to accelerate innovation that can attract subsequent third-party funding.

NSF established the **I-Corps Nodes** program to support regional needs for innovation education, infrastructure and research. The interconnected nodes of this network are diverse in research areas, resources, tools, programs, capabilities and geographic locations; while the network has the flexibility to grow or reconfigure, as needs arise.

I-Corps Nodes foster understanding on how to:

- Identify, develop and support promising ideas that can generate value,
- Create and implement tools and resources that enhance our Nation's innovation capacity,
- Gather, analyze, evaluate and utilize the data and insight resulting from the experiences of the I-Corps Teams/Sites, and
- Share and leverage effective innovation practices on a national scale to improve the quality of life for the U.S. citizenry.

I-Corps Regional Nodes contribute to the National Innovation Network in the following three ways:

Level 1 Contribution: *I-Corps Regional Training*: Nodes demonstrate the capacity to deliver an innovation-enhancing training program based on the hypothesis/validation "Customer Development" curriculum that is used to support NSF I-Corps teams. NSF may call upon I-Corps Regional Nodes up to twice a year to host a cohort of approximately 20-25 I-Corps teams in the delivery of the NSF-selected I-Corps curriculum.

Level 2 Contribution: *I-Corps Node Regional Infrastructure*: I-Corps Regional Nodes are developing near-term tools and resources that are intended to impact and expand the benefits of the entire I-Corps program within a 2-3 year timeframe. Level 2 efforts are also addressing the issues associated with accelerating the diffusion/adaption/adoption of effective innovation practices in the national ecosystem, while further building entrepreneurial capacity in the node environments.

Level 3 Contribution: *I-Corps Node Blue Sky Research*: I-Corps Regional Nodes are leveraging and analyzing data from Level 1 and Level 2 contributions. Key activities are focusing on: 1) developing an understanding of how institutions can improve support for innovation ecosystems; 2) sharing and developing methods for successfully scaling effective practices and models that foster innovation; 3) exploring how the National Innovation Network can enable new collaborations among geographic regions to support commercialization - independent of geographic locations; 4) examining and tracking the I-Corps teams' dynamics, activities and outcomes; and 5) identifying and proposing improvements to the I-Corps curriculum materials, training practices, and National Innovation Network utilization.

NSF established the **I-Corps Sites** program to contribute to the nation's innovation ecosystem. The goals of the Sites program are to spur translation of research, to encourage collaboration between academia and industry, to develop formal, active, local innovation ecosystems that contribute to a larger, national network of mentors, researchers, entrepreneurs and investors, and to train students to understand innovation and entrepreneurship. Through I-Corps Sites, NSF investments strategically strengthen the innovation ecosystem by addressing the challenges inherent in the early stages of the innovation process – the program supports activities that are designed to overcome many of the obstacles in the path of innovation. I-Corps Sites are housed in academic units whose mission is to provide resources to individuals and teams in the form of space, seed funding, entrepreneurial mentoring, curriculum, or other assets needed to transition technology into the marketplace.

As part of an evolving national innovation network, I-Corps Sites are funded at universities to nurture and support multiple, local teams by providing infrastructure, advice, resources, networking opportunities, training and modest funding ($1,000 to $3,000 per team over a 3-6 month period) to enable researchers to transition their ideas, devices, processes or other intellectual activities into the marketplace or into becoming I-Corps Team or SBIR applicants. While different institutions may choose different mechanisms for achieving the goals of their I-Corps Site, certain characteristics of a Site must be consistent – projects must be team-centric, the origin and nature of the projects must be STEM-focused, and the kind of support that is provided to the teams by the Site must include assets needed to explore transitioning technology into the marketplace.

The Innovation Corps program is a key element in a series of NSF-supported programs concentrating on the innovation ecosystem. I-Corps has its genesis in a number of long-standing programs within NSF that support the innovation ecosystem, such as Engineering Research Centers (ERC), Industry/University Cooperative Research Centers Program (I/UCRC), Partnerships for Innovation (PFI), Science and Technology Centers (STC), and Materials Research Science and Engineering Centers (MRSEC). In FY 2011 and FY 2012, investments in the inaugural year for I-Corps complemented these long-standing investments. All of these programs are built on the backbone of support for core research, primarily to individual investigators, found in every directorate at NSF.

Cybersecurity

I often hear from technology leaders in Silicon Valley that the government and this country must get more serious on cyber security. The number of attacks is increasing dramatically and as our lives, personal data and the Nation's critical infrastructure become more connected online, we put ourselves ever more at risk to large scale destructive breaches and attacks. A key step to addressing these cyber threats is bringing academics, government agencies, internet/telecommunication companies, and

cyber security companies together in a safe haven environment to share experience and strategies to more effectively combat this growing problem. I have introduced legislation (the Excellence in Cybersecurity Act) that would create centers of excellence around the country to bring together industry leaders with government agencies to identify and analyze existing and future cyber security challenges faced by various industries, to create solutions and promote best practices to address such challenges, and to collaborate with individuals in those industries to share knowledge.

Question 2. How is the NSF's Secure and Trustworthy Cyberspace (SaTC) program addressing the issue of cyber security? Will the SaTC program partner with cyber security industry leaders and try to find industry specific solutions by sharing experience and knowledge?

Answer:
How is the NSF's Secure and Trustworthy Cyberspace (SaTC) program addressing the issue of cyber security?

The NSF's Secure and Trustworthy Cyberspace (SaTC) is an NSF-wide investment that is building the knowledge base in cybersecurity by enabling discovery, learning and innovation, and that will lead to a more secure and trustworthy cyberspace. Through a focus on long-term, foundational research, SaTC is developing the scientific foundations for cybersecurity research that will be useful for years to come. It is also broadening the cybersecurity research portfolio to include more cross-disciplinary projects and to increase opportunities for implementing new technologies that emerge from the research. It is expanding the number of large, multi-institutional projects that provide high-level visibility to cybersecurity grand challenges; and it is establishing curricula recommendations for new courses, degree programs, and educational pathways to develop future cybersecurity experts. SaTC is building a cybersecure society and providing a strong competitive advantage for the Nation's ability to produce high-quality digital systems and a well-trained workforce.

In 2011, the National Science and Technology Council (NSTC), with the cooperation and involvement of NSF, put forward a strategic plan titled *Trustworthy Cyberspace: Strategic Plan for the Federal Cybersecurity Research and Development Program.* This plan identifies a broad, coordinated research agenda to make cyberspace secure and trustworthy. The strategic plan details four goals that together cover a set of interrelated priorities for the federal agencies that conduct or sponsor research and development in cybersecurity. These four goals are: (1) inducing change, (2) developing scientific foundations, (3) maximizing research impact, and (4) accelerating transition to practice. SaTC is meeting these goals through investments in the following areas:

- Inducing change in the current state of cybersecurity by funding research that encourages an adversarial perspective (i.e., thinking like an attacker, with the same goals and methods as an adversary) and that closely examines the security, reliability, resiliency, privacy, usability, and overall trustworthiness of digital infrastructure. Areas of research include tailored trustworthy spaces, moving target, and economic and social incentives.
- Developing scientific and mathematical foundations for cybersecurity research to derive first principles and the fundamental building blocks of security and trustworthiness.
- Maximizing research impact by catalyzing integration across academic disciplines, increasing cooperation between government and the private sector, increasing collaboration across international borders, and protecting critical infrastructure.

- Accelerating transitions to practice by encouraging and enabling adoption and implementation of new technologies so as to create measurable improvements in the cybersecurity landscape.
- Addressing the pivotal issues in the education and preparation of tomorrow's cybersecurity researchers and professionals across all areas of science and engineering.

Will the SaTC program partner with cyber security industry leaders and try to find industry specific solutions by sharing experience and knowledge?

SaTC has, and continues to develop, partnerships with other agencies and industry to effectively achieve its long-term goals. The ongoing partnerships with industry for sharing expertise and knowledge that will lead to industry solutions are described in more detail in the following paragraphs.

The yearly SaTC solicitation has a Transition to Practice (TTP) Option that supports the leveraging of proposed research activities and ideas whose outcomes at the end of the award are capable of being implemented, matured, applied, experimentally deployed, or demonstrated as a useable capability. SaTC provides additional funding for these awards so that research results can be further developed, matured and experimentally deployed in organizations or industries, including in networks and end systems.

The SaTC solicitation established in FY 2012-2014 a project class for "Frontier" awards with budgets of up to $10 million and durations of up to five years. These are large, multi-disciplinary, multi-organizational, and/or multi-institution projects that provide high-level visibility to grand challenge research areas in cybersecurity. In FY 2012 and 2013, NSF funded five Frontier projects, including projects on cybersecurity for healthcare and wellness, cybersecurity for cloud computing, and cybercrime ecosystems. Some of these projects have collaborations with industry to further the linkages between knowledge and practice. For example, the cloud computing project, which started in FY 2013, plans to hold "Cloud Security Horizons" summits with industry stakeholders to help shape the future of security in cloud computing. The cybercrime ecosystems project is working with Twitter to improve the company's abuse detection infrastructure by integrating into it the project's findings on the underground market for fraudulent accounts.

In FY 2013, the SaTC program held a workshop in partnership with the Computing Community Consortium (CCC) and the Semiconductor Research Corporation (SRC) on fundamental cybersecurity issues of interest to both the semiconductor industry and academic researchers. SRC is a leading technology research consortium, comprising semiconductor companies and university research programs. One of the outcomes from this workshop was a joint partnership between NSF and SRC to support research on Secure, Trustworthy, Assured and Resilient Semiconductors and Systems (STARSS) with a focus on Design for Assurance. More specifically, in FY 2014, the STARSS program plans to fund its first awards on new strategies for computer hardware architecture, specification, and verification, with the aim of decreasing the likelihood of unintended behavior or access, increasing resistance and resilience to tampering, and improving the ability to provide authentication throughout the supply chain and in the field.

In FY 2014, NSF released a Dear Colleague Letter for Innovation Transition (InTrans) awards for project teams completing five-year Frontiers projects in the SaTC program. Research is expected to build on innovations developed within a given Frontier project through close

coordination with industry partner(s). The fundamental research results of the Frontier must drive more applied research with the potential to enable the industrial partner(s) to develop technological innovations with concrete and tangible positive impacts for society. The collaboration must also provide students with opportunities to work closely with industry researchers. To ensure industry commitment to the research grant, these awards will be co-funded by NSF and industry. Further, industry partners will be required to provide the majority of the funding as NSF support for InTrans awards will not exceed one-third of the total co-funding support provided by industry.

In FY 2013, the SaTC program held a first-ever Principal Investigators' (PI) meeting. The meeting brought together over 300 SaTC-funded PIs and co-PIs with interested parties from industry and government agencies and included a focus on results and open questions in the Science of Security. A second SaTC PI meeting is being planned for early- to mid-FY 2015 and will continue to involve industry and government agencies.

In FY 2014, the SaTC program sponsored a 2.5-day workshop centered on identifying high-impact actions that could be taken in any sector to better secure the Internet. The workshop, called the Cybersecurity Ideas Lab, brought together 35 invited experts in computer science, cybersecurity, economics, social science and policy. These experts were drawn from industry, academia, and the government. In addition to advancing the national dialogue on cybersecurity, the workshop yielded a list of concrete recommendations for enhancing the security of the Internet ecosystem that will be published in an upcoming report.

Also in FY 2014 NSF will initiate collaboration with Intel in the area of security for critical infrastructure. Cybersecurity threats exploit the increased complexity and connectivity of critical infrastructure systems, placing the Nation's security, economy, public safety, and health at risk. This partnership combines NSF experience in developing and managing successful large, diverse research portfolios with Intel's long history of building research communities in emerging technology areas through programs such as its Science and Technologies Centers Program.

In FY 2015, the SaTC program is planning to hold a cross-agency workshop that will review the progress made in developing a science of cybersecurity, and that will propose ways that requirements and results can be better communicated across the agencies, as well as among academics and industry.

High-Performance Computing

Question 3. I commend the NSF for its important and historic role in advancing the Nation's competitiveness through support of advanced computing infrastructure and the science and engineering applications it enables. In view of NSF's considerable expertise in high- performance computing for open science, what is NSF's vision for its leadership role in the broader federal context of science-supporting agencies? In particular, how is NSF planning for, and how committed is it to, its vision for maintaining and modernizing its world-class big data and high-performance computing infrastructure, software, and applications that support all areas of scientific research and education, including the most demanding "grand challenge" science problems, accelerating transition to practice?

Answer: Innovation and discovery in science and engineering is increasingly dependent on a cohesive yet dynamic and powerful cyberinfrastructure in which high performance computing (HPC) plays an essential and integral role. The National Science Foundation (NSF) has been

an international leader in high-performance computing deployment, application, research, and education for almost four decades. With the success of HPC modeling and simulation across an increasingly wide range of multidisciplinary research topics and teams, coupled with the advent of next generation instruments and sensors producing vastly larger and more diverse datasets available in real or near-real-time, NSF is committed to position and support the entire spectrum of its research communities, enabling them to be at the cutting edge of advanced computing technologies, hardware and software.

With the *Cyberinfrastructure for 21st Century Science and Engineering Advanced Computing Infrastructure Vision and Strategic Plan,* NSF seeks to promote a complementary, comprehensive, and balanced portfolio of advanced computing infrastructure and programs for research and education. This portfolio supports multidisciplinary computational and data-enabled science and engineering that in turn support the entire scientific, engineering, and education community. NSF is a leader in creating and deploying a comprehensive portfolio of advanced computing infrastructure, programs, and other resources to facilitate cutting-edge foundational research in computational and data-enabled science and engineering (CDS&E) and their application to all disciplines.

The strategies for fulfilling this vision include the following:

- Foundational research to fully exploit parallelism and concurrency through innovations in computational models and languages, mathematics and statistics, algorithms, compilers, operating and run-time systems, middleware, software tools, application frameworks, virtual machines, and advanced hardware.
- Applications research and development in use of high-end computing resources in partnerships with scientific domains, including new computational, mathematical and statistical modeling, simulation, visualization and analytic tools, aggressive domain-centric applications development, and deployment of scalable data management systems.
- Sustainable and innovative resources built, tested, and deployed into a collaborative ecosystem that encompasses integration/coordination with campus and regional systems, networks, cloud services, and/or data centers in partnerships with scientific domains.
- Comprehensive education and workforce programs, ranging in scope from programs designed to develop deep expertise in computational, mathematical and statistical simulation, modeling, and CDS&E to programs designed to enable an advanced technical workforce with career paths in science, academia, government, and industry.
- Transformational and grand challenge community programs that support contemporary complex problem-solving by engaging a comprehensive and integrated approach to science, utilizing high-end computing, data, networking, facilities, software, and multidisciplinary expertise across research communities, other government agencies, and international partnerships.

While support for larger and more complex multiscale, multiphysics simulations are encompassed in these strategies, NSF perceives that an opportunity exists for expanded discovery and economic impact with this comprehensive approach to advanced computing.

In 2013, NSF initiated a two-year National Academy of Science study to examine anticipated priorities and possible decision-making frameworks for NSF in the implementation of its computing strategy in the 2017 – 2020 timeframe. The committee has been recently charged and named. An interim report may be available in late calendar year 2014.

NSF's Assistant Director of the Directorate for Computer and Information Science and Engineering (CISE) is co-chair of the Networking and Information Technology Research and Development (NITRD) Subcommittee of the National Science and Technology Council's Committee on Technology. NSF works in close collaboration with other science-supporting agencies through the NITRD High End Computing (HEC) Interagency Working Group.

Questions for the Record Submitted by
Adam B. Schiff

Hispanic-Serving Institutions Program

As you know, the America COMPETES Act of 2007 authorized an NSF program to support Hispanic-Serving Institutions (HSIs). Despite language in the reauthorization of America COMPETES Act of 2010 directing the NSF to maintain support for each of its existing programs for minority-serving institutions -- including HSIs – an HSI-specific program has not yet been established. In both FY 2013 and 2014, the Committee weighed in on the issue and asked the NSF to report back on plans to establish an HSI-focused program and how existing and planned efforts will meet the specific needs of HSIs through NSF's other programs. Subsequently, the NSF reported on the logistical difficulties of establishing and managing such an initiative and then "proposed a multi-pronged approach... to meet the needs of HSIs by building on prior efforts and focusing on efforts to build capacity, especially in community colleges... including opportunities to increase the participation, retention, and graduation of Hispanics in STEM". While programs dedicated to Historically-Black Colleges and Universities (HBCUs) and Tribal-Serving Institutions (TSIs) have been in place at the NSF for over a decade, Hispanic-Serving Institutions (HSIs) remain one of the most crucial cohorts of minority-serving institutions yet to receive targeted NSF infrastructure development funding in the areas of science, technology, engineering, and math. Recognizing that NSF funding to HBCUs and TSIs have proven essential to the demonstrated success of strengthening STEM initiatives at these institutions and assisting in preparing a strong STEM workforce in a time of utmost need, it would be remiss for us not to continue encouraging and working with the NSF to assist HSIs as well.

Question 1. Can you elaborate on the logistical difficulties of establishing and managing a dedicated HSI program at the NSF, and explain why, in light of the existing program models for other minority-serving institutions that the NSF has managed for over ten years, these difficulties could or could not be overcome?

Answer: In FY 2013, NSF funds awarded to Hispanic-Serving Institutions (HSIs) totaled $155.65 million through 332 awards. NSF support to HSIs continues to be strong and exceeds the combined total of $104.52 million for Historically Black Colleges and Universities (HBCUs) and Tribal Colleges and Universities (TCUs). While there are about 105 HBCUs and 30-35 TCUs, in 2010-2013 there were 370 HSIs (defined as institutions with 25 percent or more total undergraduate Hispanic full-time equivalent student enrollment), with an additional 277 "emerging HSIs" (defined as institutions with 15-24 percent undergraduate full-time equivalent Hispanic enrollment). These 370 institutions of higher education are very heterogeneous, including small community colleges, four-year primarily undergraduate institutions, and large research-intensive universities, all with different missions. The range of available STEM programs within these diverse institutions is quite wide. Crafting a single program, comparable to NSF's dedicated programs for HBCUs and TCUs, which has the potential for national scale and serves such a variety of institutions presents a logistical, programmatic, and financial challenge, particularly as the numbers of HSIs are increasing rapidly.

Question 2. Can you update the Committee on the progress of the NSF's proposed initiatives to meet the needs of HSIs that the Foundation committed to undertaking in its

August 2013 report to the Committee? In particular, how has the NSF proceeded to assist STEM initiatives in community colleges?

Answer: In the August 2013 response to Congress, NSF indicated a desire to implement a comprehensive approach to address the needs of HSIs including Dear Colleague Letters (DCLs) that focus on undergraduate education and/or express a commitment to broadening participation of underrepresented groups, engaging HSI community colleges, and creating opportunities for capacity building in HSIs. NSF has developed two DCLs to complement the letter (NSF 12-081) issued in FY 2012, which is still active.[6]

One of the new DCLs encourages HSIs, especially community colleges, to build research capacity through special grant opportunities including Early Concept Grants for Exploratory Research (EAGER) and Conferences, Symposia, and Workshops that focus on evidence-based practices that have been shown to be particularly effective for students at HSIs, as well as exploratory research that may lead to new models and best practices.[7] Examples of appropriate topics include:

- Understanding factors that will lead to improved retention of students in STEM programs at two-year HSIs.
- Understanding barriers and challenges that prevent the transfer of students at two-year HSIs to four-year colleges; understanding factors that promote the transfer of students including articulation agreements.
- Improving the quality of STEM undergraduate academic and research experiences at two-year HSIs.
- Research on strategies that enhance interest and motivation of students and improve persistence and graduation rates in undergraduate STEM programs at HSIs through innovations in STEM curricula, instructional materials, and research experiences.
- Building capacity at HSIs through collaborations with majority institutions that support faculty research, professional development, and mentoring.

The second DCL encourages current awardees, including HSIs, to apply for supplemental funding to active awards for the purpose of increasing the matriculation of graduates of two-year HSIs to four-year institutions while strengthening strategies for retention in STEM majors, such as providing research experiences for first and second-year undergraduates.[8]

These activities complement ongoing programmatic efforts, which resulted in 46 awards to HSIs in 2013 through several EHR programs including Advanced Technological Education, Louis Stokes Alliances for Minority Participation, and the Robert Noyce Scholarship Program.

Question 3. Has the NSF considered the possibility of creating, or at the very least beginning outlining a plan to create, an HSI-focused program in FY 2015 and to what extent has this been discussed?

Answer: NSF is developing plans to invest in approaches to improve STEM learning for all students, at all levels, including the rapidly growing number of Hispanic students in K-12 settings. NSF continues to explore strategies to increase funding for innovative approaches to improving STEM education at HSIs, especially two-year institutions. More than half of HSIs are two-year institutions. More than half of all undergraduates attend two-year institutions; however,

[6] www.nsf.gov/pubs/2012/nsf12081/nsf12081.jsp
[7] www.nsf.gov/pubs/2014/nsf14064/nsf14064.jsp
[8] www.nsf.gov/pubs/2014/nsf14065/nsf14065.jsp

relatively few Hispanic students who begin college at two-year institutions continue on to earn baccalaureate degrees, particularly in STEM. NSF is aiming to identify the factors that will facilitate the transfer of students from two-year to four-year institutions prepared to enter STEM majors. For FY 2015, discussions are underway to build on the Dear Colleague Letters issued in FY 2014 and to identify options for tracks within existing programs targeting HSI community colleges and critical junctures (high school to college, two-year to four-year institutions). These activities provide the foundation for future efforts designed to build capacity and improve undergraduate education at these institutions. Evaluation of the effectiveness of the DCLs and expanded program tracks will inform future efforts and directions regarding HSIs.

The Honorable Susan M. Collins
Full Appropriations Hearing on Innovation in the FY 2015 Budget Request
Questions for the Record

(*Director Cordova*) Director Cordova, the Experimental Program to Stimulate Competitive Research (EPSCoR), which is administered by NASA, the Department of Energy, and your organization, the National Science Foundation, has played a critical role in helping to advance our nation's research infrastructure and integrated STEM workforce development efforts.

In my state, EPSCoR is housed at the University of Maine at Orono, but the funding has facilitated collaboration among institutions statewide and has enabled colleges, universities, and researchers to forge partnerships with private, non-profit, and governmental sectors.

NSF EPSCoR grants have been particularly beneficial to Maine. For example, in 2006, Maine ESPCoR received NSF seed funding to initiate a Forest Bioproducts Research Institute with the goal of creating and commercializing wood bioproducts while maintaining forest health. Before long, industry recognized the great R&D work that the FBRI was conducting and forged a technology transfer partnership—resulting in major private capital investments and the establishment of a full-fledged research institute and technology center. The FBRI has brought over $3.5 million in new capital equipment to Maine and produced 11 patents. Perhaps more important, however, than the development of new technologies is the development of a STEM-ready workforce.

The public-private partnerships between the FBRI and industry have supported more than 100 graduate, undergraduate, and high school research internships, and integrated more than 5,000 students into its STEM outreach activities.

What role do you see EPSCoR playing in helping states to develop self-sustaining academic research enterprises that not only produce new technologies but also prepare students for employment in STEM fields?

Sen. Tom Udall
Questions for the record
Senate Committee on Appropriations
Hearing on "Driving Innovation through Federal Investments"
April 29, 2014

Questions for Dr. France Cordova (National Science Foundation)

1. NRAO and radio astronomy in New Mexico (NSF)
Dr. Cordova, NSF plays a key role in supporting astronomy and STEM education activities at National Radio Astronomy Observatory (NRAO) facilities in Socorro, New Mexico. NRAO enables research into the birthplaces of stars and planets, super-massive black holes, gravitational waves, chemical precursors of life, and the remnant heat of the Big Bang. How is the NSF leveraging federal investments in NRAO and other scientific facilities to foster innovation?

2. NSF investments in international radio astronomy facilities
The Federal government is investing in ground-breaking international facilities such as the Atacama Large Millimeter/submillimeter Array in Chile. How is NSF ensuring that these investments leverage and contribute to our critical domestic science facilities?

3. NSF radio astronomy and solar observatories role in promoting STEM education
Dr. Cordova, we share a keen interest in attracting young American students to STEM fields and encouraging greater participation in STEM career fields. Given that astronomy is a field that often sparks a lifelong interest in science, how is NSF using federal research facilities such as those of the NRAO in Socorro, New Mexico and the National Solar Observatory (NSO) near Alamogordo, New Mexico to help foster a new generation of young scientists?

4. Impact of budget cuts and budget uncertainty on American scientific capabilities
Could you describe how recent budget cuts, budget uncertainty, and the recent government shutdown have impacted American researchers and scientific facilities, such as the NRAO and NSO observatories in New Mexico? How does this impact the retention of core US scientific capabilities?

5. Spectrum sharing and radio astronomy
How is NSF working with the Department of Commerce, the Federal Communications Commission and others to ensure that efforts to increase commercial access to radio spectrum for mobile broadband and other uses do not prevent the ability of radio astronomers to continue to make observations from NRAO facilities?

6. Leveraging commercial spaceflight investments to promote scientific research and STEM activities
New Mexico is home to some exciting research and STEM activities that take advantage of suborbital space launches. Test flights have already begun at Spaceport America for commercial reusable suborbital vehicles that could dramatically increase access to microgravity environments for scientific research. I have heard from scientists from New Mexico and across the country who eagerly anticipate doing more experiments at lower cost in microgravity and space environments thanks to America's burgeoning commercial spaceflight industry. This includes research relevant to numerous fields as well

as studying the upper parts of Earth's atmosphere itself. These upper parts of the Earth's atmosphere are currently so inaccessible--and so little understood--that scientists sometimes refer to it as the "ignorosphere." What plans does NSF have to support scientific research that takes advantage of access to suborbital space to advance the frontiers of science and technology? How can NSF encourage more researchers to take advantage of such opportunities as they become more widely available through commercial suborbital spaceflights?

7. National Solar Observatory site in New Mexico

New Mexico is home to the National Solar Observatory's Richard B. Dunn Solar Telescope (DST). Located on Sacramento Peak near Alamogordo, this telescope has revealed many intricacies of the surface features of the Sun. DST has also served as a test bed for adaptive optics technologies and the next generation of solar instrumentation. Yet my understanding is that the National Science Foundation is developing a plan to potentially close this facility by the time the new Daniel K. Inouye Solar Telescope (DKIST) in Hawaii becomes operational. I have serious concerns about a potentially costly closure of DST given the value of continuing to operate this telescope facility for scientific research and training purposes, even after the newer DKIST facility becomes operational.

- Will you assure me that NSF will keep me apprised of any plans regarding the future of the National Solar Observatory's Richard B. Dunn Solar Telescope?
- Before NSF decides to divest from or close DST, will you seek to find suitable entities willing and able to continue operating the facility?

8. Behavioral and social sciences funding

Many challenges facing society ranging from pollution to violence are often related to human behavior. Given the importance of studying human behavior, what implications do you see for the proposed cuts to NSF funding for the behavioral and social sciences?

9. Support for Hispanic Serving Institutions

The America Competes Act authorized the NSF "to establish a new program to award grants on a competitive, merit-reviewed basis to Hispanic Serving Institutions (HSIs) to enhance the quality of undergraduate STEM education at such institutions, and to increase the retention and graduation rates of students pursuing associate's or baccalaureate degrees in STEM." My understanding is that NSF did not submit a proposal to create such a program and has even expressed its intent to never fund this initiative. Why is it so difficult for the NSF to create an initiative focused on HSIs within its Directorate for Education and Human Resources?

UNITED STATES SENATE
COMMITTEE ON APPROPRIATIONS
Hearing on
Driving Innovation through Federal Investments
April 29, 2014
Dr. France Córdova, Director, National Science Foundation

Questions for the Record Submitted by Sen. Tom Udall

NRAO AND RADIO ASTRONOMY IN NEW MEXICO

Question 1: Dr. Cordova, NSF plays a key role in supporting astronomy and STEM education activities at National Radio Astronomy Observatory (NRAO) facilities in Socorro, New Mexico. NRAO enables research into the birthplaces of stars and planets, super-massive black holes, gravitational waves, chemical precursors of life, and the remnant heat of the Big Bang. How is the NSF leveraging federal investments in NRAO and other scientific facilities to foster innovation?

Answer: Investments in these facilities foster innovation, first and foremost, by providing tools for frontier scientific inquiry by thousands of U.S. scientists each year. Working at the frontier provides training opportunities for young students, postdocs, and early-career faculty to develop their scientific and technical careers, renewing the capabilities of young STEM professionals in the U.S. Over the longer term, technical advances in areas such as low-noise radio receivers, advanced data-analysis and big data techniques (such as the extraction of signals from noisy data sets), and application of adaptive optics are likely to lead to innovative uses of such technologies in the broader society.

NSF INVESTMENTS IN INTERNATIONAL RADIO ASTRONOMY FACILITIES

Question 2: The Federal government is investing in ground-breaking international facilities such as the Atacama Large Millimeter/submillimeter Array in Chile. How is NSF ensuring that these investments leverage and contribute to our critical domestic science facilities?

Answer: The U.S. science community that employs the Atacama Large Millimeter/ submillimeter Array (ALMA) for observations is conducting its research through the work of hundreds of investigators located at institutions within the United States; the actual location of the Observatory is critical for these scientists to acquire the best data to achieve the goals of their scientific investigations, but their research is largely conducted at their home institutions in the United States. A number of the ALMA technologies are common with those of the Karl J. Jansky Very Large Array (VLA) in New Mexico, so shared scientific and technical personnel simultaneously contribute to the success of both VLA and ALMA.

NSF RADIO ASTRONOMY AND SOLAR OBSERVATORIES ROLE IN PROMOTING STEM EDUCATION

Question 3: Dr. Cordova, we share a keen interest in attracting young American students to STEM fields and encouraging greater participation in STEM career fields. Given that astronomy is a field that often sparks a lifelong interest in science, how is NSF using federal research facilities such as those of the NRAO in Socorro, New Mexico and the

National Solar Observatory (NSO) near Alamogordo, New Mexico to help foster a new generation of young scientists?

Answer: The National Radio Astronomy Observatory (NRAO) and the National Solar Observatory (NSO) support observation by a large number of students, often in conjunction with their advisors at their home institutions; the tools at the national facilities provide these students with forefront data that are not available through any other observatories. For decades, these national facilities also have hosted independently funded NSF Research Experiences for Undergraduates (REU) programs. NSO partners in an award via NSF's Partnerships in Astronomy and Astrophysics Research and Education (PAARE) program; PAARE seeks to enhance training of individuals from institutions that focus on the teaching of under-represented groups. Finally, both of the mentioned NRAO and NSO sites have active visitor centers that support both formal and informal science education programs.

IMPACT OF BUDGET CUTS AND BUDGET UNCERTAINTY ON AMERICAN SCIENTIFIC CAPABILITIES

Question 4: Could you describe how recent budget cuts, budget uncertainty, and the recent government shutdown have impacted American researchers and scientific facilities, such as the NRAO and NSO observatories in New Mexico? How does this impact the retention of core US scientific capabilities?

Answer: Budget uncertainty and constraints are a challenge to all American researchers and scientific facilities. Budgets are always limited, of course, and this limits the number of facilities that can support researchers and necessitates difficult choices within the portfolio of existing and future facilities. Development and construction of new scientific facilities at the forefront of the field is an outstanding way to attract talented young Americans into astronomy, thus ensuring the retention of core US scientific capabilities. For example, development of the Atacama Large Millimeter/submillimeter Array (ALMA) and the Daniel K. Inouye Solar Telescope (DKIST) are crucial to the retention of US leadership in radio astronomy and solar physics, respectively. Development and implementation of the Large Synoptic Survey Telescope (LSST) will provide an avenue for leadership in the scientific uses and exploration of "Big Data," in a way that has not been possible with any previous astronomical facility.

SPECTRUM SHARING AND RADIO ASTRONOMY

Question 5: How is NSF working with the Department of Commerce, the Federal Communications Commission and others to ensure that efforts to increase commercial access to radio spectrum for mobile broadband and other uses do not prevent the ability of radio astronomers to continue to make observations from NRAO facilities?

Answer: NSF is actively working with these agencies, generally through the National Telecommunications and Information Administration (NTIA), in order to satisfy the spectrum requirements of radio astronomy while also enabling societal use of the radio spectrum. Examples of current items in which NSF is engaged include the re-distribution of Channel 37 and television "white space" spectrum as well as the spectrum allocations for automobile radars.

LEVERAGING COMMERCIAL SPACEFLIGHT INVESTMENTS TO PROMOTE SCIENTIFIC RESEARCH AND STEM ACTIVITIES

Question 6: New Mexico is home to some exciting research and STEM activities that take advantage of suborbital space launches. Test flights have already begun at Spaceport America for commercial reusable suborbital vehicles that could dramatically increase access to microgravity environments for scientific research. I have heard from scientists from New Mexico and across the country who eagerly anticipate doing more experiments at lower cost in microgravity and space environments thanks to America's burgeoning commercial spaceflight industry. This includes research relevant to numerous fields as well as studying the upper parts of Earth's atmosphere itself. These upper parts of the Earth's atmosphere are currently so inaccessible--and so little understood--that scientists sometimes refer to it as the "ignorosphere." What plans does NSF have to support scientific research that takes advantage of access to suborbital space to advance the frontiers of science and technology? How can NSF encourage more researchers to take advantage of such opportunities as they become more widely available through commercial suborbital spaceflights?

Answer: NSF's Division of Atmospheric and Geospace Sciences (AGS) in the Directorate for Geosciences supports research on the lower thermosphere and mesosphere; regions sometimes referred to as the "ignorosphere." Presently, observations of this region of near Earth space are provided by high power radars and lidars, as well as NASA rocket-based experiments. AGS has also supported research using Cube-Sats, which are small low-cost observational satellites, typically with a volume of 1 liter (10 cm cube) and that are launched as secondary payloads on existing missions. When the cost and availability of suborbital vehicles is established, NSF expects to entertain proposals that use these additional tools for upper atmospheric studies.

The aeronomy community is well aware of this emerging opportunity to access suborbital space. To catalyze research interest, NSF cosponsored a workshop: "The End of the Ignorosphere: An Aeronomy Researcher's Conference on Commercial Suborbital Access to Space" in April 2013. In addition, this research community's largest annual workshop, which was attended by more than 300 scientists, featured a presentation on this opportunity last year in June.

NATIONAL SOLAR OBSERVATORY SITE IN NEW MEXICO

New Mexico is home to the National Solar Observatory's Richard B. Dunn Solar Telescope (DST). Located on Sacramento Peak near Alamogordo, this telescope has revealed many intricacies of the surface features of the Sun. DST has also served as a test bed for adaptive optics technologies and the next generation of solar instrumentation. Yet my understanding is that the National Science Foundation is developing a plan to potentially close this facility by the time the new Daniel K. Inouye Solar Telescope (DKIST) in Hawaii becomes operational. I have serious concerns about a potentially costly closure of DST given the value of continuing to operate this telescope facility for scientific research and training purposes, even after the newer DKIST facility becomes operational.

Question 7: Will you assure me that NSF will keep me apprised of any plans regarding the future of the National Solar Observatory's Richard B. Dunn Solar Telescope? Before NSF decides to divest from or close DST, will you seek to find suitable entities willing and able to continue operating the facility?

Answer: As mentioned in a previous response, the Daniel K. Inouye Solar Telescope (DKIST) is a critical component in retaining the core capabilities and leadership of the American solar physics community. The Richard B. Dunn Solar Telescope (DST) test-bed activities in adaptive optics and solar instrumentation have been aimed specifically at the development and implementation of DKIST, so one of the primary test-bed functions will be concluded upon the completion of DKIST construction. NSF and the personnel of the National Solar Observatory are actively seeking entities that are interested in the continuation of operations at Sacramento Peak.

NSF will keep the committee apprised of its plans for the future of the telescopes it currently supports.

BEHAVIORAL AND SOCIAL SCIENCES FUNDING

Question 8: Many challenges facing society ranging from pollution to violence are often related to human behavior. Given the importance of studying human behavior, what implications do you see for the proposed cuts to NSF funding for the behavioral and social sciences?

Answer: The proposed reductions to NSF's research funding for the social, behavioral, and economic (SBE) sciences will seriously affect the near- and long-term research agenda.

In 2013, the directorate sponsored a two-day workshop on "Youth Violence: What We Need to Know." This two-day workshop brought together researchers from sociology, anthropology, psychology, communications, computer science, information systems, and public policy to identify much of the existing scientific evidence regarding the precursors and causes of violence perpetrated by children and adolescents and underscored the need for additional study to enhance our understanding of the dynamics of, contributors to, and impact of violent ideology and violent acts. Just this April, U.S. Representative Ed Royce (R-CA), Chairman of the House Foreign Affairs Committee, held a hearing to examine how the education of women in countries prone to violent extremism can create economic opportunities and help counter the spread of radicalism. In his opening statement and drawing on examples in Pakistan, Chairman Royce noted the importance of the SBE sciences and their global reach:

> Studies have shown that women tend to invest more in their children than men, which is why increases in female income improve child survival rates some twenty times more than increases in male income. Women who can read also stand to benefit from the pamphlets distributed in public awareness campaigns, and have been shown to better understand radio broadcasts designed to keep them informed.[1]

Such studies, which examine deep relationships among gender and family dynamics, education, employment, political participation, and the roles of media and communications, are precisely the type of long term, interdisciplinary research that are at risk.

SBE's contributions to public health and safety, education, innovation, and the economy are well documented. Consider just a handful:

[1] http://foreignaffairs.house.gov/press-release/chairman-royce-convene-hearing-women-s-education-promoting-development-countering

- In 2012, Alvin Roth shared the Nobel Prize in Economic Sciences with Lloyd S. Shapely "for the theory of stable allocations and the practice of market design," which has had applications that range from matching compatible organ donors and recipients to matching medical students to residencies. NSF/SBE has supported his research since the late 1970s.
- Through the National Center for Geographic Information and Analysis at the University of California-Santa Barbara, NSF-funded researchers have developed transformative GIS technologies, embedded in large systems and handheld devices. NSF/SBE has supported this work since the late 1980s.
- Working with state, county, and city planners, SBE-funded researchers are modelling ways to allocate scarce water resources, implement new mosquito control systems, and decipher the social networks that both enable disease to spread and encourage vaccination programs.
- SBE-supported researchers provided the Federal Communications Commission (FCC) with its current system for apportioning the airwaves via a fruitful practical application of game theory and experimental economics. Since their inception in 1994, FCC "spectrum auctions" have netted over $60 billion in revenue for the federal government and have been emulated in several other countries.
- NSF-funded investigators are examining the development of political protests in the Ukraine and elsewhere, focusing on ways that social media allows for "leaderless" protests. These findings have been reported in several outlets including CNN, Voice of America, and Huffington Post.

These examples, which provide clear value to the Nation, are based on research sustained over decades, but it is the innovation pipeline to the future that is most threatened. Early results in the psychological sciences suggest ways that experiences as a child, whether learning to speak another language or to play a musical instrument, affect cognitive capacity much later in life, which has profound implications for an aging population. Much more research is needed to establish robust connections and relevant recommendations for structuring work, retirement, and long term care for the elderly. Fundamental research in neuroscience extends to developmental issues, illness, and traumatic injury, and thus has broad implications for the disabled, many of whom are returning veterans. Global migration -- from poor countries to wealthy, from south to north, and from societies dominated by the young to those that are aging – threatens to overwhelm social organizations, distort labor markets, and destabilize political structures. Fluctuations in population combined with global climate change and its impacts on habitat, agriculture, trade and finance require more -- not less -- SBE analysis to tease out causality and identify points where interventions might be effective.

Responding to the nexus of aging, disability, retirement, and long term care or modeling population, environment, and behavior defies reduction to a single discipline and draws on research in a broad range of disciplines from neuroscience and psychology to economics, spatial sciences, and anthropology. Cutting funding for long term research in the SBE sciences now compromises the future.

SUPPORT FOR HISPANIC SERVING INSTITUTIONS

Question 9: The America Competes Act authorized the NSF "to establish a new program to award grants on a competitive, merit-reviewed basis to Hispanic Serving Institutions (HSIs) to enhance the quality of undergraduate STEM education at such institutions, and to increase the retention and graduation rates of students pursuing associate's or

baccalaureate degrees in STEM." My understanding is that NSF did not submit a proposal to create such a program and has even expressed its intent to never fund this initiative. Why is it so difficult for the NSF to create an initiative focused on HSIs within its Directorate for Education and Human Resources?

Answer: In FY 2013, NSF funds awarded to Hispanic-Serving Institutions (HSIs) totaled $155.65 million through 332 awards. NSF support to HSIs continues to be strong and exceeds the combined total of $104.52 million for Historically Black Colleges and Universities (HBCUs) and Tribal Colleges and Universities (TCUs). While there are about 105 HBCUs and 30-35 TCUs, in 2010-2013 there were 370 HSIs (defined as institutions with 25 percent or more total undergraduate Hispanic full-time equivalent student enrollment), with an additional 277 "emerging HSIs" (defined as institutions with 15-24 percent undergraduate full-time equivalent Hispanic enrollment). These 370 institutions of higher education are very heterogeneous, including small community colleges, four-year primarily undergraduate institutions, and large research-intensive universities, all with different missions. The range of available STEM programs within these diverse institutions is quite wide. Crafting a single program, comparable to NSF's dedicated programs for HBCUs and TCUs, which has the potential for national scale and serves such a variety of institutions presents a logistical, programmatic, and financial challenge, particularly as the numbers of HSIs are increasing rapidly.

Questions for the Record Submitted by the Honorable Susan M. Collins

THE EXPERIMENTAL PROGRAM TO STIMULATE COMPETITIVE RESEARCH (EPSCOR)

Director Cordova, the Experimental Program to Stimulate Competitive Research (EPSCoR), which is administered by NASA, the Department of Energy, and your organization, the National Science Foundation, has played a critical role in helping to advance our nation's research infrastructure and integrated STEM workforce development efforts.

In my state, EPSCoR is housed at the University of Maine at Orono, but the funding has facilitated collaboration among institutions statewide and has enabled colleges, universities, and researchers to forge partnerships with private, non-profit, and governmental sectors.

NSF EPSCoR grants have been particularly beneficial to Maine. For example, in 2006, Maine EPSCoR received NSF seed funding to initiate a Forest Bioproducts Research Institute with the goal of creating and commercializing wood bioproducts while maintaining forest health. Before long, industry recognized the great R&D work that the FBRI was conducting and forged a technology transfer partnership—resulting in major private capital investments and the establishment of a full-fledged research institute and technology center. The FBRI has brought over $3.5 million in new capital equipment to Maine and produced 11 patents. Perhaps more important, however, than the development of new technologies is the development of a STEM-ready workforce.

The public-private partnerships between the FBRI and industry have supported more than 100 graduate, undergraduate, and high school research internships, and integrated more than 5,000 students into its STEM outreach activities.

Question 1: What role do you see EPSCoR playing in helping states to develop self-sustaining academic research enterprises that not only produce new technologies but also prepare students for employment in STEM fields?

Answer: EPSCoR stimulates research that is fully competitive in the disciplinary and multidisciplinary research programs of the National Science Foundation. Specific EPSCoR objectives are: (1) to catalyze key research themes that empower knowledge generation, dissemination, and application; (2) to activate effective jurisdictional and regional collaborations that advance scientific research, promote innovation, and benefit society; (3) to broaden participation in science, engineering, and education by institutions, organizations, and people within EPSCoR jurisdictions; and (4) to use EPSCoR for development, implementation, and evaluation of future programmatic experiments that inform programmatic enhancement and new initiatives.

For FY 2013, NSF EPSCoR's Research Infrastructure Improvement (RII) Track-1 awards supported 1,535 faculty members who produced 679 publications based on research funded primarily through their RII Track-1 projects. Primary support is defined as research that is directly funded by EPSCoR. These researchers also produced 1,254 publications that were partially funded by EPSCoR. Partial support is defined as use of equipment or facilities that are funded by EPSCoR. Moreover, RII Track-1 researchers leveraged their EPSCoR support and were awarded 654 grants for a total of $259.5 million in FY 2013. Funding sources include

NSF, other federal agencies, foundations, and state agencies. Also, 12 patents were awarded based on RII discoveries and 55 patents are pending.

Moreover, with regard to workforce development, student engagement is an important part of EPSCoR RII Track-1 projects. In FY 2013, for example, these projects supported 1,383 graduate and 1,955 undergraduate students, of which 43 percent were female, 15 percent underrepresented minorities, and 1 percent disabled. A total of 305 graduate students completed degrees (41 percent female, 11 percent underrepresented minorities and one person with a disability). In addition, 825 undergraduate students graduated (30 percent female, 12 percent underrepresented minorities, and two persons with disabilities).

An example of how these investments prepare students for employment is South Dakota, where research, education, and economic development partnerships involving 200 different companies have created 773 industry and university internships for students; 32 percent of which have resulted in full-time job offers for the interns.

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

OFFICE OF THE
DIRECTOR

March 27, 2014

The Honorable Lamar Smith
Chairman
Committee on Science, Space, and Technology
U.S. House of Representatives
Washington, DC 20515

Dear Chairman Smith:

Over the course of the past year, we have had a number of productive discussions on the topics of NSF grant transparency and the importance to this nation of responsible stewardship of taxpayer dollars. I have appreciated the opportunity to work alongside you exploring ways to improve how NSF supports research and education.

From the hearing held by your Committee earlier this week, I learned from your opening statement that you believe "NSF refused to provide a response" to a request you made last year for the scientific review and analysis supporting five grants. I was surprised to hear this, since I believed NSF had in good faith offered to arrange a briefing for the Committee. Specifically, my May 15, 2013 letter stated:

> "Mr. Chairman, given the overarching confidentiality and privacy concerns associated with your request, and the potentially harmful effects such a disclosure may have on our reviewer community and our merit review system, I am hopeful that there might be another way to better help the Committee understand how NSF makes decisions to approve and fund grants short of the approach outlined in your letter. For example, I would be pleased to arrange a briefing for the Committee on the robust nature of our processes and accountability of the merit review system and provide general information on the grants in question, in order to assist this effort."

Through this offer, NSF was willing to provide you the basic information you requested without violating reviewer confidentiality or sacrificing the credibility of our merit review process. Furthermore, in subsequent conversations between us, I understood that you were no longer interested in pursuing the information you had previously requested regarding those grants.

If you are indeed still interested in this information, my offer still stands. Can we find a mutually agreeable way to provide the information that you are looking for while also protecting reviewer confidentiality?

I sincerely hope we can meet to discuss how best to resolve this issue, and that I can continue to demonstrate to you the ways that NSF is a dynamic organization constantly seeking to improve its transparency and accountability to the public.

Sincerely,

Cora B. Marrett

Cora B. Marrett
Acting Director

cc:
Ranking Member Eddie Bernice Johnson
Dr. Dan Arvizu
Dr. John Holdren

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

2321 RAYBURN HOUSE OFFICE BUILDING

WASHINGTON, DC 20515-6301

(202) 225-6371
www.science.house.gov

April 7, 2014

The Honorable France Cordova
Director, National Science Foundation
4201 Wilson Blvd
Arlington, VA 22230

Dear Dr. Cordova,

Congress' authority to obtain information from federal agencies is broad. The Supreme Court has established that such broad power is necessary for the legislative function, including oversight and investigations. In *McGrain v. Dougherty*, the Supreme Court described the power of inquiry, with the accompanying process to enforce it, as "an essential and appropriate auxiliary to the legislative process." In *Eastland v. United States Serviceman's Fund*, the Court stated that the "scope of its power of inquiry ... is as penetrating and far-reaching as the potential power to enact and appropriate under the Constitution."

I am requesting paper copies of the following public records: every e-mail, letter, memorandum, record, note, text message, all peer reviews considered for selection and recommendations made by the research panel to the National Science Foundation (NSF), or document of any kind that pertains to the NSF's consideration and approval of the grants listed below, including any approved amendments to the grants:

- 3/4/13 Award #1010974, The Great Immensity, Awarded Amount $697,177. NSF Program: Division of Research on Learning in Formal and Informal Settings

- 8/25/2010 Award #1247824, Picturing Animals in National Geographic, 1888-2008. Awarded Amount $227,437. NSF Program: Division of Social and Economic Science

- 11/22/14 Award #1154738, Culture, Change and Chronic Stress in Lowland Bolivia, Awarded Amount $19,684. NSF Program: Division of Behavioral and Cognitive Science

- 8/16/2009 Award # 0917732, Collaborative Research: the Kalavasos and Maroni Built Environments Project. Investigating Social Transformation in Late Bronze Age Cyprus, Awarded Amount $107,570. NSF Program: Archeology

- 10/1/2010 Award # 1011801, CNH: Does Community-Based Rangeland Ecosystem Management Increase the Resilience of Coupled Systems to Climate Change in Mongolia? Awarded Amount $1,499,718. NSF Program: DYN Coupled Natural-Human, Collaborative Research

- 3/15/2011 Award # 1060807, The Reciprocal Dynamics of Family Transformation Through International Marriage Migration, Awarded Amount $147,460. NSF Program: Cultural Anthropology

- 6/21/11 Award # 1115361, The Prehistory of Chiapas, Mexico, Awarded Amount $276,586. NSF Program: Archeology

- 9/21/2012 Award # 1024413, Ecosystem Resilience to Human Impacts: Ecological Consequences of Early Human-Set Fires in New Zealand, Awarded Amount $339,958. NSF Program: Geology and Spatial Science, Collaborative Research

- 7/10/2013 Award # 1313688, An Analysis of Disturbance Interactions and Ecosystem Resilience in the Northern Forest of New England, Awarded Amount $235,494. NSF Program: DYN Coupled Natural-Human

- 8/13/2013 Award #1026143, Transnational Adoptees and Migrants: From Peru to Spain, Awarded Amount $246,454. NSF Program: Cultural Anthropology

- 7/21/2009 Award #0928339, Human Control of Bicycle Dynamics with Experimental Validation and Implications for Bike Handling and Design, Awarded Amount: $300,000. NSF Program: Division of Civil, Mechanical and Manufacturing Innovation

- 8/7/2007, Award #0722825 and 0723986, The Veiling-Fashion Industry: Transnational Geographies of Islamism, Capitalism, and Identity, Awarded Amount: $199,088. NSF Program: Division of Behavioral and Cognitive Sciences

- 7/28/2006, Award #0550605 1023067, After the JD III: The Trajectories of Legal Careers, Awarded Amount: $735,228. NSF Program: Division of Social and Eonomic Sciences

- 9/26/2010, Award #1024674, Metallurgical Practice, Technology and Social Organization during the Middle to Late Bronze Age in the Southern Urals, Russia, Awarded Amount: $134,354. NSF Program: Division of Behavioral and Cognitive Sciences

- 5/30/2012 Award #1023167, Rags to Riches: An Archaeological Study of Textiles and Gender in Iceland, AD 874 -1800, Awarded Amount: $487,049. NSF Program: Division of Polar Programs

- 8/21/2013 Award #1303898, Weaving Islands of Cloth: Gender, Textiles, and Trade Across the North Atlantic from the Viking Age to the Early Modern Period, Awarded Amount: $217,957. NSF Program: Division of Polar Programs

- 11/16/2011 Award #0909289, The Study of Social Impacts of Tourism in Finnmark, Norway, Awarded Amount: $275,139. NSF Program: Division of Polar Programs.

- 4/23/2008 Award #0747522, Automated Support for Novice Authoring of Interactive Drama, Awarded Amount: $516,000. NSF Program: Division of Information and Intelligent Systems

- 9/16/2005 Award #0524539, Constructal Theory of Social Dynamics, Awarded Amount: $79,988. NSF Program: Division of Social and Economic Dynamics

- 5/6/2010 Award #0947787, Izapa Regional Settlement Project, Awarded Amount: $280,558. NSF Program: Division of Behavioral and Cognitive Sciences

I would appreciate if the information described above could be forwarded to me as soon as possible. If your staff has any questions, please contact Cliff Shannon, Staff Director of the committee's Research and Technology Subcommittee at Cliff.Shannon@mail.house.gov or 202.226.9783.

Sincerely,

Lamar

Lamar Smith

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

OFFICE OF THE
DIRECTOR

MAY 0 1 2014

The Honorable Lamar Smith
Chairman
Committee on Science, Space and Technology
U.S. House of Representatives
Washington, DC 20515

Dear Chairman Smith:

Thank you for your April 7, 2014 letter requesting paper copies of public records for 20 National Science Foundation (NSF) grants.

We are pleased to provide the Committee with the public records for two of the awards as a template for compiling the remainder of your request. It took approximately 26 hours of NSF staff time to gather and review the documentation for one grant. We estimate that it would take about 18 weeks to complete this review process for the other 18 grants, including the determination of specific material that may be commercial or proprietary. Therefore, before we proceed to complete your request for the balance of the grants, we would like to ensure this material satisfies your interest. The publicly available records we are providing include the proposal, correspondence, fact-based documents, and post-decisional documents, redacted as appropriate to protect the confidentiality of the reviewers and proprietary information.

To further your understanding of our decision process, we are also willing to provide access to NSF's review analyses, which represent the syntheses of individual peer reviews, for all 20 grants. These documents are pre-decisional, deliberative process documents that would not be made available to the public. To help NSF preserve its ability to protect these pre-decisional documents from future disclosure and to further protect the confidentiality of the review process, we would ask you or a senior staff member to examine these documents at the NSF. I would plan to be present during this review to answer any questions.

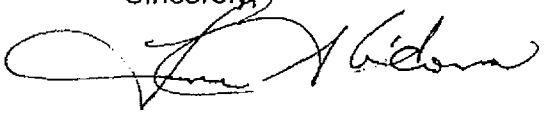
I would also like to update you on our efforts to accelerate our progress in response to your interest and our commitment to continuous process improvement regarding transparency and accountability. The Transparency and Accountability Working Group established last December has completed its efforts to ascertain best practices and identify needed policy updates to document new procedures.

As of May 1, all of our Assistant Directors have implemented new measures of accountability to enhance their responsibility for the proposals awarded funded through their directorates, as well as the alignment of investment decisions to the national interest. Furthermore, we are working with NSF program staff to strengthen the communication clarity of funding justifications in research grant abstracts made available to the public. Finally, I have appointed Dr. Peter Arzberger within the Office of the Director as the permanent leader for this activity to ensure continued focus and consistency across the Foundation, to evaluate our effectiveness and to be the point of contact for external concerns.

Dr. Arzberger was co-lead of the NSF Transparency and Accountability Working Group, which has produced a report "Strengthening Transparency and Accountability at the National Science Foundation: Policy and Practice Recommendations for a Path Forward." The report contains several recommendations that we will be implementing.

Mr. Chairman, I look forward to working with you and the Committee in supporting our nation's science and engineering enterprise and ensuring strong stewardship of the public trust. Please feel free to contact me directly at fcordova@nsf.gov or (703)292-8000, if you have any questions, or ask your staff to follow up with Judy Gan, Head of our Office of Legislative and Public Affairs, at jgan@nsf.gov or (703)292-8070.

Sincerely,



France A. Córdova
Director

Enclosures

CC: Ranking Member Eddie Bernice Johnson
The Honorable Dan Arvizu
The Honorable John P. Holdren

United States Senate

COMMITTEE ON COMMERCE, SCIENCE,
AND TRANSPORTATION

WASHINGTON, DC 20510-6125

WEB SITE: http://commerce.senate.gov

May 12, 2014

The Honorable France A. Córdova
Director, National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Dear Dr. Córdova:

As of April 8, 2014, Microsoft has stopped providing free support, including service updates to mitigate potential security vulnerabilities, for Windows XP. We are concerned because, according to news sources, despite the security risks of running outdated and unsupported software, an estimated 10 percent of federal government computers are still running Windows XP, leaving agency systems vulnerable to hackers and cybercriminals.[1] While costly custom agreements with Microsoft to provide continued support may be an option for some users, the continued use of Windows XP with or without custom support comes at a hefty price – both for taxpayers and for the security posture of the federal government.

The Chair of the Internet Security and Privacy Advisory Board in March 2012 wrote to then Acting Director of the Office of Management and Budget Jeffrey Zients, expressing concern with the government's reliance on such systems, stating, "[c]ontinuing to use XP after [the end of support on April 8, 2014] will magnify security risks and associated mitigation costs, considerably."[2] The Board made the recommendation that the government phase out outdated operating systems, which the Board believed "...would have a significant positive impact on the cyber security posture of Federal agencies, and would demonstrate security leadership by example from the government." The President's Council of Advisors on Science and Technology made a similar recommendation in 2013 to phase out unsupported and insecure operating systems, such as Windows XP.[3]

The National Science Foundation Fiscal Year 2013 Federal Information Security Management Act (FISMA) report identified several assets that at the time of the report were

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[1] Craig Timberg & Ellen Nakashima, *Government computers running Windows XP will be vulnerable to hackers after April 8*, WASH. POST, Mar. 16, 2014, http://www.washingtonpost.com/business/technology/government-computers-running-windows-xp-will-be-vulnerable-to-hackers-after-april-8/2014/03/16/9a9c8c7c-a553-11e3-a5fa-55f0c77bf39c_story.html.

[2] Letter from Daniel Chenok, Chair, ISPAB to Jeffrey Zients, Acting Director, U.S. Office of Management and Budget (Mar. 30, 2012) *available at* http://csrc.nist.gov/groups/SMA/ispab/documents/correspondence/ispab-ltr-to-omb_outdated-os.pdf.

[3] PRESIDENT'S COUNCIL OF ADVISORS ON SCI. & TECH., REPORT TO THE PRESIDENT IMMEDIATE OPPORTUNITIES FOR STRENGTHENING THE NATION'S CYBERSECURITY (2013).

running on a version of Windows XP.[4] Given the likely security risks of continuing to use unsupported operating systems, we ask that you provide answers to the following questions to assure us that the National Science Foundation and its offices and directorates are making every effort to prioritize the security of federal systems and information.

1. Does the National Science Foundation currently own or use any systems, operated by or on behalf of the federal government, running on an unsupported operating system or software such as Windows XP? If so, for each of the Federal Information Processing Standard Publication 199 categorized impact levels for systems (High, Moderate, and Low), what is the total number of systems running on unsupported operating systems at the agency (including each office or sub-component)?

2. The National Institute of Standards and Technology (NIST) recommends as part of the security controls for federal systems that agencies replace unsupported system components and provide "justification and documents approval for the continued use of unsupported system components required to satisfy mission/business needs."[5] If the agency or any office is continuing the use of operating systems and software that no longer receive support, what analysis led to that decision and did the organization follow the NIST recommendation for providing justification and documents approval? Who was involved or consulted in this decision making?

3. Does each office continuing to run unsupported operating systems such as Windows XP have custom support agreements for such systems? If so, please provide documentation of such agreements, including expectations, security requirements, duration, and total dollar amount.

4. Please provide any agency plans regarding the use of or transition from unsupported operating systems, such as Windows XP, including, the timeline for transition, associated costs of a transition, including a cost-benefit analysis, and an explanation of how the agency secures systems running unsupported operating systems during the transition to newer operating systems in order to manage any associated risks and vulnerabilities. If, within the past year, the agency or any office has made a transition from unsupported operating systems, such as Windows XP, please provide similar information regarding that transition.

5. Describe whether resource limitations have hampered efforts by the agency to phase out unsupported and insecure operating systems, such as Windows XP.

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[4] U.S. NAT'L SCI. FOUND., FY 2013 ANNUAL FISMA REPORT: CHIEF INFORMATION OFFICER SECTION REPORT, at 3 (2013).

[5] U.S. DEP'T OF COMMERCE, NAT'L INST. OF STANDARDS & TECH., SPECIAL PUBLICATION 800-53 SECURITY AND PRIVACY CONTROLS FOR FEDERAL INFORMATION SYSTEMS AND ORGANIZATIONS, System and Services Acquisition-22 at F-182 (2013).

Thank you for your prompt attention to this matter. We would appreciate receiving your response to this matter by June 6, 2014. If you have any questions, please contact Cheri Pascoe with the Minority Committee staff at (202) 224-1251 or Meeran Ahn with the Majority Committee staff at (202) 224-1300.

Sincerely,

John D. Rockefeller IV
Chairman

John Thune
Ranking Member

cc: Amy Northcutt
Chief Information Officer
National Science Foundation

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

June 1, 2014

OFFICE OF THE
DIRECTOR

The Honorable John Thune
Ranking Member
Committee on Commerce, Science and Transportation
United States Senate
Washington, DC 20510

Dear Senator Thune:

I am writing in response to your May 12, 2014 letter to the National Science Foundation (NSF) regarding the use of Windows XP systems within the agency.

NSF is familiar with the recommendations of the Internet Security and Privacy Advisory Board (ISPAB) and the President's Council of Advisors on Science and Technology, cited in your letter, regarding the risks posed by continued use of Windows XP and other operating systems once they are out of support. The following sections describe NSF's current use of Windows XP, in response to your specific questions.

1. Does the National Science Foundation currently own or use any systems, operated by or on behalf of the federal government, running on an unsupported operating system or software such as Windows XP? If so, for each of the Federal Information Processing Standard Publication 199 categorized impact levels for systems (High, Moderate, and Low), what is the total number of systems running on unsupported operating systems at the agency?

As cited in your letter, NSF's Fiscal Year 2013 Federal Information Security Management Act (FISMA) report identified several assets running a version of Windows XP. At the time of our report, which was submitted to the Office of Management and Budget (OMB) on December 2, 2013, NSF had 98 Windows XP machines in use.

95 of the Windows XP machines in use at the time of the agency's annual FISMA reporting were upgraded to the Windows 7 operating system or decommissioned prior to the April 8, 2014 end of support date for Windows XP.

At present, NSF has three machines running Windows XP in use within the agency. NSF has not assigned a Federal Information Processing Standard Publication (FIPS) 199 impact level to these individual machines, as they do not individually or collectively constitute an information system requiring designation of an impact level.

NSF's FY13 FISMA report also identified 88 machines running Mac OS X version 10.6 (Snow Leopard). Apple does not typically announce end-of-support dates for its operating systems, but it stopped providing patches for the Snow Leopard operating system on February 25, 2014. Since December 2013, NSF has decommissioned or upgraded all machines that were previously running Snow Leopard.

2. The National Institute of Standards and Technology (NIST) recommends as part of the security controls for federal systems that agencies replace unsupported system components and provide "justification and documents approval for the continued use of unsupported system components required to satisfy mission/business needs." If the agency or any office is continuing the use of operating systems and software that no longer receive support, what analysis led to that decision and did the organization follow the NIST recommendation for providing justification and documents approval? Who was involved or consulted in this decision making?

With the continued operation of the three Windows XP systems still in use at the agency, NSF has followed NIST recommendations for providing justification and documenting approval. As part of the migration planning activities associated with NSF's move from Windows XP, NSF established a plan to upgrade or replace the Windows XP machines. When NSF identified the need for continued use of three Windows XP machines past Microsoft's end-of-support date, the agency's Chief Information Security Officer (CISO) implemented a plan to mitigate the risk of continued Windows XP use, and ensured that the appropriate approvals were obtained.

The three Windows XP machines are print controllers managed by NSF's internal print shop to provide quick printing and copying services to agency staff. NSF's CISO and the NSF information technology (IT) security staff have isolated the three Windows XP machines from the internal NSF network and to prevent them from accessing external sources that could introduce threats. Access to the print controllers is tightly managed and monitored; only one print server, the print shop manager's workstation, and the NSF security scanners can connect to these machines. As an additional protection, internet access from these machines has been disconnected; although these machines would not normally be used for internet access, this provides an added layer of security from potential threats. Finally, NSF has documented an acceptance of risk (AoR) for continued use of the Windows XP machines.

In keeping with NSF's policies regarding AoR documentation and approval, NSF's Chief Information Security Officer consulted with other agency officials, NSF infrastructure staff and the machine owners to appropriately document and obtain approval for the AoR approach. The AoR for the three Windows XP systems is valid for one year; at this time NSF is evaluating potential approaches to migrate its print controller services to another platform.

3. Does each office continuing to run unsupported operating systems such as Windows XP have custom support agreements for such systems? If so, please provide documentation of such agreements, including expectations, security requirements, duration, and total dollar amount.

NSF is able to use standard support agreements for machine-related issues not specific to the Windows XP operating system. The agency is aware that Microsoft offers custom operating system support for Windows XP systems; we do not currently have such an agreement with Microsoft, but we have the ability to enter into it if needed. We understand that executing such an agreement would

involve a set enrollment fee to enter the program, plus a flat support fee per device per year, and specific dollar amount charges per machine to perform security hotfix support.

4. Please provide any agency plans regarding the use of or transition from unsupported operating systems, such as Windows XP, including the timeline for transition, associated costs of a transition, including a cost-benefit analysis, and an explanation of how the agency secures systems running unsupported operating systems during the transition to newer operating systems in order to manage any associated risks and vulnerabilities. If, within the past year, the agency or any office has made a transition from unsupported operating systems, such as Windows XP, please provide similar information regarding that transition.

NSF strives to limit the number of unsupported operating systems in use at the Foundation. NSF's transition planning and execution activities involve a partnership between the agency's IT security, infrastructure, and customer support teams, and include regular management reporting as well as the use of automated inventories to assess and track transition status.

NSF plans to transition the three remaining Windows XP machines to newer operating systems within one year. The information provided in response to question 2 highlights the analysis that NSF conducted prior to determining that the Windows XP machines could remain in operation after the April 2014 end-of-support date, and addresses the mechanisms used to mitigate risk while the machines continue to operate.

5. Describe whether resource limitations have hampered efforts by the agency to phase out unsupported and insecure operating systems, such as Windows XP.

Resources are one consideration in NSF's phase-out plans for legacy operating systems, but NSF develops transition plans with many factors in mind. Additional factors that are considered in the decision to phase out unsupported operating systems include an assessment of agency risk, the availability of replacement technology, the availability of third-party support, and the ability to apply mitigating factors (e.g., isolating potentially vulnerable machines from broader agency network access). NSF strives to be proactive with regard to planning for and conducting transition planning for end-of-life systems; for example, NSF's migrations from the Windows XP operating system started more than two years before the Microsoft end-of-support date.

In closing, I'd like to assure you that NSF is committed to maintaining the integrity of agency systems and data. The agency places a high priority on cybersecurity efforts, including the mitigation of risk associated with the use of legacy operating systems.

Thank you for your interest in NSF. Please do not hesitate to contact me if you require any additional information.

Sincerely,

France A. Córdova
Director

Identical letter to: The Honorable John D. Rockefeller IV, Chairman

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

June 1, 2014

OFFICE OF THE DIRECTOR

The Honorable John D. Rockefeller IV
Chairman
Committee on Commerce, Science and Transportation
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

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NSF strives to limit the number of unsupported operating systems in use at the Foundation. NSF's transition planning and execution activities involve a partnership between the agency's IT security, infrastructure, and customer support teams, and include regular management reporting as well as the use of automated inventories to assess and track transition status.

NSF plans to transition the three remaining Windows XP machines to newer operating systems within one year. The information provided in response to question 2 highlights the analysis that NSF conducted prior to determining that the Windows XP machines could remain in operation after the April 2014 end-of-support date, and addresses the mechanisms used to mitigate risk while the machines continue to operate.

5. Describe whether resource limitations have hampered efforts by the agency to phase out unsupported and insecure operating systems, such as Windows XP.

Resources are one consideration in NSF's phase-out plans for legacy operating systems, but NSF develops transition plans with many factors in mind. Additional factors that are considered in the decision to phase out unsupported operating systems include an assessment of agency risk, the availability of replacement technology, the availability of third-party support, and the ability to apply mitigating factors (e.g., isolating potentially vulnerable machines from broader agency network access). NSF strives to be proactive with regard to planning for and conducting transition planning for end-of-life systems; for example, NSF's migrations from the Windows XP operating system started more than two years before the Microsoft end-of-support date.

In closing, I'd like to assure you that NSF is committed to maintaining the integrity of agency systems and data. The agency places a high priority on cybersecurity efforts, including the mitigation of risk associated with the use of legacy operating systems.

Thank you for your interest in NSF. Please do not hesitate to contact me if you require any additional information.

Sincerely,

France A. Córdova
Director

Identical letter to: The Honorable John Thune, Ranking Member

Mason, David

From: Jester, Julia
Sent: Tuesday, December 09, 2014 10:49 AM
To: Gibson, Anthony J; Pearce, Karen; Canfield, Neil; Macklin, Sheila V.
Subject: FW: Follow-up to May letter from Ranking Member Thune and Chairman Rockefeller

---

From: Jester, Julia
Sent: Tuesday, December 09, 2014 10:48 AM
To: 'Pascoe, Cherilyn (Commerce)'
Cc: Ahn, Meeran (Commerce); Seidel, Rebecca (Commerce)
Subject: RE: Follow-up to May letter from Ranking Member Thune and Chairman Rockefeller

Hi Cheri,

Regarding the update to our June 1, 2014 response pertaining to the use of unsupported operating systems within the Foundation:

- The Foundation has upgraded or decommissioned the three Windows XP systems that were still operational at the time of our June response. NSF has no remaining Windows XP systems in use within the agency.

- At the present time, we have five agency servers running Solaris 9, which reached end of support on October 30, 2014. This is down from 18 Solaris 9 systems, as identified in NSF's FY14 Federal Information Security Management Act (FISMA) report. We have a documented acceptance of risk for continued use of the five remaining Solaris 9 systems, and will upgrade or decommission these systems within six months.

- As described in our June 2014 response, NSF strives to limit the number of unsupported operating systems in use at the Foundation. We continue to take a proactive approach to transition planning for agency systems that are approaching their end of support date. When NSF must maintain a device past the vendor's end-of-support date, our security, infrastructure, and customer support teams work closely together to document risk mitigation strategies while we work to upgrade or decommission the impacted devices.

I hope this answers your questions – please let me know if you need anything further.

Thanks,

-Julia

From: Pascoe, Cherilyn (Commerce) [mailto:Cherilyn_Pascoe@commerce.senate.gov]
Sent: Wednesday, December 03, 2014 5:02 PM
To: Jester, Julia
Cc: Ahn, Meeran (Commerce); Seidel, Rebecca (Commerce)
Subject: Follow-up to May letter from Ranking Member Thune and Chairman Rockefeller

Hi Julia –

With the end of the year approaching, we wanted to circle back for an update on the agency's efforts on the use of unsupported operating systems since Ranking Member Thune and Chairman Rockefeller sent their May 12,

2014 letter. The agency's response letter on June 1, 2014 identified that the agency at the time of the letter had three devices running Windows XP. Since the date of the agency's response letter, has the agency transitioned any systems/devices it owns or uses running unsupported operating systems, including Windows XP? What is the total current number of systems/devices running on unsupported operating systems?

We look forward to receiving a prompt response. Similar requests have gone out to all agencies that received this letter. Please don't hesitate to contact us if you have any questions.

Thanks,
Cheri

Cherilyn (Cheri) Pascoe
Professional Staff Member and Investigator
Senator John Thune
U.S. Senate Committee on Commerce, Science, and Transportation
560 Dirksen Senate Office Building
Washington, DC 20510
(202) 224-1251

11829

Congress of the United States
House of Representatives
Committee on Appropriations
Washington, DC 20515–6015

May 22, 2014

The Honorable France Córdova
Director
National Science Foundation
4201 Wilson Blvd., Suite 1205N
Arlington, VA 22230

Dear Dr. Córdova:

As you are probably aware, the Commerce, Justice, Science (CJS) and Related Agencies Appropriations Act for fiscal year 2015 will be considered by the House of Representatives next week. I expect that the debate on this measure will once again include a discussion of the value and relative priority of individual National Science Foundation (NSF) grants.

The fiscal year 2015 CJS bill provides a significant funding increase to NSF, bringing the agency's total budget to a record-high $7.4 billion. With this increased funding, however, must come increased responsibility to ensure that all Federal funds are being used efficiently and effectively. NSF must take every necessary step to ensure that its grants are scientifically meritorious and aligned to national needs, and the purpose and value of each grant must be communicated to the Congress and the public in a clear, easily understood manner.

I understand that the agency recently defined some actions to take in order to increase accountability and transparency in its grant decision making. Those steps include improving the quality of award titles and abstracts so that they more clearly reflect what is being funded and why, as well as the institution of new management review processes to ensure that funding decisions at the individual grant level and the broader portfolio level reflect national priorities and interests.

These are positive steps, and I encourage you to fully and aggressively implement them and any other measures that you believe will strengthen accountability and transparency in NSF operations. I also urge you to emphasize to all NSF employees the critical importance of these measures. Every time a grant is awarded that is—or even just appears to be—frivolous, wasteful or low priority, it becomes more difficult to justify and sustain funding for the important work of the Foundation. I don't want to see that happen, and I know that you don't, either.

Please remain in regular touch with the Subcommittee on this issue. An open line of communication between our offices will be both necessary and useful as you continue to implement improvements.

Sincerely,

Frank R. Wolf
Chairman
House Subcommittee on Commerce,
Justice, Science and Related Agencies

THIS IS IMPORTANT. SINCE THE FUNDING FOR NSF IS AT A RECORD HIGH TO ENSURE AMERICA REMAINS THE LEADER, NSF MUST BE JUDICIOUS IN THE GRANTS IT AWARDS TO ENSURE THAT TAXPAYER INVESTMENT IN THE SCIENCES IS BEING USED WISELY.

THANK YOU.

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

May 23, 2014

OFFICE OF THE
DIRECTOR

Dear Chairman Wolf:

Thank you very much for your letter to me last night. I greatly appreciate the confidence that you have placed in the National Science Foundation and its mission.

As you and I have discussed, the Foundation takes very seriously our stewardship of taxpayer dollars, and our accountability for those resources. That is why, as you referenced in your letter, we are implementing a Transparency and Accountability Initiative that will further ensure the research investments we make are in the national interest, represent wise stewardship of the taxpayer dollars, and reflect our commitment to transparency and accountability.

I am proud of the Foundation and the people that work here, and deeply honored to be its Director. As we work through these difficult financial times, I know that NSF will continue to expand the frontiers of knowledge and yield significant returns to the U.S. economy and society.

I value your committed leadership to strengthening our nation's science and engineering enterprise. We will strive to ensure that your trust in the Foundation and its mission is well placed. Please feel free to call on me at any time.

Sincerely,

France Córdova

cc: Dan Arvizu, Chairman, National Science Board

11891

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States

House of Representatives

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

2321 RAYBURN HOUSE OFFICE BUILDING

WASHINGTON, DC 20515–6301

(202) 225–6371
www.science.house.gov

July 28, 2014

The Honorable France A. Córdova
Director
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Dear Dr. Córdova,

Please provide all records (as defined by attachment A) related to the selection, procurement, and construction of the new National Science Foundation headquarters, including, but not limited to: the General Services Administration (GSA) space review; the GSA market survey; the GSA "space needs" assessment; the review of available options; the Request for Proposals to developers and the responses submitted by developers; the prospectus submitted to Congress; and budget estimates produced throughout the process. The attachment sets forth the standard scope of information requested by the Committee on Science, Space, and Technology when conducting oversight in the Committee's jurisdiction. Please adhere to the relevant aspects of the attachment in compiling information to respond to this request.

Please provide the requested materials by Monday, August 11, 2014. If you have any questions related to this inquiry, please contact Mr. Cliff Shannon, Staff Director, Subcommittee on Research and Technology at 202-225-6371.

Sincerely,

Lamar Smith
Chairman

ATTACHMENT A

1. The term "records" is to be construed in the broadest sense and shall mean any written or graphic material, however produced or reproduced, of any kind or description, consisting of the original and any non-identical copy (whether different from the original because of notes made on or attached to such copy or otherwise) and drafts and both sides thereof, whether printed or recorded electronically or magnetically or stored in any type of data bank, including, but not limited to, the following: correspondence, memoranda, records, summaries of personal conversations or interviews, minutes or records of meetings or conferences, opinions or reports of consultants, projections, statistical statements, drafts, contracts, agreements, purchase orders, invoices, confirmations, telegraphs, telexes, agendas, books, notes, pamphlets, periodicals, reports, studies, evaluations, opinions, logs, diaries, desk calendars, appointment books, tape recordings, video recordings, e-mails, voice mails, computer tapes, or other computer stored matter, magnetic tapes, microfilm, microfiche, punch cards, all other records kept by electronic, photographic, or mechanical means, charts, photographs, notebooks, drawings, plans, inter-office communications, intra-office and intra-departmental communications, transcripts, checks and canceled checks, bank statements, ledgers, books, records or statements of accounts, and papers and things similar to any of the foregoing, however denominated.

2. The terms "relating," "relate," or "regarding" as to any given subject means anything that constitutes, contains, embodies, identifies, deals with, or is in any manner whatsoever pertinent to that subject, including but not limited to records concerning the preparation of other records.

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

OFFICE OF THE
DEPUTY DIRECTOR

August 21, 2014

The Honorable Lamar Smith
Chairman
Committee on Science, Space and Technology
U.S. House of Representatives
Washington, D.C. 20515

Dear Chairman Smith:

In response to your request to NSF Director Córdova for information regarding the National Science Foundation (NSF) relocation to a new headquarters facility in Alexandria, Va., we are providing the documents responsive to your request. Today the Committee will receive approximately 20,000 documents, which include the NSF Headquarters relocation project office files. Also included is a portion of the project director's email correspondence; we are continuing to collect the remainder of this email correspondence and will provide it as it becomes available.

These documents may contain source selection information related to the conduct of a Federal Agency procurement, the disclosure of which is restricted by Section 27 of the Federal Procurement Policy Act (41 U.S.C. 423), as well as "sensitive but unclassified" information. It is our understanding from the General Services Administration (GSA) that the unauthorized disclosure of source selection information may subject both the discloser and recipient of the information to contractual, civil, and/or criminal penalties as provided by law. NSF anticipates that the Committee will appropriately dispose of this material when its review is completed.

Please note that other documents relevant to the Committee's request are likely retained by GSA, which is responsible for the lease on behalf of the government. We have made GSA aware of your interest, and we would recommend that you contact them for information that may be responsive to your request.

Sincerely,

Cora B. Marrett

Cora B. Marrett
Deputy Director

Cc Ranking Member Eddie Bernice Johnson
Dr. Dan Arvizu, National Science Board Chairman

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

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WASHINGTON, DC 20515-6301

(202) 225-6371
www.science.house.gov

July 28, 2014

The Honorable France A. Córdova
Director
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Dear Dr. Córdova,

I regret that you do not acknowledge the Committee's authority to receive information from the National Science Foundation. Supreme Court decisions have repeatedly upheld Congress' broad power to obtain information from federal agencies. In *Eastland v. United States Serviceman's Fund*, for instance, the Court asserted that the "scope of [Congressional] power of inquiry … is as penetrating and far-reaching as the potential power to enact and appropriate under the Constitution."

NSF spends more than $7 billion per year of taxpayer funds. Unimpeded Congressional access to official information is required by Congress for appropriate oversight. Such oversight is impossible if an agency of the federal government unilaterally determines to limit the information that it furnishes to Congress, and permits review of official documents only at its offices and under NSF staff supervision. This is legally unsupportable. It is also an affront to taxpayers. In the strongest terms, I urge you to reconsider your decision.

In spite of your improper withholding of information, the Committee intends to press forward as best as it can with carrying out its oversight responsibilities. When Committee staff members were allowed limited, supervised access to information requested in my April 7, 2014 letter, the brief period of time allotted to review project files did not allow much information to be absorbed. Nevertheless, a few initial impressions were made:

- Project jackets are organized consistently, but the amount and detail of information in individual jackets varies widely. A few jackets contain fairly detailed information about how reviewers evaluated both funded and competing proposals. But other project jackets contained almost no information about the peer review process that resulted in taxpayer funding.

- Reviewers' written comments varied significantly, from reviewer to reviewer and from project to project. There no minutes or notes of discussions among external reviewers and NSF staff. Some reviewers' comments were detailed and substantive. Other reviewers' written comments were just one or two paragraphs, providing little or no insight into their views of the scientific merits and potential value of proposals.
- In one case, the documents in a project jacket featured an NSF notification to an applicant that relatively low competitive standing would not permit funding of a proposal. But the proposal was funded, and the project jacket yielded no additional information – about reconsidered reviews, additional availability of funds, or merits of competing unfunded proposals.

Committee staff members will be contacting your staff soon in order to arrange for additional document review. Among the material they will seek to inspect: (a) grant applications that competed with the 20 projects identified in my April 7, 2014 letters; (b) reviewer and NSF staff written evaluations of these competing grants; and (c) the competitive rankings of all of these grant applications.

Sincerely,

Lamar Smith

Lamar Smith
Chairman

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

OFFICE OF THE
DEPUTY DIRECTOR

August 21, 2014

The Honorable Lamar Smith
Chairman
Committee on Science, Space and Technology
U.S. House of Representatives
Washington, D.C. 20515

Dear Chairman Smith:

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Please note that other documents relevant to the Committee's request are likely retained by GSA, which is responsible for the lease on behalf of the government. We have made GSA aware of your interest, and we would recommend that you contact them for information that may be responsive to your request.

Sincerely,

Cora B. Marrett

Cora B. Marrett
Deputy Director

Cc Ranking Member Eddie Bernice Johnson
Dr. Dan Arvizu, National Science Board Chairman

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives

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August 28, 2014

Dr. Pramod P. Khargonekar
Assistant Director
Directorate of Engineering
National Science Foundation
4201 Wilson Blvd.
Arlington, VA 22230

Dear Dr. Khargonekar,

On behalf of the Subcommittee on Research and Technology, I want to express my appreciation for your participation in the July 29, 2014 hearing titled, "A Review of the National Earthquake Hazards Reduction Program."

I have attached a verbatim electronic transcript of the hearing for your review. The Committee's rule pertaining to the printing of transcripts is as follows:

> *The transcripts of those hearings conducted by the Committee and Subcommittees shall be published as a substantially verbatim account of remarks actually made during the proceedings, subject only to technical, grammatical, and typographical corrections authorized by the person making the remarks involved.*

Transcript edits, if any, should be submitted no later than September 11, 2014. If no edits are received by the above date, I will presume that you have no suggested edits to the transcript.

I am also enclosing questions submitted for the record by Members of the Committee. These are questions that the Members were unable to pursue during the time allotted at the hearing, but felt were important to address as part of the official record. Responses to the enclosed questions must be received no later than September 11, 2014.

All transcript edits should be submitted to me and directed to the attention of Christian Rice at Christian.Rice@mail.house.gov. If you have any further questions or concerns, please contact Mr. Rice at 202.225.6371.

Thank you again for your testimony.

Sincerely,

Larry Bucshon
Chairman
Subcommittee on Research
and Technology

cc: Rep. Dan Lipinski
Ranking Member
Subcommittee on Research and Technology

Enclosures: Transcript

HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY

"A Review of the National Earthquake Hazards Reduction Program"

Dr. Pramod P. Khargonekar, Assistant Director, Directorate of Engineering, National Science Foundation

Question submitted by Rep. Larry Bucshon, Chairman, Subcommittee on Research and Technology

1. Following-up on my question during the hearing, please provide a list of the research and development being supported through NEHRP related to lifelines in a seismic event.

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

September 9, 2014

OFFICE OF THE DIRECTOR

The Honorable Lamar Smith
Chairman
Committee on Science, Space and Technology
U.S. House of Representatives
Washington, D.C. 20515

Dear Chairman Smith,

Thank you for your August 27, 2014 letter regarding the availability of NSF grant information for the House Science Committee.

As I have expressed to you in person and in several letters over the last four months, NSF fully recognizes, appreciates and acknowledges the Committee's jurisdictional authority and oversight responsibilities. For example, we recently delivered 31 packages of material including over 27,000 documents to the Committee in response to your request for information regarding the NSF headquarters relocation.

With respect to your request for documents concerning 20 NSF-funded grants, your letter suggests that we have been withholding information from the Committee. To the contrary, NSF has provided the Committee full and complete access to our files for each of the grants of interest, providing *in camera* review by Committee staff at NSF with the only redactions being the deletion of reviewer names, per our agreement. I have not been made aware of any indication of inappropriate actions or misapplication of our procedures during these document reviews. Any variability in the documents produced is due to program officers' approaches to administrative record keeping – not any purposeful removal of data, as your letter seems to suggest. Also, it is my understanding that we have been accommodating of your staff's schedule and their availability for review of this information, as well as for the Committee's recent additional request for documentation regarding competing, non-funded proposals. I visited with Committee staff during one of the recent review sessions, and I can attest that the Committee staff members received the appropriate information they sought.

Your letter asserts that NSF does not trust the Committee, yet the agency has provided unprecedented and complete access to Committee staff for the requested information. As I have previously mentioned, we are balancing this access with the need to preserve the trust of the scientific community whose participation in the merit review process occurs in a confidential environment. Proposers and reviewers alike rely on the understanding that their comments, evaluations, intellectual property and other proprietary information will be safeguarded. An *in camera* review protects the integrity of the expert peer review process.

In camera inspection is a time-honored and well-accepted accommodation for Congressional review of agency documentation. It is a practice that has been accepted by many different Administrations and Congresses. This approach, I believe, best supports our mutual interests. It provides full access to requested information to enable Congressional oversight. And it preserves the expectation of confidentiality by the scientific community who engage in the merit review process and the undeniable benefits of that process for the American people. Finally, this *in camera* process of providing the Committee with highly confidential material and Privacy Act protected information helps mitigate any unfounded and unreasonable allegations of political interference with the merit review process, a point I know you also feel very strongly about. Indeed, by keeping the grant material in house, we are helping to ensure that the process remains apolitical.

I assure you that accountability to Congress and the taxpayers is of paramount importance to me. NSF's Congressional charter requires us to "promote the progress of science." The integrity of the merit review process, which has served the nation well for over 60 years, is essential to this mission. As you are aware, the Foundation has taken significant steps over the last year to strengthen this process even further, including ensuring greater transparency and documenting accountability for our investment decisions. These efforts have included new processes for accountability within all of our research directorates, the establishment of a position within the Office of the Director to ensure continued focus and consistency, community awareness, and training for NSF program staff on clearer and more transparent justifications for funding decisions. For example, as of May 1, we have implemented new processes to ensure that titles and abstracts more clearly convey the potential societal impact of the funded research to the public.

NSF welcomes suggestions from the Committee and others for continuous improvement of our merit review process. I am also available to answer any specific questions about the merit review process or any other NSF matters. I will continue to make documents available for *in camera* review at NSF for as long as the Committee needs in order to conduct its review and oversight.

Mr. Chairman, I am eager to meet with you to discuss these issues at your convenience.

Sincerely,

France A. Córdova
Director

Cc: Ranking Member Eddie Bernice Johnson
Dr. Dan Arvizu, National Science Board Chairman

1921

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

September 15, 2014

OFFICE OF THE DIRECTOR

The Honorable Lamar Smith
Chairman
Committee on Science, Space and Technology
U.S. House of Representatives
Washington, D.C. 20515

Dear Chairman Smith,

Thank you for your September 11, 2014 letter requesting paper copies of records for 30 NSF grants.

I will be pleased to provide the information responsive to your request for *in camera* review at NSF. We will start to collect these documents immediately and would plan to provide the first few files for the Committee's examination by September 22, with the balance completed by October 1. As before, we will redact reviewers' names and any personally identifiable information. I have asked Judy Gan, Head of our Office for Legislative and Public Affairs, to coordinate this review with Committee staff. She can be reached at jgan@nsf.gov or (703)292-8070.

Sincerely,

France A. Córdova
Director

Cc: Ranking Member Eddie Bernice Johnson
Dr. Dan Arvizu, National Science Board Chairman

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

2321 RAYBURN HOUSE OFFICE BUILDING

WASHINGTON, DC 20515-6301

(202) 225-6371
www.science.house.gov

September 11, 2014

The Honorable France Cordova
Director, National Science Foundation
4201 Wilson Blvd
Arlington, VA 22230

Dear Dr. Cordova,

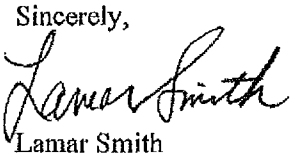
I request paper copies of the following public records: every e-mail, letter, memorandum, record, note, text message, all peer reviews considered for selection and recommendations made by the research panel to the National Science Foundation (NSF), or document of any kind that pertains to the NSF's consideration and approval of the grants listed below, including any approved amendments to the grants:

- Comparative Histories of Scientific Conservation: Nature, Science, and Society in Patagonian and Amazonian South America
- Regulating Accountability and Transparency in China's Dairy Industry
- Does Community-Based Rangeland Ecosystem Management Increase the Resilience of Coupled Systems to Climate Change in Mongolia?
- Izapa Regional Settlement Project
- CAREER: A Political Approach to Rural Sanitation in India
- Life History Transitions among the Toba in Northern Argentina
- Ancient Mayan Wooden Architecture and the Salt Industry
- Bronze Age Village Life and Landscape Dynamics at Politiko-Troullia, Cyprus
- Ecosystem Resilience to Human Impacts: Ecological Consequences of Early Human-Set Fires in New Zealand
- How Marginalized Populations Self-Organize with Digital Tools: Ethnographic Case Studies in Africa and China
- Metallurgical Practice, Technology and Social Organization During the Middle to Late Bronze Age in the Southern Urals, Russia
- Kinship, Women's Labor and China's Economic Performance in the 17th – 21st Centuries
- Ethnic Boundaries and Cultural Change in an Amazonian Population
- Oppression and Mental Health in Nepal
- A History of the Impact of Euro-American Linguistic Technologies on Chinese Information Infrastructure
- An Ethnoarcheological and Archeological Study of the Gamo Caste System in Southwestern Ethiopia
- Investigating the Operation of and Reaction to the Public Vehicle Registry in Mexico

- Climate Change Narrative Game Education
- CRPA: How Do We Learn the Fate of Tropical Forests Under Climate Change? A Multimedia Exhibition of Photographic Art Portraying Scientists and Students at Work in Amazonia
- The Change
- Hotspot California: Bringing Dioramas to Life Through Community Voices
- Crowd Sourcing Apprenticeship Learning: LawMeets – A Web Platform for Teaching Entrepreneurial Lawyering
- Productive Play: The Convergence of Play and Labor in Online Games and Virtual Worlds
- Communicating Climate Change
- Cultural Dynamics and Overlapping Interaction Spheres in the Marmara Lake Basin, Western Turkey
- A Linguistic Ethnography of the Global Trade in Indigenous Plants
- Polar Learning and Responding: POLAR Climate Partnership (I and II)
- Culture, Change and Chronic Stress in Lowland Bolivia
- Legal Mobilization of Enslaved Litigants: Ecclesiastical versus Civil Lawsuits
- Phonelab: A Programmable Participatory Smartphone Testbed

Please make this information available to me by Monday, September 22. If you or your staff have any questions, please contact Cliff Shannon, Staff Director of the Research and Technology Subcommittee at Cliff.Shannon@mail.house.gov or 202.226.9783.

Sincerely,



Lamar Smith
Chairman
Committee on Science, Space,
and Technology

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives

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October 29, 2014

The Honorable France Cordova
Director, National Science Foundation
4201 Wilson Blvd
Arlington, VA 22230

Dear Dr. Cordova,

I request paper copies of the following public records: every e-mail, letter, memorandum, record, note, text message, all peer reviews considered for selection and recommendations made by the research panel to the National Science Foundation (NSF), or document of any kind that pertains to the NSF's consideration and approval of the grants listed below, including any approved amendments to the grants:

- ANIMA (Accelerometer Network Integrator for Mobile Animals), a New Instrument Package for Integrating Behavior, Physiology and Ecology of Wild Mammals (Award #0963022)
- Effect of Self-Control on Antisocial and Prosocial Behavior (Award #1104118)
- CAREER: Flexible control of reward based decisions (Award #1253576)
- Collaborative Research: Turbulence and Suspension Feeding - a New Approach using the Lobate Ctenophore Mnemiopsis Leidyi (Award #1061268)
- RAPID: When Pride Becomes Shame: Organizational Identification and Self-Presentation During Scandal (Award #1260929)
- CCEP-II: Polar Learning and Responding: PoLAR Climate Change Education Partnership (Award #1239783)
- Participant Support for the Zero Emissions Category of the Clean Snowmobile Challenge (Award #1062619)
- Collaborative Research: EvalFest (Evaluation Use, Value and Learning through Festivals of Science and Technology) (Award #1423050)
- Collaborative Research: Wikipedia and the Democratization of Academic Knowledge (Award #1322934)
- Collaborative Research: Wikipedia and the Democratization of Academic Knowledge (Award #1322971)
- Geoinformatics: Leveraging the Paleobiology Database for Research, Education, Mentorship, and Interoperability (Award #0949416)

If your staff has any questions, please contact Cliff Shannon, Staff Director of the Research and Technology Subcommittee, at Cliff.Shannon@mail.house.gov or 202.226.9783.

Sincerely,

Lamar Smith
Chairman

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

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October 29, 2014

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Director, National Science Foundation
4201 Wilson Blvd
Arlington, VA 22230

Dear Dr. Cordova,

I request paper copies of the following public records: every e-mail, letter, memorandum, record, note, text message, all peer reviews considered for selection and recommendations made by the research panel to the National Science Foundation (NSF), or document of any kind that pertains to the NSF's consideration and approval of the grants listed below, including any approved amendments to the grants:

- ANIMA (Accelerometer Network Integrator for Mobile Animals), a New Instrument Package for Integrating Behavior, Physiology and Ecology of Wild Mammals (Award #0963022)
- Effect of Self-Control on Antisocial and Prosocial Behavior (Award #1104118)
- CAREER: Flexible control of reward based decisions (Award #1253576)
- Collaborative Research: Turbulence and Suspension Feeding - a New Approach using the Lobate Ctenophore Mnemiopsis Leidyi (Award #1061268)
- RAPID: When Pride Becomes Shame: Organizational Identification and Self-Presentation During Scandal (Award #1260929)
- CCEP-II: Polar Learning and Responding: PoLAR Climate Change Education Partnership (Award #1239783)
- Participant Support for the Zero Emissions Category of the Clean Snowmobile Challenge (Award #1062619)
- Collaborative Research: EvalFest (Evaluation Use, Value and Learning through Festivals of Science and Technology) (Award #1423050)
- Collaborative Research: Wikipedia and the Democratization of Academic Knowledge (Award #1322934)
- Collaborative Research: Wikipedia and the Democratization of Academic Knowledge (Award #1322971)
- Geoinformatics: Leveraging the Paleobiology Database for Research, Education, Mentorship, and Interoperability (Award #0949416)

If your staff has any questions, please contact Cliff Shannon, Staff Director of the Research and Technology Subcommittee, at Cliff.Shannon@mail.house.gov or 202.226.9783.

Sincerely,

Lamar Smith
Chairman

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

November 19th, 2014

OFFICE OF THE
DIRECTOR

The Honorable Lamar Smith
Chairman
Committee on Science, Space and Technology
U.S. House of Representatives
Washington, D.C. 20515

Dear Chairman Smith,

Thank you for your November 10, 2014 letter detailing your request for information about NSF award #1101743, "ICES: Large: Meme Diffusion Through Mass Social Media."

With regards to your request, NSF will be happy to provide you with the applicable solicitation for proposals, as well as records pertaining to the development of the solicitation. Additionally, we will share with you NSF rules or official guidance, if any, that are provided to staff, external reviewers and grant applicants regarding the "use of taxpayer funds by NSF grantees that directly or indirectly supports political action or advocacy," per your request. This information will be delivered to your offices no later than November 28th.

Regarding the specific information requested associated with award #1101743, I will be pleased to provide the information responsive to your request for *in camera* review at NSF by November 28th. This information will include, per your request, a list of all proposals received in response to the solicitation, and whether the proposal was recommended for award and which received awards.

As before, we will redact reviewers' names and any personally identifiable information. I have asked Judy Gan, Head of our Office for Legislative and Public Affairs, to coordinate this review with Committee staff. She can be reached at jgan@nsf.gov or (703)292-8070.

Sincerely,

France A. Córdova
Director

Cc: Ranking Member Eddie Bernice Johnson
Dr. Dan Arvizu, National Science Board Chairman

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

2321 RAYBURN HOUSE OFFICE BUILDING

WASHINGTON, DC 20515–6301

(202) 225–6371
www.science.house.gov

November 10, 2014

The Honorable France Cordova
Director, National Science Foundation
4201 Wilson Blvd
Arlington, VA 22230

Dear Dr. Cordova:

I am concerned that a National Science Foundation (NSF)-approved grant, "ICES: Large Meme Diffusion Through Mass Social Media" (Award #1101743), was intended to create standards for online political discussion. According to the grant abstract published on the NSF website, the research team planned to:

> "… create a web service open to the public for monitoring trends, bursts, and suspicious memes. This service could mitigate the diffusion of false and misleading ideas, detect hate speech and subversive propaganda, and assist in the preservation of open debate."

The web service developed under the grant was named "Truthy," a term borrowed from political satirist Stephen Colbert. Truthy was used to target political messages and commentary connected to "Tea Party," "GOP" and "conservative."

While some have argued that Truthy *could be used* to better understand things like disaster communication or to assist law enforcement, instead it appears Truthy focused on examples of "false and misleading ideas, hate speech, and subversive propaganda" communicated by conservative groups. Whether by amazing coincidence or on purpose, it appears that several social media accounts that were highlighted by Truthy were subsequently terminated by the owners of the social media platforms, effectively muzzling the political free speech of the targeted individuals and groups.

In presenting and publishing the findings of their taxpayer-supported work, the research team proudly described how the web service targeted conservative social media messages. Their presentations featured examples of what they found to be online political speech "abuses" by supporters of these groups (e.g., "Abuse of Social Media and Political Manipulation"). The authors also alluded to instances in which they were aware that some of these individuals' social media accounts had been terminated.

It should be noted that there is significant and growing concern about the reluctance of owners of some social media platforms to limit or block free speech in any form, including threats to commit rape and murder. Against that backdrop, it would be truly shocking if NSF funds contributed to suppression of

online political speech. It is also of interest that at least one prominent federal official has called recently for the federal government to regulate and limit online political speech.

The Committee and taxpayers deserve to know how NSF decided to award a large grant for a project that proposed to develop standards for online political speech and to apply those standards through development of a website that targeted conservative political comments.

I request all information in the Foundation's possession about Award #1101743, "ICES: Large: Meme Diffusion Through Mass Social Media," a $919,917.00 grant made by the Foundation in July 2011. This information should include:

- The application submitted to the Foundation for the above project.

- The Foundation solicitation for proposals that elicited the application; every internal and external e-mail, letter, memorandum, record, note, text message or other document that pertains to development of the solicitation; and a list of all applications received in response to the solicitation. (Please denote applications which were recommended for awards and which received awards.)

- For the above project, every e-mail, letter, memorandum, record, note, text message, all peer reviews considered for selection and recommendations made by the research panel to NSF, or document of any kind that pertains to NSF's consideration and approval, including any approved amendments to the grants.

- The annual and final reports received by NSF for the above project, as well as any interim reports and every e-mail, letter, memorandum, record, note, text message or other document received or sent by NSF about the project during its active phase or subsequent to the project's completion.

- NSF rules and other official guidance provided to its staff, external reviewers and grant applicants regarding use of taxpayer funds by NSF grantees that directly or indirectly supports political action and advocacy.

I would appreciate if the information described above could be forwarded to me as soon as possible. If your staff has any questions, please contact Cliff Shannon, Staff Director of the committee's Research and Technology Subcommittee at Cliff.Shannon@mail.house.gov or 202.226.9783.

Sincerely,

Lamar Smith

Lamar Smith
Chairman

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

OFFICE OF THE
DIRECTOR

December 23, 2014

The Honorable Frank Wolf
Chairman
Subcommittee on Commerce, Justice,
Science and Related Agencies
Committee on Appropriations
United States House of Representatives
Washington, DC 20515

Dear Chairman Wolf:

As required in H. Rept. 113-71 accompanying H.R. 2787, the Commerce, Justice, Science, and Related Agencies Appropriations Act of 2014, I am pleased to provide this letter response to the Committee's request to report on "steps the Foundation is taking to better explain and communicate the impact and relevance of its research grants, both collectively and individually."

NSF takes very seriously its stewardship of taxpayer dollars, and its accountability for those resources. Wise stewardship of taxpayer dollars is necessary to maintain and ensure the public's trust for NSF's funding of fundamental scientific and engineering research, especially in an era of competing priorities for limited discretionary funds. NSF must continually review and strengthen its accountability and transparency in making investment decisions that support the public good.

In order to further build and sustain public trust, and as part of our ongoing commitment to seek opportunities to more effectively fulfill our mission, NSF leadership established a Transparency and Accountability Initiative in 2013. This Initiative was crafted after a review of our ongoing operations by NSF senior leadership, and in consultation with the National Science Board.

Our goals with the Transparency and Accountability Initiative are to ensure the research investments we make are in the national interest, represent wise stewardship of the taxpayer dollars, and reflect our commitment to transparency and accountability. Our approach reinforces the integrity of the merit review process. It will strengthen the management of that process through targeted actions at every level of the organization.

The Initiative is already strengthening NSF's alignment of individual investment decisions with the national interest, as defined by the NSF charter "to promote the progress of science; to advance the national health, prosperity and welfare; to secure the national defense..." in all facets of the merit review process through management reviews, clarified roles and responsibilities, training, and improved communications.

Since I joined NSF in April 2014, I have overseen implementation of many of these actions.

The Initiative has established and deployed training for Program Officers and other leadership and staff to ensure national interest always underlies funding recommendations and is well articulated in NSF guidelines for award abstracts made available to the public.

These efforts will engage the research community and general public through a campaign that clearly articulates NSF's mission and stewardship responsibility and highlights the requirement for alignment of grant proposals with the national interest as well as research portfolio objectives. To date, NSF has issued two Memorandums to Staff (see attached Memorandum O/D 13-26, and O/D 14-01). At a March 13, 2014 state of the agency meeting for staff, Acting Director Marrett explained and emphasized the Foundation's policy for accessible abstracts and reinforced leadership expectations for the initiative.

The two above referenced memorandums outlined the importance of NSF's responsibility to build and sustain public trust, and announced the establishment of the Transparency and Accountability Working Group (TAWG). The TAWG is composed of individuals from each of the research directorates. It is responsible for assisting in the implementation of the initiative, and reporting back to me on ways to strengthen the Foundation's communication of its funding on an individual award basis, and the larger context in which those decisions are made.

With the strong recognition that NSF cannot achieve new transparency and accountability goals by ourselves, Acting Director Marrett released two "Important Notices to Presidents of Universities and Colleges and other National Science Foundation Awardee Organizations" (see attached Notices No. 135 and 136) that alerted the community to our efforts. These notices called upon their assistance to engage the public in order to understand why their projects are worthy of taxpayer support. I will continue to engage and remind the community that they have an obligation to help achieve these goals as recipients of taxpayer funded support. In fact, at the November 2014 National Science Board meeting, in open session, I shared the progress NSF has made to date on transparency and accountability. I plan to communicate in January 2015 to the NSF community about the Initiative's recent activities, including the creation of a public website on Transparency and Accountability (http://www.nsf.gov/od/transparency/transparency.jsp), with the continuing goal of emphasizing how seriously we value the public awareness and understanding of NSF funding.

The net result of these actions will be greater accountability for taxpayer dollars at all levels of the organization and improved transparency to the scientific community and the public regarding NSF's processes and decisions.

Mr. Chairman, NSF, in strong partnership with the legislative branch and the nation's scientific community, has created what is arguably the world's most successful merit-based model for allocating funding for fundamental research. The results of this research have expanded the frontiers of knowledge and yielded significant returns to the U.S. economy and society. I feel confident that this Transparency and

Accountability Initiative will improve our processes, strengthen the science we support, and further advance the national interest. I am committed to making transparency and accountability a core value embedded into NSF's everyday work.

I greatly appreciate your strong support of the National Science Foundation and advancing science and engineering in the national interest. Thank you for your leadership at an important time for our great nation.

Sincerely,

France A. Córdova
Director

Identical Letter To: The Honorable Chaka Fattah, Ranking Member

Enclosures:

Staff Memorandum O/D 13-26:
Portfolio Framework

Staff Memorandum O/D 14-01:
Transparency and Accountability Working Group Charge and Membership

Notice No. 135
Important Notice to Presidents of Universities and Colleges and Heads of Other National Science Foundation Awardee Organizations regarding Transparency and Accountability at NSF

Notice No. 136
Important Notice to Presidents of Universities and Colleges and Heads of Other National Science Foundation Awardee Organizations regarding NSF abstracts and titles

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

OFFICE OF THE
DIRECTOR

December 23, 2014

The Honorable Frank Wolf
Chairman
Subcommittee on Commerce, Justice,
Science and Related Agencies
Committee on Appropriations
United States House of Representatives
Washington, DC 20515

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Sincerely,

France A. Córdova
Director

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NATIONAL SCIENCE FOUNDATION
OFFICE OF THE DIRECTOR
ARLINGTON, VA 22230

STAFF MEMORANDUM

O/D 13-26
November 19, 2013

SUBJECT: Portfolio Framework

As a public agency, the National Science Foundation is responsible for building and sustaining the public trust through the transparency of our processes and the accountability of our organization. This obligation is important to advance our mission, particularly in an era of competing priorities for limited discretionary funds. Today, I would like to share with you a portfolio framework we are adopting to ensure and enhance transparency and accountability at NSF, and outline steps to engage you in most effectively implementing this framework.

This action follows extensive discussions with the National Science Board and with senior NSF management over the last several months and builds on efforts already in place in parts of our organization. Our goal is to consider and communicate individual investment decisions in the context of broader research portfolio objectives that are aligned with the national interest as defined by NSF's mission "to promote the progress of science; to advance the national health, prosperity and welfare; to secure the national defense...." The framework reflects our commitment to continuous improvement in fulfilling our mission, the core value of "accountable" as articulated in the NSF strategic plan, and engages employees at all levels across our organization as follows:

- **Programs** demonstrate that funding recommendations advance science, engineering and education through a portfolio of awards that support NSF's mission. They articulate the content and opportunities of their portfolio and provide grant abstracts that clearly explain to the public the project's significance and funding justification.
- **Divisions** regularly review the development and portfolio of both individual and cross-cutting programs to ensure that investments promote the progress of science, engineering and education, address both intellectual merit and broader impacts, and align with directorate and agency priorities.
- **Directorates and the Office of International and Integrative Activities** articulate the substance, goals and priorities of the combined research portfolios they oversee. They carefully assess their investments to ensure that they promote and align with NSF's mission.
- **Office of the Director** establishes the directions and goals of the entire Foundation and conducts an agency-wide management review to ensure that investment decisions promote and align with NSF's mission and investment priorities.
- **Administrative Offices** work with program officers and others in the directorates to identify efficiencies in reviewing, training, and other aspects of continuous improvement for the Foundation.

Initial discussions within offices and directorates have already confirmed our commitment to these efforts, and we now intend to expand these engagements with staff through the following near term actions:

- **Directorate and Office town hall meetings** to answer questions and collect feedback within the next two weeks.
- Establishment of an **NSF-wide working group** within the next two weeks, to provide recommendations to the NSF leadership team and me on cross-cutting issues and opportunities.
- **Pilot training** for program staff on writing effective abstracts and titles, beginning in January.
- An **NSF-wide town hall meeting** to share perspectives in January.

As we move ahead, we will identify and leverage effective practices, monitor our progress, and assess the internal and external impact, making adjustments as appropriate.

With your support, this increased focus on transparency and accountability will improve our processes; strengthen our research, infrastructure and human capital development programs; enhance our public and community communications; and advance the national interest.

I'd also like to take this opportunity to thank you for all of your hard work that has helped us recover from the recent lapse in appropriations. You have shown, once again, that through your dedication and commitment, we can overcome adversity and advance our vital mission to the nation.

Thank you in advance for your thoughts, suggestions and support.

Cora B. Marrett
Acting Director

Distribution: All NSF Staff

NATIONAL SCIENCE FOUNDATION
OFFICE OF THE DIRECTOR
ARLINGTON, VA 22230

STAFF MEMORANDUM

OD 14-01
January 14, 2014

ADMINISTRATION AND MANAGEMENT

Subject: Transparency and Accountability Working Group charge and membership

On November 19, 2013, I issued O/D 13-26, which announced the establishment of a new NSF-wide activity to enhance the transparency and accountability of NSF's funding decisions. This was done after extensive discussions with NSF Assistant Directors/Program Office Head (ADs) and members of the National Science Board. The approach I articulated relies on the development of a robust and dynamic NSF-wide award portfolio, which reflects NSF's programmatic goals.

While O/D 13-26 identified the framework to enhance the transparency and accountability of NSF's funding decisions, it did not provide details on implementation. Therefore, through this memorandum, I am establishing a Working Group with strong programmatic expertise to help make O/D 13-26 operational NSF-wide. NSF always seeks to improve procedures, processes and communication, and the work of this group will continue our efforts in these areas. As the group conducts its work, I have asked the group to keep in mind the following:

- the primary responsibility for directorate and program office actions and communications rests with the Assistant Director or Office Head;
- flexibility is needed to accommodate a diverse array of disciplines and programs, as well as different approaches already utilized or being developed by each directorate and program office; and
- any actions taken to support this activity should minimize additional workload.

The Working Group will support the ADs by addressing issues that cross directorate and program office boundaries and warrant deliberations by senior management. In addition, the Working Group should highlight any other topic that should be on the agenda of the ADs. Therefore, the Working Group will need to maintain a close relationship with the ADs. Initially, I would like the Working Group to:

1. assess how the Foundation is currently handling portfolios, training, and other topics related to transparency and accountability;
2. seek input on these activities from staff at all levels; and
3. determine the kinds of issues arising both within and outside of NSF on what is being discussed.

Additional Working Group tasks will develop from what emerges through this information gathering process.

Members of the Working Group include:

Erwin Gianchandani, CNS/CISE
Larry Goldberg, ENG
Brian Humes, SES/SBE
Brad Keister, PHY/MPS
Carter Kimsey, DBI/BIO
Alexandra Medina-Borja, OIIA/OD
Don Millard, DUE/EHR
Saran Twombly, DEB/BIO
Dave Verardo, AGS/GEO
Mark Weiss, co-chair
Peter Arzberger, co-chair

Please feel free to contact any member of the working group with your comments or questions.

I want to thank them for their commitment to this important activity.

Cora B. Marrett
Acting Director

DISTRIBUTION: All Staff

National Science Foundation
Office of the Director
Arlington, VA 22230

Notice No. 135 **December 11, 2013**

IMPORTANT NOTICE TO PRESIDENTS OF UNIVERSITIES AND COLLEGES AND HEADS OF OTHER NATIONAL SCIENCE FOUNDATION AWARDEE ORGANIZATIONS

Subject: Transparency and Accountability at NSF

As a public agency, the National Science Foundation builds and sustains trust for our mission through the transparency of our processes and the accountability of our organization. Periodically, as a learning organization committed to continuous improvement, we review our processes to ensure that they continue to engender this trust. A recent review by NSF senior leadership in consultation with the National Science Board affirmed our fundamental principles and identified opportunities for improvements in two areas to enhance our public stewardship.

One area is our accountability for ensuring that our investment decisions support the national interest, defined by NSF's mission "to promote the progress of science; to advance the national health, prosperity and welfare; to secure the national defense..." To strengthen this alignment, our directorates and offices are examining process improvements for defining research priorities and objectives at all levels of the organization and at all stages of merit review. As a result, the community should benefit from greater understanding and knowledge of the priorities and objectives of our research programs. We would certainly welcome the community's thoughts and suggestions in this regard.

A second area is communications regarding our investment decisions. In the current fiscal environment, it is more important than ever to justify the expenditure of public funding. We believe we can enhance our public communications of what we are funding and why it is important. The immediate focus will be on improving our research abstracts, ensuring these primary sources of public information clearly articulate the broader context and funding justification. While our program officers are responsible for preparing abstracts, this often involves input from principal investigators, and so we will be directly engaging the community in this effort. Of course, one of the most effective outreach mechanisms for improved communication is through our community, and we look forward to working with you as we identify other mechanisms to strengthen our public message.

From an implementation perspective, our efforts may result in the adoption of new policies and improved processes, which we will share with the community. We expect that, over time, this increased focus on transparency and accountability will improve our processes, strengthen our research programs, enhance our communications and advance the national interest.

Thank you for your continuing support for NSF and the nation's science and engineering research and education enterprise.

Cora Marrett
Acting Director

National Science Foundation
Office of the Director
Arlington, VA 22230

Notice No. 136 **March 28, 2014**

IMPORTANT NOTICE TO PRESIDENTS OF UNIVERSITIES AND COLLEGES AND HEADS OF OTHER NATIONAL SCIENCE FOUNDATION AWARDEE ORGANIZATIONS

Subject: NSF Abstracts and Titles

Since the issuance of the December 11, 2013 Important Notice to the Community (IN-135) that announced our focus on transparency and accountability, we have developed and are now implementing an approach for addressing the two primary areas of the initiative.

- The first is improving public understanding of our funding decisions through our award Abstracts and Titles.
- The second is ensuring that the broad areas of supported research (or portfolios) are aligned to the national interest, as defined by NSF's mission, "...to promote the progress of science; to advance the national health, prosperity and welfare; to secure the national defense..."

In this notice, I want to clarify the NSF policy on award Abstracts and Titles. We are acting to ensure that our award Abstracts and Titles clearly convey to the public justification for our actions.

First, NSF abstracts are the public face of NSF investments and decision-making and they can be used to immediately address a specific area of interest from those outside of the NSF regarding what projects are supported and why. By providing clearer articulation of our actions we will benefit the scientific enterprise and better communicate the value and excitement of what we do.

An NSF award abstract, with its title, is an NSF document that describes the project and justifies the expenditure of Federal funds.

There are two major components of the NSF Abstract:

- A nontechnical description of the project that states the problem to be studied, and explains the project's broader significance and importance, that serves as a public justification for NSF funding. This component should be understandable to an educated lay reader. It may include such information as the theoretical or analytical foundation of the proposed research, the fundamental issues that may be resolved by the research, the project's relation to NSF's mission, the project's place in the context of ongoing research in the field, the project's

potential impact on other fields, and the prospect that it will lead to significant advances or the integration of related lines of inquiry.

- A technical description of the project that states the goals and scope of the research, and the methods and approaches to be used. In many cases, the technical description may be a modified version of the project summary submitted with the proposal.

Thus, an NSF award abstract which is intended for a broad audience may differ from the Project Summary that is submitted as part of a technically reviewed proposal.

Furthermore, the title of an NSF supported project must describe the purpose of the research in nontechnical terms to the fullest possible extent.

Your appreciation of the role of the NSF abstract and title is essential.

We thank you for your understanding. As always, we welcome your input.

Cora B. Marrett
Acting Director

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

2321 RAYBURN HOUSE OFFICE BUILDING

WASHINGTON, DC 20515-6301

(202) 225-6371
www.science.house.gov

February 10, 2015

The Honorable France A. Córdova
Director
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Dear Dr. Córdova,

The Committee on Science, Space, and Technology is continuing its oversight of the National Science Foundation (NSF). As part of this oversight, I have previously requested copies of documents and information related to the NSF grant consideration and approval process. To date, the NSF has not complied with these requests. Although the Committee is availing itself of the limited access to documents that you have provided, I still have questions regarding the grant process.

The Committee requests that the NSF produce all documents including, but not limited to, every e-mail, letter, memorandum, record, note, text message, peer views considered for selection and recommendations made by the research panel to the NSF referring or relating to the NSF's consideration and approval for the grants listed below, including any approved amendments to the following grants, in electronic format:

1. "Geoinformatics: Leveraging the Paleobiology Database for Research, Education, Mentorship, and Interoperability." (Award #0949416)
2. "Bringing Dioramas to Life Through Community Voices." (Award #0915778)
3. "Trial Network to Bring Music to the Study of Biology." (Award #0956196)
4. "Enhancing Diversity in Environmental Biology." (Award #0829236)
5. "Preparing to Prepare the 21st Century Biology Student: Using Scientific Societies as Change Agents for the Introductory Biology Experience." (Award #0840911)
6. "Biogeochemical Modification of Seawater CO2 Chemistry in Near-Shore Environments: Effect of Ocean Acidification." (Award #1255042)
7. "Atmospheric Mixed Phase Chemistry for Improved Climate Predictions: Field Measurements and Modeling of the Southern Oxidant and Aerosol Study." (Award #1242258)
8. "Synoptic Geospace Systems Analysis Utilizing Instrumentation from South Pole and McMurdo Stations." (Award #1248062)
9. "Random, Stochastic, and Self-similar Equations." (Award #1106982)
10. "Resiliency against Coordinated Cyber Attacks on Power Grid." (Award #1202229)
11. "Resiliency against Coordinated Cyber Attacks on Power Grid." (Award #1202542)

12. "Biodiversity & Biofuels: Finding Win-Win Scenarios for Conservation and Energy Production in the Next Century." (Award #1332342)
13. "CAREER: Human-Behavior Driven Malware Detection." (Award #0953638)

The Committee on Science, Space, and Technology has jurisdiction over the National Science Foundation as set forth in House Rule X.

We request that you provide the requested documents and information as soon as possible, but no later than 5:00 p.m. on Tuesday, February 24, 2015. When producing documents to the Committee, please deliver production sets to the Majority Staff in Room 2321 of the Rayburn House Office Building and the Minority Staff in Room 394 of the Ford House Office Building. The Committee prefers, if possible, to receive all documents in electronic format.

If your staff has any questions about this request, please contact Cliff Shannon, Staff Director of the Research and Technology Subcommittee, at Cliff.Shannon@mail.house.gov or 202-226-9783.

Sincerely,

Lamar Smith
Chairman

cc: The Honorable Eddie Bernice Johnson, Ranking Minority Member

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

OFFICE OF THE DIRECTOR

February 10, 2015

The Honorable Lamar Smith
Chairman
Committee on Science, Space and Technology
U.S. House of Representatives
Washington, D.C. 20515

Dear Chairman Smith,

Thank you for your letter dated today, February 10, 2015 requesting paper copies of records for 13 NSF grants.

I will be pleased to provide the information responsive to your request for *in camera* review at NSF by February 24, as requested. As before, we will redact reviewers' names and any personally identifiable information. I have asked Tony Gibson, Senior Advisor for Legislative Affairs, to coordinate this review with Committee staff. He can be reached at agibson@nsf.gov or (703)292-8070.

Sincerely,

France A. Córdova
Director

Cc: Ranking Member Eddie Bernice Johnson
Dr. Dan Arvizu, National Science Board Chairman

United States Senate

COMMITTEE ON COMMERCE, SCIENCE,
AND TRANSPORTATION

WASHINGTON, DC 20510-6125

WEBSITE: http://commerce.senate.gov

February 11, 2015

The Honorable France A. Córdova
Director, National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

The Honorable Daniel E. Arvizu
Chairman, National Science Board
4201 Wilson Boulevard
Arlington, VA 22230

Dear Drs. Córdova and Arvizu:

Federally-funded research facilities contribute to important areas of science and engineering, help maintain our nation's competitive edge, and deliver significant economic benefits. Proper accounting of facility budgets – including comprehensive and accurate information pertaining to the construction and operation of these facilities – ensures that all expenditures are fair and reasonable and protects funding for important core research grants and programs. Therefore, to ensure the efficient use of taxpayer dollars and to maximize Federal research investment, the Commerce Committee requests information regarding the National Science Foundation's (NSF) fiscal management of its large facility cooperative agreements for facility construction and operation.

Multiple reviews and reports by the NSF Office of Inspector General (OIG) have recommended improvements in NSF's methodology for estimating and tracking facility costs.[1] Independent external audits of NSF financial statements have also suggested the need for close attention to construction-type cooperative agreements.[2] The Committee welcomes recent NSF efforts to make some improvements to its management of large facility cooperative agreements. For example, NSF has expressed its intention to change its end-to-end cost surveillance policies and procedures and obtain audits of certain awardees' accounting practices prior to entering into a large facility construction cooperative agreement totaling $100 million or more.[3]

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[1] Memorandum from Brett M. Baker, Assistant IG for Audit, NSF, to Martha Rubenstein, Dir., Office of Budget, Fin., and Award Mgmt., NSF, NSF OIG Alert Memo, Report No. 12-6-001, NSF's Management of Cooperative Agreements (Sept. 28, 2012), *available at* http://www.nsf.gov/oig/reports/Alert%20Memo%20on%20Mgmt%20of%20Cooperative%20Agreements.pdf; NSF OIG, SEMIANNUAL REPORT TO CONGRESS (Sept. 2014), *available at* http://www.nsf.gov/pubs/2015/oig15001/oig15001.pdf.

[2] NSF, FY 2014 AGENCY FINANCIAL REPORT (Dec. 15, 2014), *available at* http://www.nsf.gov/pubs/2015/nsf15002/pdf/nsf15002.pdf.

[3] Memorandum from Richard O. Buckius, Chief Operating Officer, NSF, to Allison C. Lerner, IG, NSF, NSF's Management of Large Facilities Construction Projects (Jan. 13, 2015).

Nonetheless, the OIG has identified accountability over large facility cooperative agreements as a top NSF management and performance challenge for Fiscal Year 2015.[4] Resolving this challenge in order to maximize the budget available for funding scientific research is a goal shared by NSF, the OIG, and awardees. The Committee also shares this goal and supports both a review of current NSF policies and the establishment of improved procedures, where necessary. As part of the Committee's oversight function, and to assure Congress and the American public that NSF is prioritizing the financial management of large facility cooperative agreements, the Committee requests the information described below.

1. Please provide all internal policies and procedures governing the approval and oversight of large facility cooperative agreements, including end-to-end cost surveillance, from Fiscal Year 2010 through the present.

2. Please provide documents detailing agency responses, including prior and current positions, to the recommendations made by the NSF OIG, the Defense Contract Audit Agency, and CliftonLarsonAllen pertaining to large facility cooperative agreements from Fiscal Year 2010 to the present.

3. Please identify each active large facility cooperative agreement with a National Science Board approved award amount totaling $200 million or more.

4. For each large facility cooperative agreement identified under 3, please provide the annual project reports, business system reviews, cost proposal reviews, sufficiency reviews, incurred cost audits, and any other financial reviews from Fiscal Year 2012 to the present.

5. For each large facility cooperative agreement identified under 3, please provide a full accounting of funds that NSF has requested or plans to request to be returned, as well as any funds returned, from Fiscal Year 2010 to the present.

6. Please provide any plans for an external review of the NSF's management of large facility cooperative agreements.

[4] Memorandum from Allison C. Lerner, IG, NSF, to Dan Arvizu, Chairman, Nat'l. Sci. Bd. & France Córdova, Dir., NSF, Management Challenges for NSF in FY 2015 (Oct. 23, 2014), *available at* http://www.nsf.gov/oig/2015ManagementChallenges.pdf.

Thank you for your cooperation and prompt attention to this matter. We would appreciate receiving your response as soon as possible, but by no later than March 4, 2015.

The Committee is making this request pursuant to its authority under Senate Rules XXV and XXVI. An attachment to this letter provides additional information about how to respond to the Committee's request. If you have any questions, please contact Cherilyn Pascoe or Missye Brickell with the Majority Committee staff at (202) 224-1251 or Brad Torppey or Richard-Duane Chambers with the Minority Committee staff at (202) 224-0411.

Sincerely,

JOHN THUNE
Chairman

BILL NELSON
Ranking Member

Enclosure

cc: Ms. Allison C. Lerner
Inspector General
National Science Foundation

United States Senate

COMMITTEE ON COMMERCE, SCIENCE,
AND TRANSPORTATION

WASHINGTON, DC 20510-6125

RESPONDING TO COMMITTEE DOCUMENT REQUESTS

In responding to the document request, please apply the instructions and definitions set forth below:

INSTRUCTIONS

1. In complying with this request, you should produce all responsive documents that are in your possession, custody, or control, whether held by you or your past or present agents, employees, and representatives acting on your behalf. You should also produce documents that you have a legal right to obtain, documents that you have a right to copy or have access to, and documents that you have placed in the temporary possession custody, or control of any third party.

2. Documents responsive to the request should not be destroyed, modified, removed, transferred, or otherwise made inaccessible to the Committee.

3. In the event that any entity, organization, or individual denoted in the request has been, or is currently, known by any other name than that herein denoted, the request should be read also to include them under that alternative identification.

4. Each document should be produced in a form that renders the document susceptible of copying.

5. When you produce documents, you should identify the paragraph or clause in the Committee's request to which the documents respond.

6. Documents produced in response to this request should be produced together with copies of file labels, dividers, or identifying markers with which they were associated when this request was issued. To the extent that documents were not stored with file labels, dividers, or identifying markers, they should be organized into separate folders by subject matter prior to production.

7. Each folder and box should be numbered, and a description of the contents of each folder and box, including the paragraph or clause of the request to which the documents are responsive, should be provided in an accompanying index.

8. It is not a proper basis to refuse to produce documents that any other person or entity also possesses non-identical or identical copies of the same document.

9. The Committee prefers to receive documents in electronic format (e.g., CD, flash drive, portable hard drive) in lieu of paper productions. Such documents should include the following:

   (a) Single page Tagged Image File ("TIF"), files accompanied by a Concordance-format load file, an Opticon reference file, and a file defining the fields and character lengths of the load file.

   (b) Document numbers in the load file should match document Bates numbers and TIF file names.

   (c) If the production is completed through a series of multiple partial productions, field names and file order in all load files should match, be searchable and accompanied by a Concordance-format load file.

   Please consult with Committee staff to determine the appropriate format in which to produce the information. Documents produced in electronic format should be organized, identified, and indexed electronically in a manner comparable to the organizational structure called for in (6) and (7) above.

10. If any document responsive to this request was, but no longer is, in your possession, custody, or control, you should identify the document (stating its date, author, subject, and recipients) and explain the circumstances by which the document ceased to be in your possession, custody, or control.

11. If a date or other descriptive detail set forth in this request referring to a document, communication, meeting, or other event is inaccurate, but the actual date or other descriptive detail is known to you or is otherwise apparent from the context of the request, you should produce all documents which would be responsive as if the date or other descriptive detail were correct.

12. The request is continuing in nature and applies to any newly discovered document. Any document not produced because it has not been located or discovered by the return date should be produced immediately upon location or discovery subsequent thereto.

13. All documents should be Bates-stamped sequentially and produced sequentially. In the cover letter, you should include a total page count for the entire production, including both hard copy and electronic documents.

14. Two sets of the documents should be delivered to the Committee, one set to the majority staff in Room 512 of the Dirksen Senate Office Building and one set to the minority staff in Room 425 of the Hart Senate Office Building. You should consult with Committee staff regarding the method of delivery prior to sending any materials.

15. In the event that a responsive document is withheld on any basis, you should provide the following information concerning any such document: (a) the reason the document is not being produced; (b) the type of document; (c) the general subject matter; (d) the date, author and addressee; (e) the relationship of the author and addressee to each other; and (f) any other description necessary to identify the document and to explain the basis for not producing the document.

16. If the request cannot be complied with in full, it should be complied with to the extent possible, which should include an explanation of why full compliance is not possible.

17. Upon completion of the document production, you should submit a written certification, signed by you or your counsel, stating that: (1) a diligent search has been completed of all documents in your possession, custody, or control which reasonably could contain responsive documents; and (2) all documents located during the search that are responsive have been produced to the Committee or identified in a privilege log provided to the Committee, as described in (15) above.

DEFINITIONS

1. The term "document" means any written, recorded, or graphic matter of any nature whatsoever, regardless of how recorded, and whether the original or copy, including, but not limited to, the following: memoranda, reports, expense reports, books, manuals, instructions, financial reports, working papers, records, notes, letters, notices, confirmations, telegrams, receipts, appraisals, pamphlets, magazines, newspapers, prospectuses, interoffice and intra-office communications, electronic mail (e-mail), instant messages, text messages, social media posts, calendars, contracts, cables, notations of any type of conversation, telephone call, meeting or other communication, bulletins, printed matter, computer printouts, invoices, transcripts, diaries, analyses, returns, summaries, minutes, bills, accounts, estimates, projections, comparisons, messages, correspondence, press releases, circulars, financial statements, reviews, opinions, offers, studies and investigations, questionnaires and surveys, power point presentations, spreadsheets, and work sheets. The term includes all drafts, preliminary versions, alterations, modifications, revisions, changes, and amendments to the foregoing, as well as any attachments or appendices thereto. The term also means any graphic or oral records or representations of any kind (including, without limitation, photographs, charts, graphs, voice mails, microfiche, microfilm, videotapes, recordings, and motion pictures), electronic and mechanical records or representations of any kind (including, without limitation, tapes, cassettes, disks, computer server files, computer hard drive files, CDs, DVDs, memory sticks, recordings, and removable computer media such as thumb drives, flash drives, memory cards, and external hard drives), and other written, printed, typed, or other graphic or recorded matter of any kind or nature, however produced or reproduced, and whether preserved in writing, film, tape, electronic format, disk, videotape or otherwise. A document bearing any notation not part of the original text is considered to be a separate document. A draft of non-identical copy is a separate document within the meaning of this term.

2. The term "documents in your possession, custody or control" means (a) documents that are in your possession, custody, or control, whether held by you or your past or present agents, employees, or representatives acting on your behalf; (b) documents that you have a legal right to obtain, that you have a right to copy, or to which you have access; and (c) documents that you have placed in the temporary possession, custody or control of any third party.

3. The term "communication" means each manner or means of disclosure, transmission, or exchange of information, in the form of acts, ideas, inquiries, or otherwise, regardless of means utilized, whether oral, electronic, by document or otherwise, and whether face-to-face, in a meeting, by telephone, mail, e-mail, instant message, discussion, release, personal delivery, or otherwise.

4. The terms "and" and "or" should be construed broadly and either conjunctively or disjunctively as necessary to bring within the scope of this request any information which might otherwise be construed to be outside its scope. The singular includes the plural number, and vice versa. The masculine includes the feminine and neuter genders.

5. The terms "person" or "persons" mean natural persons, firms, partnerships, associations, corporations, subsidiaries, divisions, departments, joint ventures, proprietorships, syndicates, or other legal, business or government entities, and all subsidiaries, affiliates, divisions, departments, branches, and other units thereof.

6. The terms "referring" or "relating," with respect to any given subject, mean anything that constitutes, contains, embodies, reflects, identifies, states, refers to, deals with, or is in any manner whatsoever pertinent to that subject.

Mason, David

From: Gibson, Anthony J
Sent: Wednesday, February 11, 2015 4:21 PM
To: Macklin, Sheila V.
Cc: Jester, Julia
Subject: Letter from Chairman Thune and Ranking Member Nelson to Director Córdova and Chairman Arvizu
Attachments: Thune & Nelson Letter to NSF 2-11-2015.pdf; Responding to Committee Document Requests.pdf

Importance: High

Sheila:

Attached is a letter from the Senate Commerce Committee (Chairman Thune and Ranking Member Nelson) to the Director and Chairman Arvizu requesting information and documents about the agency's financial management of its large facility cooperative agreements for facility construction and operation.

Can you please log in and task BFA with writing the response and collecting the documents for transmittal?

Our response is due to the Committee by March 4. We should probably have this due for review by Feb. 25.

Please let me know if you have any questions.

Thanks much,

--Tony

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

March 4, 2015

The Honorable Bill Nelson
Ranking Member
Committee on Commerce, Science and Transportation
United States Senate
Washington, D.C. 20510

Dear Senator Nelson:

Thank you for your letter of February 11, 2015, regarding the National Science Foundation's (NSF) fiscal management of its large facility cooperative agreements for facility construction and operation. We welcome the opportunity to respond to your questions and provide you with the documentation that demonstrates how seriously NSF pursues its oversight of these financial assistance awards.

Over the past several years, NSF management and the National Science Board (NSB) have worked in concert to enhance oversight of large facility cooperative agreements. The improvements range from strengthened internal procedures for NSF management to a more thorough review from NSB in vetting and approving projects for construction. The Agency has also added more stringent requirements for any prospective recipients of large facility construction awards.

Financial management of large facility cooperative agreements is a top priority at NSF. While the OIG's proposal audits focused on contingency estimates, NSF took the opportunity to tighten requirements and assessments for all cost and schedule risks. NSF's Large Facilities Manual now specifies these requirements and assessments, and the Agency is applying them to new awards.

In addition to the Large Facilities Manual, the documentation responding to your letter provides a record of our improvements from Fiscal Year 2010 to the present. We would like to highlight the commitments that NSF's Chief Operating Officer recently made in his Audit Follow-up Official decision of January 15, 2015. NSF plans to obtain accounting system audits where appropriate; to perform a thorough cost analysis of proposed budgets and require independent cost reviews; to obtain incurred cost audits and explore other best practices for cost surveillance; and to ensure that controls and thresholds for contingency expenditures are strengthened and well documented. We are establishing a series of work sessions with our OIG to ensure that all parties fully understand these commitments. The Board's Audit and Oversight Committee will also be engaged in this process.

To continue these improvement efforts, NSF management and the NSB will commission an independent, external review to assess our cooperative agreement procedures and explore areas for improvement. We look forward to sharing the results of the study with the Committee as we work to address this OIG Fiscal Year 2015 management challenge.

Again, we appreciate the Committee's attention to these important matters, as we share your goals of ensuring efficient use of taxpayer dollars and maximizing the Federal research investment. We look forward to answering any questions you may have related to the enclosed documentation[1] and to a continuing dialog toward the progress of science in the service of the nation.

Sincerely,

France A. Córdova
NSF Director

Dan E. Arvizu
NSB Chairman

Enclosures:

- Appendix I-V
- Reference Table
- Electronic Flash Drive

Identical letter to:
The Honorable John Thune

cc: Ms. Allison Lerner
Inspector General
National Science Foundation

[1] We wish to note that the transmitted documents may contain sensitive or confidential information, and should be treated accordingly.

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

March 4, 2015

The Honorable John Thune
Chairman
Committee on Commerce, Science and Transportation
United States Senate
Washington, D.C. 20510

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NSF Director

Dan E. Arvizu
NSB Chairman

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Identical letter to:
The Honorable Bill Nelson

cc: Ms. Allison Lerner
Inspector General
National Science Foundation

[1] We wish to note that the transmitted documents may contain sensitive or confidential information, and should be treated accordingly.

12 125

Mason, David

From: Trovato, Joseph <Joseph.Trovato@mail.house.gov>
Sent: Tuesday, May 26, 2015 4:04 PM
To: Macklin, Sheila V.
Subject: Congressional inquiry - Michael MacWithey
Attachments: macwithey.pdf

Ms. Macklin,

Good morning! I called the main congressional line for this inquiry and was referred to you. Michael MacWithey contacted the Congressman for assistance concerning his reimbursement for travel for the 2014 Einstein Fellowship finalist interview in DC. He was working with an organization called the Triangle Coalition. Attached is his privacy release and additional information.

According to Mr. MacWithey, he had contacted the Triangle Coalition multiple times requesting an update on the reimbursement and was told that there were delays and checks will be mailed as soon as possible. This went on for a while, until he recently checked again and received an email stating that the grant had been closed, they wish he had gotten in touch sooner, and that he should "live and learn". Can you provide any insight onto what happened and if he can get reimbursed?

Thank you so much for looking into this!

Joseph Trovato
Office of Congressman John Mica
407-657-8080

Congressman John L. Mica
7th District, Florida
Maitland Office

Congress of the United States
House of Representatives
Washington, DC 20515

Please Return to:
Congressman John L. Mica
100 East Sybelia Avenue
Suite 340
Maitland, FL 32751
Phone: 407-657-8080
Fax: 407-657-5353

PRIVACY ACT RELEASE FORM

The PRIVACY ACT OF 1974 requires that written consent be obtained from the constituent before information can be disclosed from records with a federal agency. So that Congressman Mica might act on your behalf, he would appreciate your signing the following statement. If you are inquiring on behalf of another person, it is necessary that they sign the statement.

☑Mr. ☐Ms. ☐Mrs. Michael L. MacWithey

Address: (b)(6) [redacted]

Apartment #: _____ City: Apopka State: FL Zip: 32712

Phone #: Preferred: (b)(6) [redacted] Other: (_____) _____

E-Mail Address (b)(6) [redacted] @ (b)(6) [redacted] NET

Date of Birth: [redacted]

If applicable to your inquiry, please provide the following information:

Social Security #: _____ Veteran's Claim #: _____

Alien Registration #: _____ Visa Application #: _____

Other Identification #: _____

Please provide a brief description of the issue and list the desired outcome. Attach *photocopies* of any additional supporting documents, including correspondence with the appropriate agencies.

I am attaching 3 emails confirming I have done my due diligence. I attached all request reciepts. The originals were sent and confirmed by A. Pena. (see email) My expectation is to be reimbursed as promised in full. I did nothing wrong as evidenced in emails + documents

Signature: [signature] Date: 5/20/15

Trovato, Joseph

From: Macwithey, Michael L. <(b)(6) net>
Sent: Tuesday, June 03, 2014 12:08 PM
To: 'Anthonette Pena'
Subject: RE: Thank you for applying to the Albert Einstein Distinguished Educator Fellowship Program
Attachments: Einstein recpt5.pdf; Einstein recpt4.pdf; Einstein recpt3.pdf; Einstein recpt2.pdf; Einstein recpt1.pdf

This is all my receipts. There was the flight (I sent that), the rental car and gas (those are here), train and taxis, and some food.

Thanks, Mike

Mike MacWithey
Apopka High School

From: Anthonette Pena [mailto:apena@trianglecoalition.org]
Sent: Tuesday, June 03, 2014 11:27 AM
To: Macwithey, Michael L.
Subject: Re: Thank you for applying to the Albert Einstein Distinguished Educator Fellowship Program

Hi Mike,

We received your reimbursement request, but unfortunately there has been significant delays in receiving the funding from NSF. Checks will be mailed as soon as possible. Thanks for your continued patience.

Anthonette Peña, NBCT
Program Director
Albert Einstein Distinguished Educator Fellow, 2008-10

TRIANGLE COALITION for STEM EDUCATION

AEF Albert Einstein Distinguished Educator Fellowship Program

1840 Wilson Blvd., Suite 201 | Arlington, VA 22201 (703) 516-5963 | apena@trianglecoalition.org
www.trianglecoalition.org | Twitter: @EinsteinFellows | Facebook

From: <Macwithey>, "Michael L." (b)(6) .net>
Date: Tuesday, June 3, 2014 at 8:16 AM
To: Anthonette Peña <apena@trianglecoalition.org>
Subject: RE: Thank you for applying to the Albert Einstein Distinguished Educator Fellowship Program

I have not seen any type of reimbursement for travel, food, or anything. Please advise.

I thought I did the paperwork while in the waiting area.

Mike

Mike MacWithey

Apopka High School

From: Anthonette Pena [mailto:apena@trianglecoalition.org]
Sent: Monday, March 10, 2014 12:26 PM
To: Macwithey, Michael L.
Subject: Thank you for applying to the Albert Einstein Distinguished Educator Fellowship Program

Please see the attached letter.

Anthonette Peña, NBCT
Program Director
Albert Einstein Distinguished Educator Fellow, 2008-10

TRIANGLE COALITION for STEM EDUCATION

AEF Albert Einstein Distinguished Educator Fellowship Program

1840 Wilson Blvd., Suite 201 | Arlington, VA 22201 (703) 516-5963 | apena@trianglecoalition.org
www.trianglecoalition.org | Twitter: @EinsteinFellows | Facebook

Astro Doughnuts & Fried chicken

Order #3-053 — Feb 23, 2014, 2:38 PM
Sale — Served by Valerie

Transaction #0228230302231410259

1 x peanut butter and jelly (su)	2.85 T
Subtotal	2.85
Tax	0.29
Total	**3.14**
Cash	20.00
Change	16.86

1308 G ST. NW
Washington, DC 20005
202-809 5565
info@astrodoughnuts.com

www.astrodoughnuts.com

Powered by ShopKeep POS

Potbelly Sandwich Shop
www.potbelly.com
1299 Pennsylvania Nw
(202) 393-6655

Host: Tonia — 02/23/2014
Order187 — 2:09 PM
10087

Grilled Chicken	5.30
Chips	1.10
Fountain Soda-Regular	1.90
Shake	2.90
A Wreck	4.70
Subtotal	15.90
Tax	1.59
Dine in Total	17.49
Cash	20.00
Change	2.51

Skinny Dan It Up!
Extra Good Soup
with a whole Skinny
Sandwich @ just $6.60

0180 — Rec:178
Server: 35-JESSE G (#35)
02/23/14 21:45, Swiped T: 21 Term: 3

THE PIG
1320 14TH STREET
WASHINGTON, DC 20005
(202)290-2821
MERCHANT #:

CARD TYPE — ACCOUNT NUMBER
MASTER CARD (b) (4), (b) (6)
Name: (b)(6)
00 TRANSACTION APPROVED
AUTHORIZATION #: 023196
Reference: 022301000180
TRANS TYPE: Credit Card SALE

CHECK: 35.75
TIP: 6.25
TOTAL: 42.00

X

PHONE: ( )
Duplicate Copy

CARDHOLDER WILL PAY CARD ISSUER ABOVE
AMOUNT PURSUANT TO CARDHOLDER AGREEMENT
RESTAURANT COPY

Trovato, Joseph

From: Anthonette Pena <apena@trianglecoalition.org>
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Anthonette Peña, NBCT
Program Director
Albert Einstein Distinguished Educator Fellow, 2008-10

TRIANGLE COALITION *for* STEM EDUCATION

AEF Albert Einstein Distinguished Educator Fellowship Program

1840 Wilson Blvd., Suite 201 | Arlington, VA 22201 (703) 516-5963 | apena@trianglecoalition.org
www.trianglecoalition.org | Twitter: @EinsteinFellows | Facebook

From: <Macwithey>, "Michael L." (b)(6) [redacted] net>
Date: Tuesday, June 3, 2014 at 8:16 AM
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Mike

Mike MacWithey
Apopka High School

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> Please see the attached letter.
>
> ***Anthonette Peña, NBCT***
> Program Director
> Albert Einstein Distinguished Educator Fellow, 2008-10

TRIANGLE COALITION for STEM EDUCATION

Albert Einstein Distinguished Educator Fellowship Program

1840 Wilson Blvd., Suite 201 | Arlington, VA 22201 (703) 516-5963 | apena@trianglecoalition.org
www.trianglecoalition.org | Twitter: @EinsteinFellows | Facebook

Trovato, Joseph

From: Deborah Murray <murrayd@triangecoalition.org>
Sent: Tuesday, April 28, 2015 9:37 AM
To: Macwithey, Michael L.
Cc: Anthonette Pena; (b)(6) com'
Subject: RE: FW: Thank you for applying to the Albert Einstein Distinguished Educator Fellowship Program

Importance: High

Follow Up Flag: Follow up
Flag Status: Flagged

Michael,
Unfortunately, we have been told that this grant has been closed, therefore we will not be able to reimburse you for your expenses. I sure wish you had gotten in touch much sooner. Live and learn.
Regards,
Debbie

Deborah Murray
Director of Finance and Administration

TRIANGLE COALITION
for STEM EDUCATION

1840 Wilson Blvd., Suite 201 | Arlington, VA 22201
(703) 516-5960 | Mobile (202) 213-3581 | murrayd@trianglecoalition.org
www.trianglecoalition.org | Twitter: @TriCoalition | Facebook

From: Macwithey, Michael L. (b)(6) net]
Sent: Monday, April 13, 2015 11:22 AM
To: Deborah Murray
Cc: Anthonette Pena; (b)(6) com'
Subject: RE: FW: Thank you for applying to the Albert Einstein Distinguished Educator Fellowship Program

I didn't send the map because of what was indicated below on the reimbursement guidelines sheet (highlighted below). Is this in the email okay or I can send the map as a separate document.

I didn't use a POV as the rental car got better gas mileage (over 22 mpg) and we were leaving it in DC and flying home.

843 miles times $0.56 would be $472.08 and we only had the rental car and two tanks of fuel for $200.41.

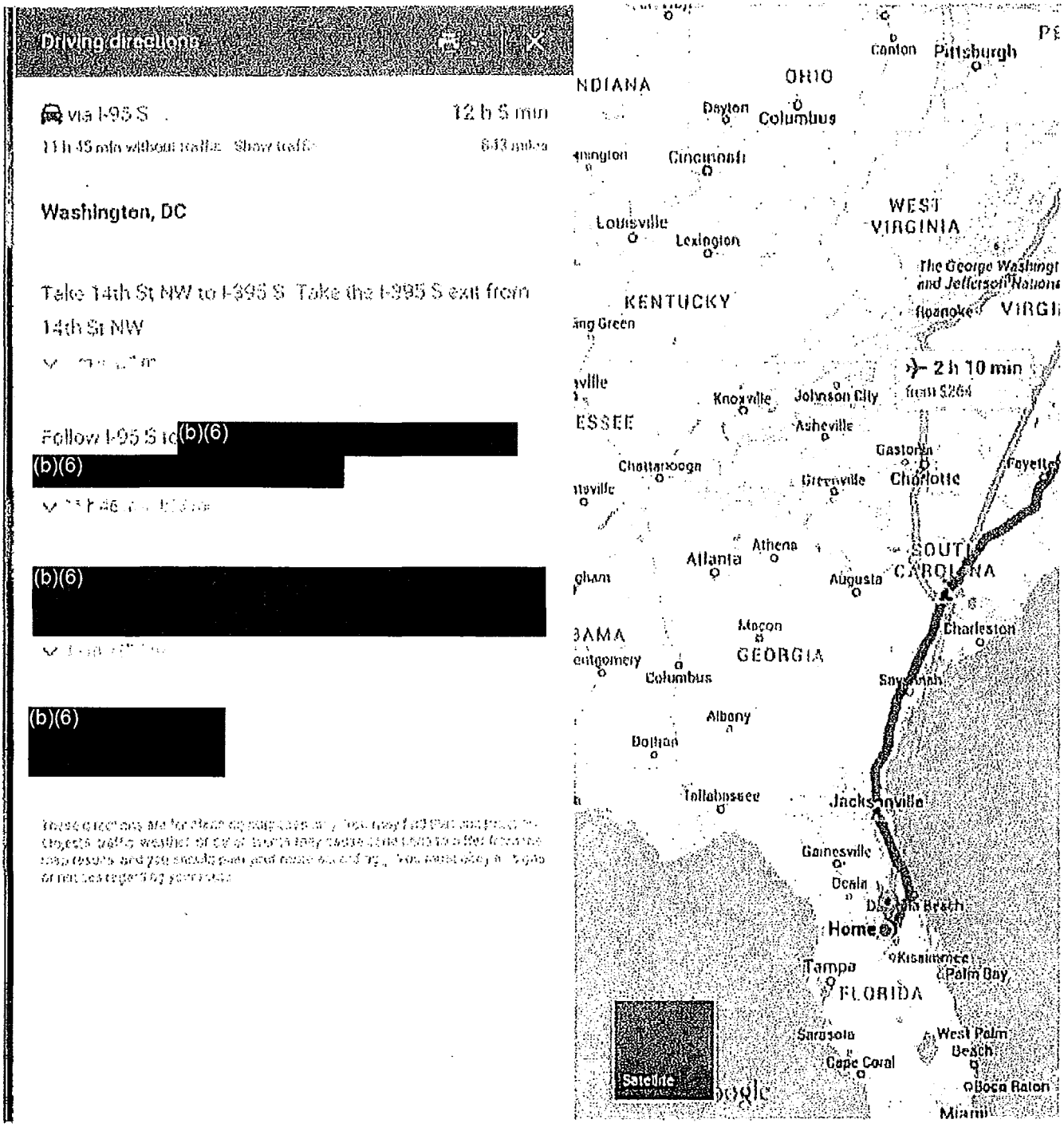
Transportation
Flight/Train
Travel using coach/economy class only. Business-class or first-class fares are not reimbursable
List baggage fees on the "Other travel" lines on the Reimbursement Form; be sure to include a receipt

Original boarding passes must be submitted for all your flights/trains

Driving

If you are driving a Privately Owned Vehicle (POV) to Interview Weekend, you can be reimbursed for the mileage at $0.56 per mile. This rate includes the cost of fuel and wear and tear on your vehicle. You must attach a map showing the total mileage driven and the route taken to your reimbursement form.

If you are driving a rental car to Interview Weekend, you can be reimbursed for the cost of the rental car and gas.



Mike MacWithey
Apopka High School

From: Deborah Murray [mailto:murrayd@trianglecoalition.org]
Sent: Monday, April 13, 2015 10:48 AM
To: Macwithey, Michael L.; Anthonette Pena
Cc: (b)(6) .com'
Subject: RE: FW: Thank you for applying to the Albert Einstein Distinguished Educator Fellowship Program
Importance: High

Michael,
You need to send us a map (i.e., Google map) that indicates the route and number of miles you travelled via car.
Thanks,
Debbie

Deborah Murray
Director of Finance and Administration
****

TRIANGLE COALITION
for STEM EDUCATION

1840 Wilson Blvd., Suite 201 | Arlington, VA 22201
(703) 516-5960 | Mobile (202) 213-3581 | murrayd@trianglecoalition.org
www.trianglecoalition.org | Twitter: @TriCoalition | Facebook

From: Macwithey, Michael L. [mailto:(b)(6) net]
Sent: Monday, April 13, 2015 7:35 AM
To: Anthonette Pena; Deborah Murray
Cc: (b)(6) .com'
Subject: RE: FW: Thank you for applying to the Albert Einstein Distinguished Educator Fellowship Program

Let me know if something is missing, I believe I double checked the list you sent and everything is there.

Thanks, Mike

Mike MacWithey
Apopka High School

From: Macwithey, Michael L.
Sent: Friday, April 10, 2015 10:52 AM
To: Anthonette Pena (apena@trianglecoalition.org); 'Deborah Murray'
Subject: FW: FW: Thank you for applying to the Albert Einstein Distinguished Educator Fellowship Program
Importance: High

I am not sure what this means. I have sent multiple emails with no reply and the deadline was implied to be close. I am at a loss on what else I might do.

Mike MacWithey
Apopka High School

From: Microsoft Outlook
Sent: Friday, April 10, 2015 10:45 AM
To: Macwithey, Michael L.
Subject: Relayed: FW: Thank you for applying to the Albert Einstein Distinguished Educator Fellowship Program
Importance: High

Delivery to these recipients or distribution lists is complete, but delivery notification was not sent by the destination:

Anthonette Pena (apena@trianglecoalition.org)

'Deborah Murray'

(b)(6) .com'

Subject: FW: Thank you for applying to the Albert Einstein Distinguished Educator Fellowship Program

Sent by Microsoft Exchange Server 2007

The information contained in this e-mail message is intended solely for the recipient(s) and may contain privileged information. Tampering with or altering the contents of this message is prohibited. This information is the same as any written document and may be subject to all rules governing public information according to Florida Statutes. Any message that falls under Chapter 119 shall not be altered in a manner that misrepresents the activities of Orange County Public Schools

[References: Florida State Constitution I:24, Florida State Statutes Chapter 119, and OCPS Management Directive A-9.] If you have received this message in error, or are not the named recipient notify the sender and delete this message from your computer

EINSTEIN FELLOWSHIP REIMBURSEMENT FORM

Name: Michael MacWithey Date: 06/09/2014

Address: (b)(6) Apopka, FL 32712

TRAVEL

Travel location (city, state): Orlando, FL Start date: 3/22/14 End date: 3/24/14

Purpose of trip *(no acronyms)*: Einstien Fellows finalist interview process in DC 2014

Travel Item *(itemize each expense in the appropriate section)* – Original receipts required for all expenses	Sub-total
1. Transportation	
a. Fares – airline, rail, bus, common carrier List each: AMERICAN flight 1878 DC → Orl	a. $128.00
b. Trip auto mileage: _____ miles @ .56 cents/mile	b. $ -0-
c. Taxi, shuttle List each: DC Metro	c. $10.80
d. Parking, tolls List each:	d. $ -0-
e. Automobile rental Budget Rental List each: CAR $99.41 Fuel (2) $101.00	e. $200.41
2. Per diem	
f. Hotel/motel cost List each:	f. $ -0-
g. Meal & Incidental Expenses M&IE rate: $_____ Dates at full rate: _____ Dates at 75% rate *(first and last day of travel)*: _____ Notes on M&IE: Set Rate per AE fellows form	g. $89.50
3. Other travel	
h. Other travel: Baggage fee	h. $25.00
i. Other travel:	i. $ -0-

NON-TRAVEL

Date	Description of expense *(itemize each expense)* – Original receipts required for all expenses	Amount
	N/A	j. $
		k. $
		l. $
		m. $
		n. $

Select expense category *(choose only one per form)*:

- ☒ Travel
- ☐ Professional Development (Must attach PD approval letter)
- ☐ Health Insurance
- ☐ Moving/Relocation

TOTAL REIMBURSEABLE EXPENSES: $453.71

Michael MacWithey 3/24/14

Signature Date

I certify that the above claimed expenses were incurred by me on legitimate Einstein Fellowship and/or government funded business.*

*Falsification of an item in an expense account involving Federal funds works a forfeiture of claim (28USC2514) and may result in a fine of not more than $10,000 or imprisonment for not more than 5 years or both (18USC287; i.d. 1001) and termination of employment/fellowship.

Return to: Einstein Fellowship, Triangle Coalition, 1840 Wilson Blvd, Suite 201, Arlington, VA 22201

TRIANGLE USE ONLY

Form: Received: Processed: Acct #:

v.082213

Travel Expense Regulations (TER)

Any travel for which reimbursement is to be made by the Triangle Coalition shall be in accordance with GSA Federal Travel Regulations (FTR). Please review the FTR carefully before submitting your travel reimbursement form. The FTR can be viewed on the GSA website www.gsa.gov/federaltravelregulation.

All original receipts are required for reimbursement.

1. **Transportation:** Includes fares, mileage expenses, rental fees, and other expenses related to transportation. You must select the method most advantageous to the Government, when cost and other factors are considered. Travel must be by the most expeditious means of transportation practicable and commensurate with the nature and purpose of your duties. Travel by common carrier (e.g., aircraft, train, bus, privately owned vehicle) is presumed to be the most advantageous method of transportation and must be used when reasonably available.

   a. **Fares - Airline/Train:** Travel using coach class service only. You will not be reimbursed for business or first class service. Original receipt(s) required.

   b. **Trip Auto Mileage:** Travel by Privately Owned Vehicle (POV) may be claimed only when commercial carriers are not available, or when the total amount charged is less than that for a least expensive commercial carrier. The current reimbursement rate is 56.5 cents per mile,* plus tolls and parking, but only to a maximum of the lowest-cost commercial carrier fares actually available at that time for that destination. The POV rate is meant to cover the cost of gas and wear & tear on your personal vehicle. Do not also submit receipts for the purchase of gasoline.
   * NOTE: The POV rate changes from time to time – go the GSA website at www.gsa.gov/mileage for the most current rate when filling out your reimbursement form.

   c. **Taxicabs, Shuttle Services:** Taxicabs and shuttle services are reimbursable for travel to and from airport/train station, for travel to obtain meals, etc. You should use courtesy transportation service furnished by hotels/motels to the maximum extent possible as a first source of transportation. Original receipt(s) required.

   d. **Parking/Tolls:** Travel by POV can include expenses for tolls and parking. Original receipt(s) required.

   e. **Automobile Rental:** Automobile rental expenses can be reimbursed only when authorized in advance, and are limited to moderately-sized vehicles depending upon use, as for hauling exhibits. Original receipt required.

2. **Per Diem:** You are eligible for an allowance when you perform official travel away from your agency office. You will not be reimbursed for per diem expenses if your official travel is 12 hours or less. Your Temporary Duty (TDY) travel location determines your maximum per diem reimbursement rate. Follow the applicable GSA per diem rate for your travel location. For GSA per diem rates go to the GSA website at www.gsa.gov/perdiem.

   f. **Hotel:** Follow the applicable GSA per diem rate for your travel location. An original receipt from the hotel is required (not just a paid receipt from an online travel site such as Expedia or Travelocity).

   g. **Meals & Incidental Expenses (M&IE):** Follow the applicable GSA per diem rate for your travel location. NOTE: Only 75% of the per diem is allowed on actual days of travel. **Gratuities for meals are not reimbursable** – the per diem is expected to cover such expenses.

3. **Other Travel:** The following are examples of miscellaneous expenses that are reimbursable.

   - **Tips:** Tips to taxis & shuttle drivers, courtesy transportation services, hotel bellman, and airport or railroad porters are reimbursable up to a maximum of 15%. **Gratuities for meals are not reimbursable** - the per diem is expected to cover such expenses.
   - **Baggage Fees:** Fees for checked baggage. (A receipt must be provided.)

Your completed Travel Reimbursement Form shall be expected within 10 days of the last day of travel, but in exceptional circumstances, with prior approval from the Triangle Coalition, this 10 day limitation may be extended up to a maximum of 30 days.

Penalties for falsification of travel vouchers involving Federal funds may result in fines and/or imprisonment.

TRIANGLE COALITION
for STEM EDUCATION

AEF Albert Einstein

Distinguished Educator Fellowship Program

REIMBURSEMENT GUIDELINES FOR 2014-15 CANDIDATES
(This does not apply to candidates whose travel was arranged through the ORISE travel team.)

With original receipts, candidates can be reimbursed for the following expenses:

1. Transportation to and from Washington, DC (flight, train, or driving mileage)
2. Transportation to/from the airport/train station to the hotel
3. Meals and Incidental Expenses (at a set per diem rate)
4. Transportation around Washington, DC for participation in interview weekend events.
5. Checked baggage fees

Transportation

Flight/Train

- Travel using coach/economy class only. Business-class or first-class fares are not reimbursable
- List baggage fees on the "Other travel" lines on the Reimbursement Form; be sure to include a receipt
- **Original boarding passes must be submitted for all your flights/trains**

Driving

- If you are driving a Privately Owned Vehicle (POV) to Interview Weekend, you can be reimbursed for the mileage at $0.56 per mile. This rate includes the cost of fuel and wear and tear on your vehicle. You must attach a map showing the total mileage driven and the route taken to your reimbursement form.
- If you are driving a rental car to Interview Weekend, you can be reimbursed for the cost of the rental car and gas. COMPARED

Taxi/Shuttle/Metro

- Travel to and from the airport/train station and the Holiday Inn Capitol are reimbursable
- Other transportation costs related to Interview Weekend events will be reimbursable with original receipts.

Per Diem

Hotel

Triangle Coalition has made your hotel reservation. The cost for the two nights (and any additional pre-approved nights) will be billed directly to the Triangle

Coalition. You will be responsible for additional nights, room service, and other incidentals during check-out.

Meals and Incidental Expenses

Candidates will be reimbursed for Meals and Incidental Expenses (M&IE) at the set government rate. Per Federal Travel Regulations, the first and last calendar day of travel will be reimbursed at 75% of the full rate. Any meals provided as part of the program should be deducted from the daily per diem rate.

The daily per diem rate for Washington, DC is $71 (Breakfast = $12, Lunch = $18, Dinner = $36, Incidental Expenses = $5). Therefore, the 75% rate is $53.25. Since the reimbursement rate is set, you do not need to turn in receipts for meals or incidental expenses from Interview Weekend. If you choose to spend more than the provided amount for M&IE, you will not be reimbursed for the additional expense.

For example:

Saturday, February 22

First day of travel at 75%	$53.25
Dinner Provided by TC	-$36.00
Reimbursable per diem	$17.25

Sunday, February 23

Full day per diem	$71.00
Breakfast Provided by TC	-$12.00
Reimbursable per diem	$59.00

Monday, February 24

Last day of travel at 75%	$53.25
Breakfast & Lunch Provided by TC	-$30.00
Reimbursable per diem	$13.25

Saturday	$17.25
Sunday	$59.00
Monday	+$13.25
Total Reimbursable per diem	$89.50

Other Travel

Checked Baggage Fees

You may be reimbursed for 1 (one) checked bag each way with an original receipts. 25.00

1840 Wilson Boulevard, Suite 201, Arlington, VA 22201-3000 | (703) 516-5960 | (800) 582-0115 | Fax (703) 516-3969
STEMeducation@triangle-coalition.org | www.trianglecoalition.org

Budget.

Budget Rent A Car System, Inc.

RENTAL AGREEMENT NUMBER [illegible]
Customer Name : [illegible]
Drivers Lic Number : [redacted]
Methods of Payment : [illegible] [redacted]

RESERVATION NUMBER [illegible]
Budget Car Num : [illegible]
Plate Number : [illegible]
Veh Description : [illegible]
Odometer Out : [illegible]
Fuel Gauge Reading: Full

Pickup Date/Time : FEB 21,2011@03:[illegible] PM
Pickup Location : [illegible] DRIVE
[illegible] SPRINGS,FL,[illegible],US

Return Date/Time : FEB 22,2011@03:[illegible]
Return Location : 1 AVIATION CIRCLE
WASHINGTON,DC,20001,US

Additional Fees May Apply If Changes Are Made To Your Return Date, Time And/Or Location.

YOUR ESTIMATED VEHICLE CHARGES
[illegible] 1 DAY MAX DAY
RATE (USD) TIME AND MILEAGE
HOUR : [illegible]
DAY : [illegible] 1DY@ [illegible] [illegible]
[illegible] : [illegible]
[illegible] : [illegible]
MILES:
MIs : Unlimited
Your Estimated Time & Mileage: [illegible]
TIRE BATTERY FEE .[illegible] /DY 1 [illegible]
VEH LICENSE RECOUP .[illegible] /DY 1 .[illegible]
ENERGY RECOVERY FEE .[illegible] /DY 1 .[illegible]
STATE SURCHARGE 2.00 /DY 1 2.00
[illegible]% Hotel Concession Fee [illegible]
Estimated Optional Services Tot Taxable : [illegible]
Estimated Subtotal Charges: [illegible]
Sales Tax [illegible]% [illegible]
YOUR ESTIMATED TOTAL CHARGES X_______ : [illegible]

YOUR OPTIONAL PRODUCTS/SERVICES
Loss Damage Waiver [illegible]/Day Declined
Personal Accident and Effects [illegible]/Day Declined
Emergency Sickness Plan [illegible]/Day Declined
Supplemental Liability Insurance [illegible]/Day Declined
[illegible]
Estimated Optional Services Total Taxable: [illegible]
By my initials I accept or decline optional services/products as shown above. X
Please return the vehicle with the same fuel level as you received it. If you do not, additional fuel fees may apply:[illegible] Mis equals a [illegible] flat rate fee, [illegible] Mis and above equals .[illegible] per Mi or [illegible] per Gal . X

-----NOTICES-----NOTICES-----NOTICES-----NOTICES-----NOTICES-----NOTICES-----NOTICES-----
Renters/Authorized drivers insurance is primary: Florida Statute [illegible], states the valid and collectible liability insurance and personal injury protection insurance of any authorized rental driver is primary for the limits of liability and personal injury protection coverage required by Sec. [illegible] and [illegible] Florida Statutes Renter/Auth. drivers INS. CO. X
Loss Damage Waiver is optional. An added daily cost of [illegible] covers your responsibility for damage to our car. Check with your insurer as this may be duplicative of your own car insurance. I agree the charges listed above are estimates and that I have received all notices and terms here and in the rental jacket. No additional drivers allowed without prior written consent. Tickets, fines and other fees to be charged to this rental. X
If you have questions regarding this rental, call us at [illegible]. This vehicle was rented to you by [illegible]

Rental CAR # 99.41

Wawa #604
16340 Jefferson Davi
Colonial Hei[illegible]
Date 2/22/2014
Time 10:23:53 A
Term: JD5101A567001
Appr: 022498
Seq#: 026958

Product: Unleaded
Pump Gallons Price
10 17.349 $3.199
Total Sale $55.50
MasterCard
(b) (4), (b) (6)

02/22/2014 10:21:18

I agree to pay the
above Total Amount
according to Card
Issuer Agreement.
THANK YOU FOR
FUELING AT WAWA!
ENTER TO WIN A $250
Wawa Gift Card!
Go to
www.MyWawaVisit.com
Take our survey for
a chance to win a
drawing for a
$250 Wawa Gift Card
Disponible
en Espanol

Survey Code: 1320446
Store Number:00604

Please respond
within 5 days
NO
PURCHASE NECESSARY
See Rules at
MyWawaVisit.com

WELCOME
A123456

DATE 02/21/14 22:04
PUMP # 06
PRODUCT: UNLD
GALLONS: 13.793
PRICE/G: $ 3.299
FUEL SALE $ 45.50

MASTERCARD
XXXXXXXX(b) (4), (b) (6)
Auth #: 021978
Ref: 78605041
Resp Code: 000
Stan: 21643192820

SITE ID: 5607247

Earn rebates
With BP Visa
Take applicat on
and Apply Today

THANK YOU
HAVE A NICE DAY

Rental CAR
Fuel to DC
45.50
55.50
$101.00

Record Locator **FGEIJJ**

Return flight

Itinerary

Carrier	Flight #	Departing	Arriving	Fare Code
American	1878	WASHINGTON REAGAN MON 24FEB 7:49 PM	ORLANDO INTL 10:09 PM	Q
	OPERATED BY US AIRWAYS CHECK-IN WITH OPERATING CARRIER			
Michael Macwithey	Seat 20E	Economy		
Judith Macwithey	Seat 20F	Economy		

Receipt

Passenger	Ticket #	Fare-USD	Taxes and Carrier-Imposed Fees	Ticket Total
Michael Macwithey (b)(6)	0012387133891	108.84	19.16	128.00
	0012387133892	108.84	19.16	128.00
Master Card XXXXXXXX(b) (4), (b) (6)				$ 256.00

Baggage Information

Baggage charges for your itinerary will be governed by American Airlines BAG ALLOWANCE -DCAMCO-No free checked bags/ American Airlines 1STCHECKED BAG FEE-DCAMCO-USD35.00/ American Airlines /UP TO 50 LB/23 KG AND UP TO 62 LINEAR IN/160 LINEAR CM 2NDCHECKED BAG FEE-DCAMCO-USD150.00/ American Airlines /UP TO 50 LB/23 KG AND UP TO 62 LINEAR IN/160 LINEAR CM ADDITIONAL ALLOWANCES AND/OR DISCOUNTS MAY APPLY

You have purchased a NON-REFUNDABLE fare. The itinerary must be canceled before the ticketed departure time of the first unused coupon or the ticket has no value. If the fare allows changes, a fee may be assessed for changes and restrictions may apply.

One or more of your flights is a Codeshare flight and is operated by a Partner Airline. If your journey begins with a flight operated by one of American's Partner Airlines, then please check-in with the Partner Airline for that portion of your journey. Upon check-in, they will check your luggage to its final destination and provide boarding passes for your connecting flights, if applicable.

Electronic tickets are NOT TRANSFERABLE. Tickets with nonrestrictive fares are valid for one year from original date of issue. If you have questions regarding our refund policy, please visit www.aa.com/refunds.

To change your reservation, please call 1-800-433-7300 and refer to your record locator.

Check-in times will vary by departure location. In order to determine the time you need to check-in at the airport, please visit www.aa.com/airportexpectations.

Air transportation on American Airlines and the American Eagle carriers is subject to American's conditions of carriage..

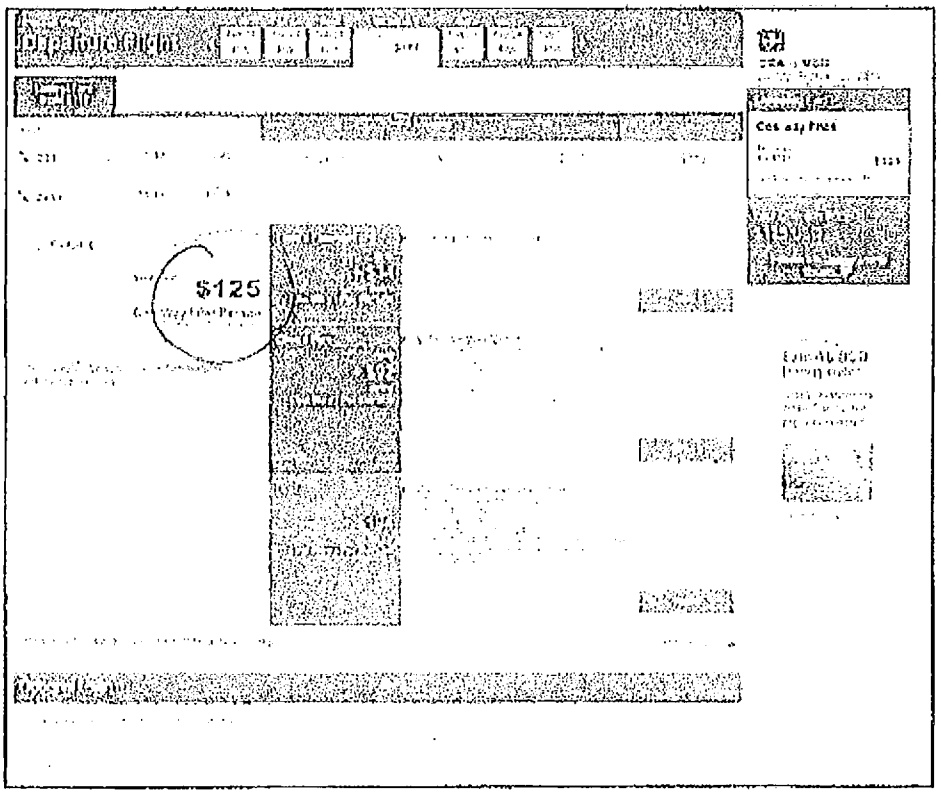
NOTICE OF INCORPORATED TERMS OF CONTRACT

MacWithey Einstein Fellows Trip to DC Quotes

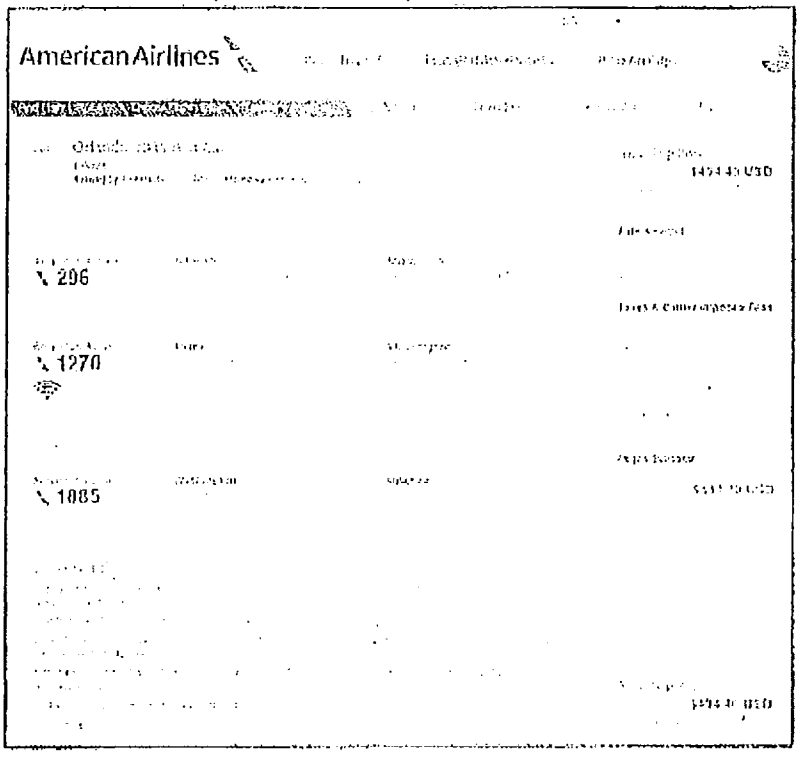
One way return trip from DC to Orlando is $125.00.

Rental Car from Orlando to DC was $99.41 and the fuel was $101.00. Receipts are attached.

Total with rental car and fuel to DC and flight home was $361.41. (b)(6) [redacted] and drove into DC Sat morning.

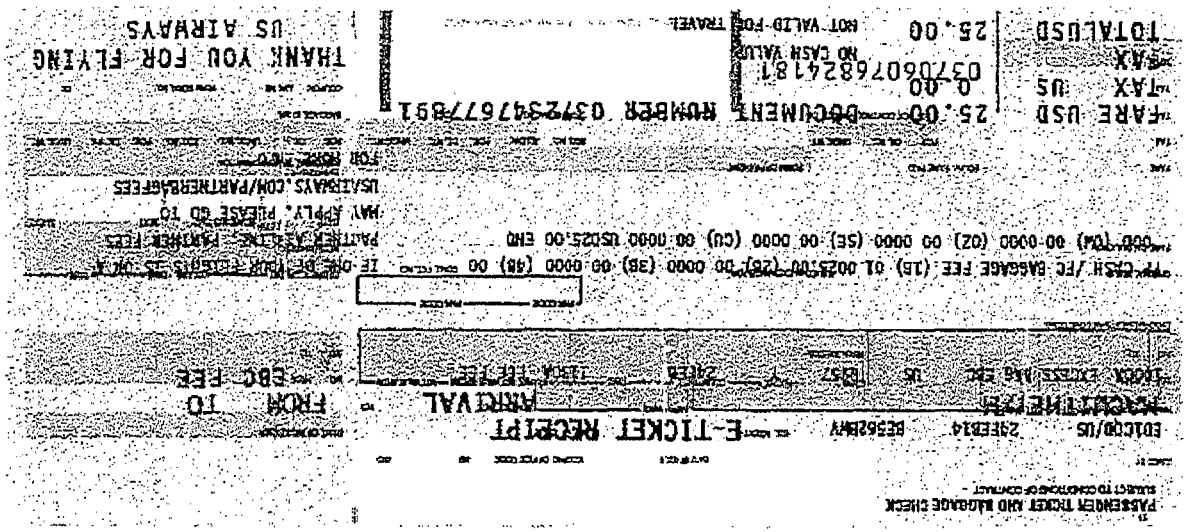


Below is the same quote for round trip flight quote from Orlando to DC of $494.40.



Round Trip Quote Sat to Mon

494.40
Round Trip



American

INFORMATION CARD

PASSENGER NAME
MACWITHEY/MICHAEL

FREQUENT FLYER #

PNR
FGEIJJ

Please check in with your airline.
Check-in at this kiosk is reserved for guests on American Airlines, Ame

PNR/NAMEFGEIJJ:70:Flight not operated by AA. [Main]
AASSDDCAKA006 DCA

02/24/14 1806

02/23/14 22:07:37

McPherson East
Washington DC
FOR CUSTOMER SERVICE
CALL 202-962-5719

14th & I St. NW
MEZZANINE 36
MACHINE 31

AN: ********(b) (4), (b) (6)

VENDOR: 036-31-31605
REF NO: 316052059251
AUTH NO: 023058

CREDIT PURCHASE

QUANTITY SELECTED: 2

COST IS $2.70 PER

FARECARD
S/N:
316050762059253
- 316050762059254

TOTAL AMOUNT: $5.40

THANK YOU
FOR RIDING METRORAIL

THE FUTURE IS
RIDING ON METRO

TRAIN IN DC $10.80

THE FUTURE IS
RIDING ON METRO

THANK YOU
FOR RIDING METRORAIL

TOTAL AMOUNT: $5.40

308900762059297
S/N:
FARECARD
- 308900762059298

COST IS $2.70 PER

QUANTITY SELECTED: 2

CREDIT PURCHASE

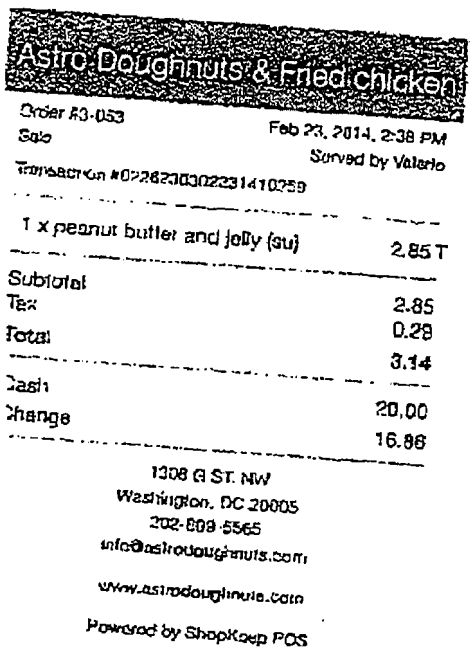
AUTH NO: 023058
REF NO: 308902059296
VENDOR: 036-33-30890

AN: ********(b) (4), (b) (6)

MACHINE 33
MEZZANINE 36
14th & I St. NW

CALL 202-962-5719
FOR CUSTOMER SERVICE
Washington DC
McPherson East

02/23/14 22:08:22



Astro Doughnuts & Fried Chicken

Order #3-053
Sale
Feb 23, 2014, 2:38 PM
Served by Valerie

Transaction #0226230302231410359

1 x peanut butter and jelly (su) 2.85 T

Subtotal 2.85
Tax 0.28
Total 3.14

Cash 20.00
Change 16.86

1308 G ST. NW
Washington, DC 20005
202-809-5565
info@astrodoughnuts.com

www.astrodoughnuts.com

Powered by ShopKeep POS

Pottbelly Sandwich Shop
www.potbelly.com
1299 Pennsylvania NW
(202) 393-5555

Host: Tonia 02/23/2014
Order187 2:09 PM
10057

Grilled Chicken	5.30
Chips	1.10
Fountain Soda Regular	1.90
Shake	2.90
A Wreck	4.70
Subtotal	15.90
Tax	1.59
Dine In Total	17.49
Cash	20.00
Change	2.51

Skinny Pair It Up!
Extra Good Soup
with a whole Skinny
Sandwich or just $5.60

0180
Server: 35-JESSE G (#35) Rec:178
02/23/14 21:45, Swiped T: 21 Term: 3

THE PIG
1320 14TH STREET
WASHINGTON, DC 20005
(202)290-2021
MERCHANT #:

CARD TYPE ACCOUNT NUMBER
MASTER CARD XXXXXX(b) (4), (b) (6)
Name: CAROLYN MACWITHEY
DO TRANSACTION APPROVED
AUTHERIZATION #: 023198
Reference: 022301000180
TRANS TYPE: Credit Card SALE

CHECK: 35.75
TIP: 6.25
TOTAL: 42.00

X

PHONE: ( )
Duplicate Copy

CARDHOLDER WILL PAY CARD ISSUER ABOVE
AMOUNT PURSUANT TO CARDHOLDER AGREEMENT
RESTAURANT COPY

Mason, David

From: Jester, Julia
Sent: Thursday, June 11, 2015 10:11 AM
To: Macklin, Sheila V.
Cc: Sullivan, Michael
Subject: FW: Congressional inquiry - Michael MacWithey
Attachments: macwithey.pdf

Sheila –

I spoke with Mr. Trovato and believe that he is happy with the response – we can close out this correspondence without an official response to Chairman Mica.

-Julia

From: Trovato, Joseph [mailto:Joseph.Trovato@mail.house.gov]
Sent: Tuesday, May 26, 2015 4:04 PM
To: Macklin, Sheila V.
Subject: Congressional inquiry - Michael MacWithey

Ms. Macklin,

Good morning! I called the main congressional line for this inquiry and was referred to you. Michael MacWithey contacted the Congressman for assistance concerning his reimbursement for travel for the 2014 Einstein Fellowship finalist interview in DC. He was working with an organization called the Triangle Coalition. Attached is his privacy release and additional information.

According to Mr. MacWithey, he had contacted the Triangle Coalition multiple times requesting an update on the reimbursement and was told that there were delays and checks will be mailed as soon as possible. This went on for a while, until he recently checked again and received an email stating that the grant had been closed, they wish he had gotten in touch sooner, and that he should "live and learn". Can you provide any insight onto what happened and if he can get reimbursed?

Thank you so much for looking into this!

Joseph Trovato
Office of Congressman John Mica
407-657-8080

12183

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

2321 RAYBURN HOUSE OFFICE BUILDING

WASHINGTON, DC 20515-6301

(202) 225-6371
www.science.house.gov

October 6, 2015

The Honorable France A. Córdova
Director
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Dear Dr. Córdova,

I request copies of the following public records: every e-mail, letter, memorandum, record, note, text message, all peer views considered for selection and recommendations made by the research panel to the National Science Foundation (NSF), or document of any kind that pertains to the NSF's consideration and approval for the grants listed below, including any approved amendments:

- Collaborative Research: Predictability of the Physical Climate System (Award #0830062)
- Predictability of Earth's Climate (Award #0332910)
- Predictability and Variability of the Present Climate (Award #9910853)

This request is part of an investigation into allegations regarding a series of federal grants awarded to the Institute of Global Environment and Society (IGES) and George Mason University, in which Dr. Jagadish Shukla was the Principal Investigator or Co-Principal Investigator.[1] Questions have been raised regarding the fiscal management of federal grant dollars received by IGES and the transfer of IGES to George Mason University. The organization reportedly paid Dr. Shukla and his wife Anastasia a total of $5.6 million in compensation since 2001. This is in addition to an annual salary of approximately $314,000 paid to Dr. Shukla by George Mason University. There are also reports that IGES shifted $100,000 in grant money to an education charity in India.[2]

Pursuant to Rule X of the U.S. House of Representatives, I request that you provide all requested information to the Committee by **October 16, 2015.**

[1] Michael Bastasch, "Climate Scientists Asking Obama to Prosecute Skeptics Got Millions from US Taxpayers," *Daily Caller*, September 21, 2015. Available at: http://dailycaller.com/2015/09/21/climate-scientists-asking-obama-to-prosecute-skeptics-gets-millions-from-u-s-taxpayers/

[2] Ian Tuttle, "Getting Rich off Climate Extremism," *National Review*, October 1, 2015. Available at: http://www.nationalreview.com/node/424875

When producing documents to the Committee, please deliver production sets to the Majority Staff in Room 2321 of the Rayburn House Office Building and the Minority Staff in Room 394 of the Ford House Office Building. The Committee prefers, if possible, to receive all documents in electronic format.

If your staff has any questions, please contact Cliff Shannon, Staff Director of the Research and Technology Subcommittee, at Cliff.Shannon@mail.house.gov or 202-226-9783.

Sincerely,

Lamar Smith
Chairman

cc: The Honorable Eddie Bernice Johnson, Ranking Minority Member, House Committee on Science, Space, and Technology

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

October 23, 2015

OFFICE OF THE DIRECTOR

The Honorable Lamar Smith
Chairman
Committee on Science, Space, and Technology
U.S. House of Representative
Washington, DC 20515

Dear Chairman Smith:

I would like to follow-up on my October 16, 2015 letter to you regarding the Committee's request for records involving three awards made by the Foundation. The Office of Inspector General has informed me that it has no ongoing need for the award jackets we provided them and has returned those documents to the Foundation. I also understand that NSF's OIG does not have any investigation underway.

We appreciate that the Committee's request involves allegations regarding the fiscal management of federal grant dollars or the appropriateness of an awardee's use of grant money. In an effort to be fully responsive to the request for documents of interest to the Committee, I am providing to the Committee, in accordance with its October 6, 2015 letter, the financial documents and records contained in the three award jackets that were requested.

In addition, as with previous requests by the Committee for confidential and highly sensitive merit review material contained within these award jackets, we will provide to the Committee *in camera* access at NSF in the same manner as before (reviewer names redacted).

We trust this gives you full access to the documents we have pertaining to these three awards.

If you have any questions, please do not hesitate to contact me or Amanda Hallberg Greenwell, Head, Office of Legislative and Public Affairs, at (703) 292-8070.

Sincerely,

France A. Córdova
Director

Enclosures

Copy to:

Ranking Member Eddie Bernice Johnson
Allison Lerner, NSF Inspector General

CENTER FOR
OCEAN-LAND-ATMOSPHERE STUDIES

February 17, 2011

National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

RE: NSF Award # ATM0332910 -- Equipment Disposal

Dear Drs. Jay Fein and Eric DeWeaver,

We are seeking instructions on the disposal of a computer cluster (specifications below) that was purchased using funds from NSF, Award # ATM0332910, (J. Shukla, Principal Investigator) which has expired. The cluster is no longer in use for federally-funded research, and is no longer under hardware maintenance. Please note that the computer cluster purchase was made also using funds from grants from NOAA and NASA that are parts of the COLA omnibus multi-agency grant.

Please let us know, in writing, if we may dispose of this computer cluster or if there is another procedure we must undertake. Please also let us know if there is another person / office at NSF with whom we should correspond.

Thank you.

Sincerely,

Stacey Whitlock
Office Coordinator

HP XC Cluster:
88 Proliant DL 145 Dual AMD Opteron
64 @ 2.4GHz / 2GB Memory
24 @ 2.8GHz / 4GB Memory
4MFG SVC Rack 42u
72 250GB SATA 1.5GB, 7200rpm drive
1 – 80GB ATA Internal drive
128 40GB ATA 7200rpm drive
Integrated 10/100/1000 NIC
1 – Myricom 17 slot switch
12 – Myricom 8-port fibre switch
2 Proliant DL 380 G3 Intel Processor, 3.06GHz
2 Proliant DL 380 G3 Xeon Processor, 3.06GHz

4041 Powder Mill Road, Suite 302, Calverton, MD 20705-3106
Telephone: (301) 595-7000; Fax: (301) 595-9793
COLA is a Center of the Institute of Global Environment and Society, Inc. (IGES)

Best Regards,
Stacey
--
Stacey Whitlock
Office Coordinator
IGES/Center for Ocean-Land-Atmosphere Studies
4041 Powder Mill Road, Suite 302
Calverton, MD 20705
Ph. 301-595-7000 / Fx. 301-595-9793

Young, Shaun L.

From: Rogers, Roddy
Sent: Monday, December 06, 2004 1:07 PM
To: Huang, Pei-Chiung (Anne); Joel, Ruth E.; Fein, Jay S.
Subject: RE: AMS ref JAS3093

I'm sorry for creating this problem. I have a thought for an alternative solution, that would not involve Jay or Shukla. There is a regular grant to Ira Geer at AMS for his educational program. It goes through PMET, but Jarvis covers it from his funds. Maybe that could be increased somehow to cover these page charges. It would then go directly to AMS without a third party. What do you think, Anne?

Rod

-----Original Message-----
From: Huang, Pei-Chiung (Anne)
Sent: Monday, December 06, 2004 10:14 AM
To: Joel, Ruth E.; Fein, Jay S.
Cc: Rogers, Roddy
Subject: RE: AMS ref JAS3093

No longer be able to increase any amounts on CGIs. They'll all have to be treated as supplements. These days one can only reduces on CGIs, but not increases.

Anne

-----Original Message-----
From: Joel, Ruth E.
Sent: Thursday, December 02, 2004 2:13 PM
To: Fein, Jay S.
Cc: Huang, Pei-Chiung (Anne); Rogers, Roddy
Subject: RE: AMS ref JAS3093

Jay - Are you referring to Shukla awd 0332910 which has fy05 increment due?

My recollection is that we need a separate supplement request if you want to add additional funds (no matter how much is being requested). My recollection is that previously we could increase the cgi amount (up to 10% with inst/pi request for additional funds) without formal supplement request and process the increase with the scheduled cgi as one action.

Anne is really the expert though.

-----Original Message-----
From: Fein, Jay S.
Sent: Thursday, December 02, 2004 1:53 PM
To: Rogers, Roddy
Cc: Joel, Ruth E.
Subject: FW: AMS ref JAS3093

rod; as i recall, the plan was for phy met to sign off on the 3k for cdp's award to Shukla at GMU and for shukla to be billed.

a complication may be that we can't change a CGI any longer and that shukla would have to submit a supplemental request.

if ruth says that is indeed the case, then i'll try to get the 3k to ams via a different route.

Ruth?? jay

-----Original Message-----
From: Alexei Korolev [mailto:alexei.korolev@rogers.com]
Sent: Wednesday, December 01, 2004 9:57 AM
To: jfein@nsf.gov
Cc: mmcmahon@ametsoc.org; imazin1@gmu.edu
Subject: Re: AMS ref JAS3093

Dear Dr. Fein,

In the previous year, in 2003, we had an agreement with Roddy Rogers that the
page charges for the paper "Supersaturation of Water Vapor in Clouds"
by Alexei Korolev and Ilia Mazin published in the Journal of the Atmospheric Sciences
will be paid through the NSF. Below is the e-mail to Mary McMahon (AMS) confirming
this arrangement. Unfortunately, I recently found that the page charges
in amount of $2,337 have not been paid, although the paper was published in
the JAS 2003 (V60, pp.2957-2974). Since your name was indicated in the

list of contacts in the email below, I assumed that you are somehow involved in this arrangement,
and might be able to provide information regarding the status of this payment.
I would appreciate any information related to the above matter. Thank you.

Sincerely,
Alexei Korolev

>
· >From: "Rogers, Roddy R." <rrogers@nsf.gov>
> >To: "Mary McMahon (E-mail)" <mmcmahon@ametsoc.org>
> >Cc: "Fein, Jay S." <jfein@nsf.gov>,
> > "Alexei Korolev (E-mail)" <Alexei.Korolev@rogers.com>,
> > "Ilia Mazin (E-mail)" <imazin1@gmu.edu>
> >Subject: AMS ref JAS3093
> >Date: Tue, 19 Aug 2003 14:53:50 -0400
> >X-Mailer: Internet Mail Service (5.5.2656.59)
> >
> >Dear Ms. McMahon,
> >
> >This is to confirm what I explained to you on the phone. It is our
> >intention to pay the estimated $3000 page charges for the paper by Korolev
> >and Mazin, "Supersaturation of Water Vapor in Clouds," which is scheduled
>for publication in the Journal of the Atmospheric Sciences. The payment
> >will be provided by a colleague of Dr. Mazin at George Mason University, as
> >yet to be determined, who is supported by a grant from the National Science
> >Foundation. Please do not bill us now. We will let you know to whom the
> >charges should be billed later in FY04, when our funding situation is clear.
> >
> >Please get in touch with me if you have further questions.
> >
> >Thank you for your understanding of this irregular arrangement.

> >
> >Sincerely yours,
> >
> >Rod Rogers
>
>

NATIONAL SCIENCE FOUNDATION
Directorate for Geosciences
Division of Atmospheric Sciences

M e m o r a n d u m

DATE: March 6, 2008
TO: DGA Grants Office
FROM: Jay Fein, Director–ATM/Climate and Large Scale Dynamics Program
SUBJECT: Supplemental Request (ATM-0819652) for Grant ATM-0332910 (PI: Jagadish Shukla, Institute of Global Environment and Society)

Dr. Shukla has requested supplemental funding at the level of $40,000 for the project entitled "Predictability of Earth's Climate" supported under ATM-0332910 (Institution: Institute of Global Environment and Society). This is the second request for supplemental funding under this award. Since the combined supplemental funding will be less than 20% of the original award ($7,047,000 for ATM-0332910) no external reviews were solicited (*PAM NSF Manual #10: X.C.4.a.).*

The original award provides funding for support of the Center for Ocean-Land-Atmosphere Studies. Work at COLA is towards an understanding of the predictability of Earth's current climate fluctuations on seasonal to decadal time scales using state-of-the art comprehensive models of the global atmosphere, world oceans and land surface. The most recent award included an expansion of studies into how seasonal to interannual predictability is altered as climate changes. This supplement will provide funding for US participation in the World Modeling Summit for Climate Prediction. The emphasis for the summit will be on simulating and predicting the physical climate system, with a forward-looking goal of prediction of regional climate change. The supplement includes travel and subsistence costs for 12 US scientists and 5 scientists from developing countries to attend the event in Reading, England.

We find that this supplemental funding request is consistent with the original work plan and appropriate with respect to advancing understanding of regional climate prediction. We therefore **recommend the PI be awarded supplemental funding at the requested level of $40,000.** The PI has been informed of this recommendation. There is no overlap between this award and others of the PI. The World Climate Research program and the University of Reading, UK, are co-funding the Summit.

Jay S. Fein

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR HISTORY REPORT

CURRENT PROPOSAL NUMBER - 0819652

PI/PD NAME / ID: Jagadish Shukla / 000028696
INSTITUTION NAME / CODE: Institute of Global Environment and Society / 5300002833
BRANCH OR COMPONENT: Center for Ocean-Land-Atmosphere Studies
DEPARTMENT (IF KNOWN):

PI GENDER: M
PI HANDICAP: N
PI MINORITY CODE:
PI DEGREE: SC D
PI DEGREE YEAR: (b)(6)

NSF STATUS ABBR	DATE	PROP NO	AWARD-ID / AMD NO	NSF ORG. CODE	REQUESTED/AWD AMOUNT	DUR(months)	TITLE	DATE RCVD	98A DUE
(b)(4) & (b)(6)									

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR HISTORY REPORT

CURRENT PROPOSAL NUMBER - 0819652

PI/PD NAME / ID: Jagadish Shukla
INSTITUTION NAME / CODE: Institute of Global Environment and Society / 5300002833
BRANCH OR COMPONENT: Center for Ocean-Land-Atmosphere Studies
DEPARTMENT (IF KNOWN):

PI GENDER: M
PI HANDICAP: N
PI DEGREE: SC.D.
PI DEGREE YEA: (b)(6)
PI MINORITY CODE:

NSF STATUS ABBR	DATE	PROP NO	AWARD-ID / AMD NO	NSF ORG. CODE	REQUESTED/AWD AMOUNT	DUR(months)	TITLE	DATE RCVD	98A DUE
(b)(4) & (b)(6)									

SUMMARY: (b)(4) & (b)(6)

D.N.
Subject: 0631413
Supplement for the second workshop on correcting tropical biases in climate models
PI: Jagadish Shukla, GMU and IGES,
(Parent grant; 0332910, Predictability of Earth's Climate)

As the PI points out, all coupled ocean-atmosphere-land general circulation models (CGCMs) have biases in their simulations of the tropics, which means such models are unreliable for predicting long-term climate. This issue is important in its own right, but more so because adding chemistry and biochemistry to climate models (the next generation climate model) will produce credible simulations and predictions only if the tropical dynamics and thermodynamics are well simulated and predicted. This is because tropical convection and clouds control important parts of chemical and biogeochemical processes.

The PI, and COLA scientist Ed Schneider, in particular, convened the first workshop in 2005 in collaboration with NCAR scientists. It was well attended by most of the major climate modeling groups around the world. A schedule of research by these groups and university scientists was established.

This second workshop, in June, 2006 (the PI submitted this proposal in mid-April, but I have been very late in getting supplements out), held at the end of the annual CCSM Breckenridge workshop, examined progress to date and future directions. It was also well attended.

I recommend a supplement of $20,000 to cover the costs of some of the invited participants and meeting costs (room, working meals, coffee, etc.)

Jay S. Fein
08/09/06

DGA ONLY	CPO ONLY
NEW GRANTEE: ☐ Yes, package sent ☑ No	Assigned to: GVH Date Received 2/20/04

TO: Cost Analysis/Audit Resolution Branch, CPO, Room 475
FROM: Al Wilson
SUBJECT: Request for Advisory Services

Proposal/RFP or Contract No.: 0333910
Organization and State: Univ of Global Env

Attached is a copy of the proposal cover sheet and budget (including budgets with detail for all years proposed) for the referenced proposal. PLEASE PROVIDE RECOMMENDATION CONCERNING:

☑ Indirect Cost Rate(s) ☐ Acceptability of Accounting System ☐ Financial Capability (Viability)
☐ Other (Specify) _____

Signature and Title	Date	Division and Phone Number
AlWilson GAA Spec	2/20/04	DGA 4835

TO: Al Wilson

FROM: Cost Analysis/Audit Resolution Branch, CPO, Room 475 — Date 3/4/04

In response to your request, the following advice is furnished:

Rates Developed by: ☑ NSF ☐ HHS ☐ DOD ☐ DOE ☐ Other (Specify) _____

(b)(4)

[redacted]

Use Clause: 109

Name	Title	Phone Number
Regina Van Houten	Cost Analyst	7826

NSF F L 00 (6-95) White - PROPOSAL FOLDER Gold - ORIGINATOR SUSPENSE Yellow - CAAR Pink - CAAR

Dwr 2/10/04

SUMMARY RESULTS OF ASSIGNMENT

Date: 03/04/2004

Grantee: Institute of Global Environment and Society.

Review: FL-99, $15,266,000; ESI-0332910

OVERVIEW: Educational Equity Concepts is being considered for an award of $15,266,000 for the predictability of the Earths climate.

INDIRECT COST RATE:

(b) (4) [redacted]

ACCOUNTING SYSTEM:

Per review of the offeror's financial management systems questionnaire, it appears to have an accounting system adequate to accumulate and segregate costs to perform cost-type projects.

FINANCIAL CAPABILITY:

The recipient appears to be adequately financially capable to perform an award of this nature.

CLIMATE DYNAMICS PROGR :

GRANT RECOMMENDATION INFORMATION

START DATE _____

~~PROPOSAL NUMBER~~ _____

P.I. Shukla

~~CO-P.I.~~ _____

INSTITUTION COLA

TYPE OF ACTION 21

DURATION _____

01 = Standard Grant
21 = Continuing Grant

SUBJECT _____

CDP SUBPROGRAM CODE CLIVAR ~~1324~~

FOREIGN IMPLICATIONS India, Vietnam

FUNDING

	FY 04	FY 05	FY 06	FY 07	FY 08
CDP:	1,064,000	1,102,000	1,138,000	1,177,000	1,218,000
OTHER NSF:					
LDM	250,000	260,000	270,000	280,000	290,000
_____	------	------	------	------	------
_____	------	------	------	------	------
NSF TOTAL:	1,314,000	1,360,000	1,408,000	1,457,000	1,508,000
OTHER AGENCIES:					
_____	------	------	------	------	------
_____	------	------	------	------	------
_____	------	------	------	------	------
GRAND TOTAL:	_____	_____	_____	_____	_____

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR HISTORY REPORT

CURRENT PROPOSAL NUMBER - 0332910

PI/PD NAME / ID Jagadish Shukla / 000028696
INSTITUTION NAME / CODE Institute of Global Environment and Society / 5300002833
BRANCH OR COMPONENT Center for Ocean-Land-Atmosphere Studies
DEPARTMENT (IF KNOWN)

PI GENDER: M PI HANDICAP: N PI DEGREE: SC.D.
PI MINORITY CODE: PI DEGREE YEAR: (b)(6)

NSF STATUS ABBR	DATE	PROP NO	AWARD-ID / AMD NO	NSF ORG. CODE	REQUESTED/AWD AMOUNT	DUR(months)	TITLE	DATE RCVD	98A DUE

(b)(4) & (b)(6)

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR HISTORY REPORT

CURRENT PROPOSAL NUMBER - 0332910

PI/PD NAME / ID: Jagadish Shukla
INSTITUTION NAME / CODE: Institute of Global Environment and Society / 5300002833
BRANCH OR COMPONENT: Center for Ocean-Land-Atmosphere Studies
DEPARTMENT (IF KNOWN):

PI GENDER: M
PI HANDICAP: N
PI MINORITY CODE:
PI DEGREE: SC.D.
PI DEGREE YEAR: (b)(6)

NSF ABBR	STATUS DATE	PROP NO	AWARD-ID / AMD NO	NSF ORG. CODE	REQUESTED/AWD AMOUNT	DUR(months)	TITLE	DATE RCVD	98A DUE
(b)(4) & (b)(6)									

SUMMARY: (b)(4) & (b)(6)

RECOMM

NATIONAL SCIENCE FOUNDATION

DIVISION OF ATMOSPHERIC SCIENCES

FACSIMILE COVER SHEET

PLEASE DELIVER THE FOLLOWING PAGES:

TO: NAME: Jim Kinter

PHONE NO: _____ FAX NO: 301 595 9793

LOCATION: COLA

FROM: JAY FEIN

NATIONAL SCIENCE FOUNDATION
DIVISION OF ATMOSPHERIC SCIENCES
4201 Wilson Boulevard Room 775
Arlington, VA 22230
Phone No.: (703) 292- FAX No.: (703) 292-9022

REMARKS:

No. of Pages (Excluding Cover Page) [9]

IF YOU DO NOT RECEIVE THE NUMBER OF PAGES SHOWN ABOVE, CALL US AS SOON AS POSSIBLE.

fax 301 595 9793 11/3/03

Jim:

Pls see hand written notes on the budget sheets. Pls make the # months correspond with the $$ amount.

Also, pls. check the listing of people funded under the GMU component... Huang. Del Sole & Kiehman appear to have been left out.

Finally, if NOAA and NASA have agreed to level of support, please let us know man-months supported by them for the PIs that NSF supports. Thanks, Jay

11/12/03
Update
NOAA will fund at 1.2M/yr for 5 years.
NASA has not made a final decision but is likely to fund for 5 years at the requested level

SUMMARY PROPOSAL BUDGET YEAR 1

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla				AWARD NO.	12	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Jagadish Shukla - PI	(b)(4), (b)(6)					
2. James L Kinter						
3. Edwin K Schneider						
4. Paul Schopf						
5. David M Straus						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFIC						
7. (2.5) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES						
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAM						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (4) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B +						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)						
Compute cluster upgrades	(b)(4)					
Peripheral equipment						
Storage network disks						
TOTAL EQUIPMENT				(b)(4)		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS	(b)(4)					
1. STIPENDS $						
2. TRAVEL						
3. SUBSISTENCE						
4. OTHER						
TOTAL NUMBER OF PARTICIPANTS	TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS				(b)(4)		
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
Ind. costs (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 1,318,999	$ 1,319,000	
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $					

PI/PD NAME Jagadish Shukla	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Revised Proposal Budget Revision # 1 for 0332910 Submitted On Oct 21 2003 10:09AM Electronic Signature

SUMMARY PROPOSAL BUDGET YEAR 2

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla				AWARD NO.	12	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Jagadish Shukla - PI	(b)(4), (b)(6)					
2. James L Kinter						
3. Edwin K Schneider						
4. Paul Schopf						
5. David M Straus						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFIC						
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES						
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMM						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (4) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B +						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING				(b)(4)		
Compute cluster upgrades						
Peripheral equipment						
Storage network disks						
TOTAL EQUIPMENT				(b)(4)		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS				(b)(4)		
1. STIPENDS $						
2. TRAVEL						
3. SUBSISTENCE						
4. OTHER						
TOTAL NUMBER OF PARTICIPANT				TOTAL PARTICIPANT COSTS		
G. OTHER DIRECT COSTS				(b)(4)		
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Ind. costs (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 1,369,000	$	
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $					

PI/PD NAME Jagadish Shukla	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET YEAR 3

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla				AWARD NO.	1	2
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Jagadish Shukla - PI	(b)(4), (b)(6)					
2. James L Kinter						
3. Edwin K Schneider						
4. Paul Schopf						
5. David M Straus						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICA						
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES						
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMM						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (4) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) Compute cluster upgrades Peripheral equipment Storage network disks				(b)(4)		
TOTAL EQUIPMENT				(b)(4)		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ 2. TRAVEL 3. SUBSISTENCE 4. OTHER	(b)(4)					
TOTAL NUMBER OF PARTICIPANTS				TOTAL PARTICIPANT COSTS		
G. OTHER DIRECT COSTS				(b)(4)		
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Ind. costs (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 1,407,999	$ (1,407,999)	
M. COST SHARING PROPOSED LEVEL $ 0				AGREED LEVEL IF DIFFERENT $		

PI/PD NAME Jagadish Shukla	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 4

	FOR NSF USE ONLY		
ORGANIZATION Institute of Global Environment and Society	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla	AWARD NO.	12	

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6) [redacted]				
2. James L Kinter					
3. Edwin K Schneider					
4. Paul Schopf					
5. David M Straus					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION					
7. (7 5) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, E					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (4) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING [redacted]	(b)(4) [redacted]				
Compute cluster upgrades					
Peripheral equipment					
Storage network disks					
TOTAL EQUIPMENT				(b)(4) [redacted]	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS (b)(4) [redacted]					
1. STIPENDS $					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS	TOTAL PARTICIPANT COSTS			(b)(4) [redacted]	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
Ind. costs (b)(4) [redacted]					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 1,457,000	$
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $				

	FOR NSF USE ONLY		
PI/PD NAME Jagadish Shukla	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET — YEAR 5

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla				AWARD NO.	12	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Jagadish Shukla - PI				(b)(4), (b)(6)		
2. James L Kinter						
3. Edwin K Schneider						
4. Paul Schopf						
5. David M Straus						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PA						
7. (1/6) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES						
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (4) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000)						
Compute cluster upgrades				(b)(4)		
Peripheral equipment						
Storage network disks						
TOTAL EQUIPMENT				(b)(4)		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS $				(b)(4)		
2. TRAVEL						
3. SUBSISTENCE						
4. OTHER						
TOTAL NUMBER OF PARTICIPANTS				TOTAL PARTICIPANT COSTS		
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
Ind. costs ((b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					$ 1,508,000	$
M. COST SHARING PROPOSED LEVEL $ 0				AGREED LEVEL IF DIFFERENT $		

PI/PD NAME Jagadish Shukla	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

* ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each seperately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Jagadish Shukla - PI	(b)(4), (b)(6)					
2. James L Kinter						
3. Edwin K Schneider						
4. Paul Schopf						
5. David M Straus						
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION P						
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES						
2. (5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ET						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (5) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (20) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)	(b)(4)					
TOTAL EQUIPMENT				(b)(4)		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS $	(b)(4)					
2. TRAVEL						
3. SUBSISTENCE						
4. OTHER						
TOTAL NUMBER OF PARTICIPANTS	TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 7,048,998	$	
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $					

PI/PD NAME Jagadish Shukla	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

	AWARD NO.	Proposed	Granted

Edwin K Schneider

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL / ACAD / SUMR	Funds Requested By	Funds granted by NSF (if different)
1. Edwin K Schneider - PI	(b)(4), (b)(6) [redacted]		$
2. James L Kinter			
3. David M Straus			
4.			
5.			
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PA			
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)			
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)			
1. (0) POST DOCTORAL ASSOCIATES			
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			
3. (3) GRADUATE STUDENTS			
4. (0) UNDERGRADUATE STUDENTS			
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)			
6. (3) OTHER			
TOTAL SALARIES AND WAGES (A + B)			
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)			
S (A + B + C)			
OR EACH ITEM EXCEE			
IEXICO AND U.S. POSSESSIONS)		(b)(4) [redacted]	
TOTAL PARTICIPANT COSTS		(b)(4) [redacted]	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION			
3. CONSULTANT SERVICES			
4. COMPUTER SERVICES			
5. SUBAWARDS			
6. OTHER			
TOTAL OTHER DIRECT COSTS			
H. TOTAL DIRECT COSTS (A THROUGH G)			
I. INDIRECT (b)(4) [redacted] SE) Off-campu TOTAL INDI			
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)			
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)			
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)		$ 410,380	$

M. COST SHARING PROPOSED LEVEL $ Not Shown	AGREED LEVEL IF DIFFERENT $		
PI/PD NAME	FOR NSF USE ONLY		
Edwin K Schneider	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
James kinter			

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

0332910

A sub-award to George M[illegible]son University (GMU) is requested in this proposal, because several of the co-investigators hold joint appointments as COLA scientists and faculty members of the GMU Climate Dynamics Program. The work described in the body of the proposal will be performed at COLA. Structuring the grant in this way enables the joint functioning of the research activities at COLA and the educational and training activities in the new and growing Ph.D. program in climate dynamics at GMU. For each of the joint appointments, GMU will provide 4.5 months of academic year support from the state of Virginia, and this grant will provide 4.5 months of academic year support. The Ph.D. program will provide graduate research assistantships to six graduate students, three to be provided by the GMU High Potential Graduate Research Assistantship program and three to be supported under this grant. This separate budget describes the portion of the funding that will be provided to GMU as a sub-award.

<u>Salaries and Fringe Benefits</u>

The attached budget includes requests for salary and fri (b) (4) [redacted] level of effort by the co-investigators and three graduate studen[redacted]n-months annual salaries is assumed for years 2-5.

Senior Personnel: The [redacted] (b)(4) & (b)(6) [redacted] increase in requests support [redacted] annual levels of e[redacted]

Post-Doc[redacted]f this portion of the work,

Other Pro[redacted]e supported at the following [redacted]

Graduate [redacted]*nts:* Funds are requested to provide graduate research assistantships and tuition support to three graduate students engaged in a course of study leading to the Ph.D. degree in a suitable discipline. These students will conduct their dissertation research under direct supervision of the faculty of the GMU Climate Dynamics Program.

Secretarial/Clerical: None.

Other: None. — Huang, DelSole, + Kirtman

<u>Permanent Equipment</u>

None.

<u>Travel</u>

None.

<u>Participant Support</u>

None.

<u>Other Direct Costs</u>

Funds are requested to pay the tuition for three (3) graduate students.

<u>Indirect Costs</u>

Indirect costs associated with this project will be charged at the off-campus rate of 26% of modified total direct costs (total direct costs excluding equipment, participant costs and tuition).

Other Support

NATIONAL SCIENCE FOUNDATION
Grant Letter

Award Date: May 2, 2008
Grant No. ATM-0332910
Amendment No. 006
Proposal No. ATM-0819652

Dr. Jagadish Shukla
President
Institute of Global Environment
and Society, Inc.
4041 Powder Mill Road, Suite 302
Calverton, MD 20705-3109

Dear Dr. Shukla:

The National Science Foundation hereby awards $40,000 to Institute of Global Environment and Society, Inc. for additional support described in the request for supplemental support.

This project, under the direction of Jagadish Shukla , is entitled:

"Predictability of Earth's Climate."

This award with this amendment totals $7,107,000 and expires December 31, 2008.

This grant is awarded pursuant to the authority of the National Science Foundation Act of 1950, as amended (42 U.S.C. 1861-75.) and is subject to NSF Grant General Conditions (GC-1), dated 6/1/07 available at http://www.nsf.gov/awards/managing/general_conditions.jsp..

Funds provided for participant support may not be diverted by the awardee to other categories of expense without the prior written approval of the cognizant NSF Program Officer. Since participant support cost is not a normal account classification, the awardee organization must be able to separately identify participant support costs. It is highly recommended that separate accounts, sub-accounts, sub-task, or sub-ledgers be established to accumulate these costs. The awardee should have written policies and procedures to segregate participant support costs.

Except as modified by this amendment, the grant conditions remain unchanged.

Please view the project reporting requirements for this award at the following web address
[https://www.fastlane.nsf.gov/researchadmin/prsLoginHome.do?awdID=0332910].

The attached budget indicates the amounts, by categories, on which NSF has based its support.

The cognizant NSF program official for this grant is Jay S. Fein (703) 292-8527.
The cognizant NSF grants official contact is Anna-Lee M. Misiano (703) 292-4339.

Sincerely,

Robert F. Joyce
Grants and Agreements Officer

CFDA No: 47.050
shukla@cola.iges.org

ATM-0332910
006

SUMMARY PROPOSAL BUDGET

Person MOS	cal	acad	sumr	Funds granted By NSF
A. (0.00) Total Senior personnel	0.00	0.00	0.00	$0
B. Other Personnel				
1. (0.00) Post Doctoral associates	0.00	0.00	0.00	$0
2. (0.00) Other professionals	0.00	0.00	0.00	$0
3. (0.00) Graduate students				$0
4. (0.00) Secretarial-clerical				$0
5. (0.00) Undergraduate students				$0
6. (0.00) Other				$0
Total salaries and wages (A+B)				$0
C. Fringe benefits (if charged as direct cost)				$0
Total salaries wages and fringes (A+B+C)				$0
D. Total permanent equipment				$0
E. Travel				
1. Domestic				$0
2. Foreign				$0
F. Total participant support costs				$40,000
G. Other direct costs				
1. Materials and supplies				$0
2. Publication costs/page charges				$0
3. Consultant services				$0
4. Computer (ADPE) services				$0
5. Subcontracts				$0
6. Other				$0
Total other direct costs				$0
H. Total direct costs (A through G)				$40,000
I. Total indirect costs				$0
J. Total direct and indirect costs (H+I)				$40,000
K. Residual funds / Small business fee				
1. Residual funds (if for further support of current projects AAG I.D.2 and I.D.3)				$0
2. Small business fee				$0
L. Amount of this request (J) or (J-K1+K2)				$40,000
M. Cost sharing				$0

ACTION PROCESSING FORM

I. RECOMMENDED AWARD DATA

30. Proposal No.	31. Prev. Award No.	32. and 33. Submitting Inst. and Inst. Code		34. Rec. Award Istr.
ATM-0819652	0332910	Inst of Global Environ Soc	5300002833	CONT

35. Rec. Eff. Date	36. Award Dur.	37. Name of PI(s)/PD(s)	38. Rec. Natr of Award
04/15/2008	0	Shukla, Jagadish	SUPP

39. Title Predictability of Earth's Climate

FINANCIAL CODES

40.	Organization	Pgm. Element	Appr.	Obj. Class	Funded Amount	PO or Recommending Official	DD or Approving Official
	06020106	6740	0108	4110	$40,000		
1.	Pgm. Refs:	0000 OTHR	Effort $329				
2.	Pgm. Refs:						
3.	Pgm. Refs:						
4.	Pgm. Refs:						
5.	Pgm. Refs:						
6.	Pgm. Refs:						
7.	Pgm. Refs:						
8.	Pgm. Refs:						

TOTAL RECOMMENDED AMOUNT * $40,000.00

41. Future Commitments			
FY	FY	FY	FY

42. Special Certifications	Human Subjects	☐ Vert. Animals	
	I.R.B. ☐ Exempt	☐ IACUC	

43. Foreign or International Implications	Name of Country		
	Code	Name	Intl Collaboration
Any foreign or International Activity ?			
Any NSF-funded students traveling Internationally ?			

44. Signature of Managing Program Officer and Section Head (If Required) and Date	Managing Org
Jay S. Fein 03/29/08	06020106

45. Signature of Managing Division Director and Assistant Director (If Required) and Date
Jarvis L. Moyers 4/14/08

46. Division Funds Certification Signature (If Required) and Date
4/14/08

II. AWARD DATA (DGA USE ONLY)

47. Date of Award	48. Award No. (If different)	49. Award Amount (If different)	50. Cumulative Award

51. Award Duration (If different)	52. Effective Date (If different)	53. Expiration Date	54. Submitting Inst. Code (If different)

55. Award Instrument	56. Natr of Awd (If different)	57. Type of Contract	58. DGA Initials and Date
CONT			

59. Remarks

☐ _____ Month(s) No-Cost Extension From _____ To: _____ Mode of Support: RSRH
☐ Original NSF Abstract Still Valid
☐ P.I. Transfer
☐ Pre-College Curriculum

ACTION PROCESSING FORM

1. Proposal No.	2. Award	3. NSF Organization	4. Document Date
ATM-0819652		CLIMATE AND LARGE-SCALE DYNAMICS	04/04/2008

5. Award Istr	5A. Code	5. Award Istr	5A. Code	5B. Natr of Rqst	5C. Code	5B. Natr of Rqst	5C. Code	6. Req. Eff Date
CONT	2			SUPP	5			02/01/2008

7. Date Received	7. Date Received	8. Req. Dur.	8. Req. Dur.	9. Requested Amount	9. Requested Amount
01/15/2008		0		$40,000.00	

SUBMITTING INSTITUTION DATA		10 Digit Code
10. Submitting Inst. Code	5300002833	10.
10A. Name	Inst of Global Environ Soc	10A.
10B. Address 1	4041 Powder Mill Road, Suite 302	10B.
10C. Address 2		10C.
10D. City-State-Zip	Calverton MD 207053109	10D.

NAME	PI/PD DATA	10 Digit Code
11. Shukla, Jagadish		11.
11A. Inst. Code	0037498000 Prior Support Y	11A.
11B. Address 1	George Mason University	11B.
11C. Address 2	4400 University Drive	11C.
11D. Dept.	George Mason University	11D.
11E. City-State-Zip	Fairfax VA 22030	11E.

NAME	CO-PI/PD DATA	
12.		12.
12A.		12A.
12B.		12B.
12C.		12C.

13. Title: Predictability of Earth's Climate — Pgm Annc:

13. Title:

14. Managing Organization	CLIMATE AND LARGE-SCALE DYNAMICS	Code 06020106	Code
15. Program Element	CLIMATE & LARGE-SCALE DYNAMICS	5740	
16. Object Class	RESEARCH GRANTS-NOT ELSEWH CLA	4110	

17. Program Reference Codes	1324	4444	EGCH							

18A. Site Visit Flag		19. Fields of Application	Code	Code
18B. Context Statement ID		Climate Related Activities	0319000	
20. % Basic Research	% Major Equipment			
100	0			
% Applied Research	% Land, Bldg and Fixed Equip			
0	0			
% Education and Training	% Non-Investment Activities	21. SBIR Topic ID	Instrumentation	
0	0		0	

22. Special Program Data Elements (10 Chars. max. in A-M, 8 chars. max. in N-Z; N-Z reserved for whole numbers only)

A:	B:	C:	D: 1976	E:	F:	G:
H:	I:	J:	K:	L:	M:	N:
O:	P:	Q:	R:	S:	T:	U:
V:	W:	X:	Y:	Z:		

NON-AWARD ACTION

23. Withdrawal	24.	25.	26.
☐ P.I./INSTITUTION INITIATED (20 ☐ PROJECT FUNDED ELSEWHERE (21	☐ DECLINATION (10)	☐ RETURNED WITHOUT REVIEW	☐ INAPPROPRIATE FOR NSF (3

27. Signature, Program Officer	28. Date	29. Signature, Division Director	30. Date
Jay S. Fein		Jarvis L. Moyers	

NSF FORM 1036

NATIONAL SCIENCE FOUNDATION
Grant Letter

Dr. Jagadish Shukla
President
Institute of Global Environment
and Society, Inc.
4041 Powder Mill Road
Suite 302
Calverton, MD 20705

Notification of NSF Approval of Additional Funding Support

Award No.	ATM-0332910
Amendment No.	005
Release Date:	November 8, 2007
Released By:	Lori C. Wiley
Amount:	$1,508,000
New Expiration Date:	December 31, 2008

As authorized by the original award, the National Science Foundation hereby releases $1,508,000 for additional support of the award referenced above. The award, with this amendment, now totals $7,067,000 and will expire on December 31, 2008.

The attached budget indicates the amounts, by categories, on which NSF has based its support.

The award is subject to any special conditions applicable to the original grant and is subject to NSF Grant General Conditions (GC-1), dated 6/1/07 available at http://www.nsf.gov/awards/managing/general_conditions.jsp..

Any technical or programmatic questions regarding this notification should be addressed to the cognizant NSF Program Officer: Jay S. Fein, (703) 292-8527, jfein@nsf.gov.

Any award specific questions of an administrative or financial nature should be addressed to the NSF Grants Official at http://www.nsf.gov/bfa/dga/docs/liaison.pdf. The cognizant Grants Official can be identified by associating the three-letter division identifier in the above-referenced award number with the Grants Official for that division on the liaison website.

Please view the project reporting requirements for this award at the following web address [https://www.fastlane.nsf.gov/researchadmin/prsLoginHome.do?awdID=0332910].

CFDA No.: 47.050
Email address:

ATM-0332910
005

SUMMARY PROPOSAL BUDGET

Person MOS	cal	acad	sumr	Funds granted By NSF
A. (3.00) Total Senior personnel	(b)(4) & (b)(6)			
B. Other Personnel				
1. (0.00) Post Doctoral associates				
2. (1.00) Other professionals				
3. (0.00) Graduate students				
4. (1.00) Secretarial-clerical				
5. (0.00) Undergraduate students				
6. (4.00) Other				
Total salaries and wages (A+B)				
C. Fringe benefits (if charged as direct cost)				(b) (4)
Total salaries wages and fringes (A+B+C)				
D. Total permanent equipment				
E. Travel				
1. Domestic				
2. Foreign				
F. Total participant support costs				
G. Other direct costs				
1. Materials and supplies				
2. Publication costs/page charges				
3. Consultant services				
4. Computer (ADPE) services				
5. Subcontracts				
6. Other				
Total other direct costs				
H. Total direct costs (A through G)				
I. Total indirect costs				
J. Total direct and indirect costs (H+I)				
K. Residual funds / Small business fee				
1. Residual funds (if for further support of current projects AAG I.D.2 and I.D.3)				
2. Small business fee				
L. Amount of this request (J) or (J-K1+K2)				$1,508,000
M. Cost sharing				$0

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION	FOR NSF USE ONLY		
Institute of Global Environment and Society	PROPOSAL NO. 0819852	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla	AWARD NO. 0332910	0	

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - none	0.00	0.00	0.00	$ 0	$
2.					
3.					
4.					
5.					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00	0	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0	
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0	
3. (0) GRADUATE STUDENTS				0	
4. (0) UNDERGRADUATE STUDENTS				0	
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (0) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				0	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				0	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				0	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS (b)(4)					
1. STIPENDS $					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS TOTAL PARTICIPANT COSTS				40,000	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				0	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0	
3. CONSULTANT SERVICES				0	
4. COMPUTER SERVICES				0	
5. SUBAWARDS				0	
6. OTHER				0	
TOTAL OTHER DIRECT COSTS				0	
H. TOTAL DIRECT COSTS (A THROUGH G)				40,000	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) (Rate: , Base:)					
TOTAL INDIRECT COSTS (F&A)				0	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				40,000	
K. RESIDUAL FUNDS				0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 40,000	$

M. COST SHARING PROPOSED LEVEL $ Not Shown | AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY		
Jagadish Shukla	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

0819652

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION	FOR NSF USE ONLY		
Institute of Global Environment and Society	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - none	0.00	0.00	0.00	$ 0	$
2.					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00	0	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0	
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0	
3. (0) GRADUATE STUDENTS				0	
4. (0) UNDERGRADUATE STUDENTS				0	
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (0) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				0	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				0	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				0	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS (b)(4) [redacted]					
1. STIPENDS $					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS [redacted] TOTAL PARTICIPANT COSTS				40,000	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				0	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0	
3. CONSULTANT SERVICES				0	
4. COMPUTER SERVICES				0	
5. SUBAWARDS				0	
6. OTHER				0	
TOTAL OTHER DIRECT COSTS				0	
H. TOTAL DIRECT COSTS (A THROUGH G)				40,000	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)				0	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				40,000	
K. RESIDUAL FUNDS				0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 40,000	$
M. COST SHARING PROPOSED LEVEL $ Not Shown	AGREED LEVEL IF DIFFERENT $				

PI/PD NAME	FOR NSF USE ONLY		
Jagadish Shukla	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
James Kinter			

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

0819652

Proposal for the U.S. Participation in the World Modeling Summit for Climate Prediction

Budget Justification

All funds are to be used for travel support of scientists from the U.S. and developing countries to attend the Modeling Summit and local conference costs. COLA will bear all administrative costs associated with travel and reimbursement of U.S. travelers. The European Centre for Medium-Range Weather Forecasts will arrange travel for foreign scientists from developing countries and cover some local conference costs, billable to COLA. A table showing the costs is given below.

Participant Costs –

(b) (4) [redacted]

Cost Sharing –

COLA will partially cover the participant costs with funding from the National Science Foundation as part of its "omnibus" grant that has as one of its goals to foster research collaboration on climate modeling and prediction, and provide administrative support.

	Persons	Per person	Total
Participant Costs			
US Scientists	12	(b) (4) [redacted]	
Foreign Scientists	5		
Local Conference Expenses			
Total Direct Costs			
Indirect Costs			
Cost Sharing by COLA			
Total Cost to NSF			$40,000

Printed by NSF PPU

Supplement

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE (If not in response to a program announcement/solicitation enter NSF 00-1)

FOR NSF USE ONLY

NSF PROPOSAL NUMBER

0819652

FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)

ATM - GEO/ATM - Climate & Large-Scale Dynamics

DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION
01/15/2008	1	06020000 ATM	5740	787160431	01/16/2008 1:35am

EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)

SHOW PREVIOUS AWARD NO. IF THIS IS
☐ A RENEWAL
☐ AN ACCOMPLISHMENT-BASED RENEWAL
0332910

IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES ☐ NO ☐ IF YES, LIST ACRONYM(S)

NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE
Institute of Global Environment and Society

AWARDEE ORGANIZATION CODE (IF KNOWN)
5300002833

ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE
Institute of Global Environment and Society
4041 Powder Mill Road
Calverton, MD. 20705

NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE

PERFORMING ORGANIZATION CODE (IF KNOWN)

ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE

IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions)
☐ SMALL BUSINESS ☐ MINORITY BUSINESS ☐ FOR-PROFIT ORGANIZATION ☐ WOMAN-OWNED BUSINESS

☐ IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE

TITLE OF PROPOSED PROJECT Predictability of Earth's Climate

REQUESTED AMOUNT	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE
$ 40,000	0 months		

CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW

☐ BEGINNING INVESTIGATOR (GPG I.G.2)
☐ DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C)
☐ PROPRIETARY & PRIVILEGED INFORMATION (GPG I.D, II.C.1.d)
☐ HISTORIC PLACES (GPG II.C.2.j)
☐ SMALL GRANT FOR EXPLOR. RESEARCH (SGER) (GPG II.D.1)
☐ VERTEBRATE ANIMALS (GPG II.D.6) IACUC App. Date _____
PHS Animal Welfare Assurance Number _____
☐ HUMAN SUBJECTS (GPG II.D.6) Human Subjects Assurance Number _____
Exemption Subsection _____ or IRB App. Date _____
☐ INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j)
☐ HIGH RESOLUTION GRAPHICS/OTHER GRAPHICS WHERE EXACT COLOR REPRESENTATION IS REQUIRED FOR PROPER INTERPRETATION (GPG I.G.1)

PI/PD DEPARTMENT
Center for Ocean-Land-Atmosphere Studies

PI/PD POSTAL ADDRESS
4041 Powder Mill Road, Suite 302
Beltsville, MD 20705
United States

PI/PD FAX NUMBER
301-595-9793

NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address
PI/PD NAME Jagadish Shukla	SC.D.	(b)(6)	301-595-7000	shukla@cola.iges.org
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				

Electronic Signature

SUMMARY PROPOSAL BUDGET

YEAR 5

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.	12	

ORGANIZATION: Institute of Global Environment and Society

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: Jagadish Shukla

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6)				
2. James L Kinter					
3. Edwin K Schneider					
4. Paul Schopf					
5. David M Straus					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PA					
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (4) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
Compute cluster upgrades	(b)(4)				
Peripheral equipment					
Storage network disks					
TOTAL EQUIPMENT				(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $	(b)(4)				
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS	TOTAL PARTICIPANT COSTS				
G. OTHER DIRECT COSTS				(b)(4)	
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
Ind. costs (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 1,608,000	$

M. COST SHARING PROPOSED LEVEL $ 0 AGREED LEVEL IF DIFFERENT $

PI/PD NAME: Jagadish Shukla

ORG. REP. NAME*: James Kinter

FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

* ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Rozell, Tracy L.

From: Young, Denise O.
Sent: Monday, November 06, 2006 11:25 AM
To: Rozell, Tracy L.
Cc: BFA DGA Awards; Rozell, Tracy L.; Fein, Jay S.
Subject: Award Id : 0332910, PI: Shukla

Dr. Jagadish Shukla
President
Institute of Global Environment
and Society, Inc.
4041 Powder Mill Road
Suite 302
Calverton, MD 20705

Notification of NSF Approval of Additional Funding Support

Award No.	ATM-0332910
Amendment No.	004
Release Date:	November 6, 2006
Released By:	Denise O. Young
Amount:	$1,457,000
New Expiration Date:	December 31, 2007

As authorized by the original award, the National Science Foundation hereby releases $1,457,000 for additional support of the award referenced above. The award, with this amendment, now totals $5,559,000 and will expire on December 31, 2007.

The attached budget indicates the amounts, by categories, on which NSF has based its support.

The award is subject to any special conditions applicable to the original grant and is subject to NSF Grant General Conditions (GC-1), dated 3/15/06 available at http://www.nsf.gov/awards/managing/general_conditions.jsp..

Any technical or programmatic questions regarding this notification should be addressed to the cognizant NSF Program Officer: Jay S. Fein, (703) 292-8527, jfein@nsf.gov.

Any award specific questions of an administrative or financial nature should be addressed to the NSF Grants Official at http://www.nsf.gov/bfa/dga/docs/liaison.pdf. The cognizant Grants Official can be identified by associating the three-letter division identifier in the above-referenced award number with the Grants Official for that division on the liaison website.

CFDA No:: 47.050
Email address:

ATM-0332910
004

SUMMARY PROPOSAL BUDGET

Person MOS	cal	acad	sumr	Funds granted By NSF
A. (3.00) Total Senior personnel	(b)(4) & (b)(6)			
B. Other Personnel				
1. (0.00) Post Doctoral associates				
2. (1.00) Other professionals				
3. (0.00) Graduate students				
4. (1.00) Secretarial-clerical				
5. (0.00) Undergraduate students				
6. (4.00) Other				
Total salaries and wages (A+B)				
C. Fringe benefits (if charged as direct cost)				
Total salaries wages and fringes (A+B+C)				(b) (4)
D. Total permanent equipment				
E. Travel				
1. Domestic				
2. Foreign				
F. Total participant support costs				
G. Other direct costs				
1. Materials and supplies				
2. Publication costs/page charges				
3. Consultant services				
4. Computer (ADPE) services				
5. Subcontracts				
6. Other				
Total other direct costs				
H. Total direct costs (A through G)				
I. Total indirect costs				
J. Total direct and indirect costs (H+I)				
K. Residual funds / Small business fee				
1. Residual funds (if for further support of current projects GPM 252 and 253)				
2. Small business fee				
L. Amount of this request (J) or (J-K1+K2)				$1,457,000
M. Cost sharing				$0

SUMMARY PROPOSAL BUDGET YEAR 4

ORGANIZATION Institute of Global Environment and Society			FOR NSF USE ONLY PROPOSAL NO. 0232910	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla			AWARD NO.	12	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI				(b)(4), (b)(6)	
2. James L Kinter					
3. Edwin K Schneider					
4. Paul Schopf					
5. David M Straus					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAG					
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (4) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
Compute cluster upgrades				(b)(4)	
Peripheral equipment					
Storage network disks					
TOTAL EQUIPMENT				(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL., CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $				(b)(4)	
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS			TOTAL PARTICIPANT COSTS		
G. OTHER DIRECT COSTS				(b)(4)	
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
Ind. costs (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 1,457,000	$
M. COST SHARING PROPOSED LEVEL $ 0			AGREED LEVEL IF DIFFERENT $		

PI/PD NAME	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
Jagadish Shukla	Date Checked	Date Of Rate Sheet	Initials - ORG
ORG. REP. NAME* James Kinter			

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

NATIONAL SCIENCE FOUNDATION
Grant Letter

Award:0332910 **PI Name:Shukla, Jagadish**

Award Date:	August 28, 2006
Grant No.	ATM-0332910
Amendment No.	003
Proposal No.	ATM-0631413

Dr. Jagadish Shukla
President
Institute of Global Environment
and Society, Inc.
4041 Powder Mill Road
Suite 302
Calverton, MD 20705

Dear Dr. Shukla:

The National Science Foundation hereby awards $20,000 to Institute of Global Environment and Society, Inc. for additional support described in the request for supplemental support.

This project, under the direction of Jagadish Shukla , is entitled:

"Predictability of Earth's Climate."

This award with this amendment totals $4,102,000 and expires December 31, 2006.

This grant is awarded pursuant to the authority of the National Science Foundation Act of 1950, as amended (42 U.S.C. 1861-75.) and is subject to NSF Grant General Conditions (GC-1), dated 3/15/06 available at http://www.nsf.gov/awards/managing/general_conditions.jsp..

Funds provided for participant support may not be diverted by the grantee to other categories of expense without the prior written approval of the cognizant NSF Program Officer.

Except as modified by this amendment, the grant conditions remain unchanged.

The attached budget indicates the amounts, by categories, on which NSF has based its support.

The cognizant NSF program official for this grant is Jay S. Fein (703) 292-8527.
The cognizant NSF grants official contact is Denise O. Young (703) 292-8216.

Sincerely,

Kathleen C. Baukin
Grants and Agreements Officer

CFDA No: 47.050

ATM-0332910
003

SUMMARY PROPOSAL BUDGET

Person MOS	cal	acad	sumr	Funds granted By NSF
A. (0.00) Total Senior personnel	0.00	0.00	0.00	$0
B. Other Personnel				
1. (0.00) Post Doctoral associates	0.00	0.00	0.00	$0
2. (0.00) Other professionals	0.00	0.00	0.00	$0
3. (0.00) Graduate students				$0
4. (0.00) Secretarial-clerical				$0
5. (0.00) Undergraduate students				$0
6. (0.00) Other				$0
Total salaries and wages (A+B)				$0
C. Fringe benefits (if charged as direct cost)				$0
Total salaries wages and fringes (A+B+C)				$0
D. Total permanent equipment				$0
E. Travel				
1. Domestic				$0
2. Foreign				$0
F. Total participant support costs				(b) (4)
G. Other direct costs				
1. Materials and supplies				
2. Publication costs/page charges				
3. Consultant services				
4. Computer (ADPE) services				
5. Subcontracts				
6. Other				
Total other direct costs				
H. Total direct costs (A through G)				
I. Total indirect costs				
J. Total direct and indirect costs (H+I)				
K. Residual funds / Small business fee				
1. Residual funds (if for further support of current projects GPM 252 and 253)				
2. Small business fee				
L. Amount of this request (J) or (J-K1+K2)				$20,000
M. Cost sharing				$0

ACTION PROCESSING FORM 8/10/06 DY

I. RECOMMENDED AWARD DATA

30. Proposal No.	31. Prev. Award No.	32. and 33. Submitting Inst. and Inst. Code		34. Rec. Award Istr.
ATM-0631413	0332910	Inst of Global Environ Soc	5300002833	CONT

35. Rec. Eff. Date	36. Award Dur.	37. Name of PI(s)/PD(s)	38. Rec. Natr of Award
08/15/2006	0	Shukla, Jagadish	SUPP

39. Title Predictability of Earth's Climate

FINANCIAL CODES

40.	Organization	Pgm. Element	Appr.	Obj. Class	Funded Amount	PO or Recommending Official	DD or Approving Official
	06020106	5740	0106	4110	$20,000		
1.	Pgm. Refs:	0000 1324 OTHR 2611 4444					
2.	Pgm. Refs:						
3.	Pgm. Refs:						
4.	Pgm. Refs:						
5.	Pgm. Refs:						
6.	Pgm. Refs:						
7.	Pgm. Refs:						
8.	Pgm. Refs:						

TOTAL RECOMMENDED AMOUNT * $20,000.00

41. Future Commitments

FY	FY	FY	FY

42. Special Certifications

☐ Human Subjects ☐ I.R.B. ☐ Exempt ☐ Vert. Animals ☐ IACUC

43. Foreign or International Implications

Type(s) of Implications (one or more)	Name of Country or World Region		Award $ for International
☐ 01. International Agreement Research	Code		
☐ 02. International Collaboration			
☐ 03. Research Outside the United States			
☐ 04. Education Outside the United States			
☐ 05. International Seminar or Workshop			
☐ 06. Travel to Int'l Scientific Conferences			
☐ 07. Other			

44. Signature of Managing Program Officer and Section Head (if Required) and Date	Managing Org
Jay S. Fein 08/09/06	06020106

45. Signature of Managing Division Director and Assistant Director (if Required) and Date
Jarvis L. Moyers 8/9/06

46. Division Funds Certification Signature (if Required) and Date 8/10/06

II. AWARD DATA (DGA USE ONLY)

47. Date of Award	48. Award No. (if different)	49. Award Amount (if different)	50. Cumulative Award
	A03		

51. Award Duration (if different)	52. Effective Date (if different)	53. Expiration Date	54. Submitting Inst. Code (if different)

55. Award Instrument	56. Natr of Awd (if different)	57. Type of Contract	58. DGA Initials and Date
CONT			dmy 8/10/06

59. Remarks

☐ _____ Month(s) No-Cost Extension From _____ To: _____ Mode of Support: RSRH
☐ Original NSF Abstract Still Valid
☐ P.I. Transfer
☐ Pre-College Curriculum

This is supplement to the 3rd year of a five-year continuing grant.

ACTION PROCESSING FORM

1. Proposal No.	2. Award	3. NSF Organization	4. Document Date
ATM-0631413		CLIMATE AND LARGE-SCALE DYNAMICS	08/09/2006

5. Award Istr	5A. Code	5. Award Istr	5A. Code	5B. Natr of Rqst	5C. Code	5B. Natr of Rqst	5C. Code	6. Req. Eff Date
CONT	2			SUPP	5			05/01/2006

7. Date Received	7. Date Received	8. Req. Dur.	8. Req. Dur.	9. Requested Amount	9. Requested Amount
04/18/2006		0		$20,000.00	

SUBMITTING INSTITUTION DATA		10 Digit Code
10. Submitting Inst. Code	5300002833	10.
10A. Name	Inst of Global Environ Soc	10A.
10B. Address 1	4041 Powder Mill Road, Suite 302	10B.
10C. Address 2		10C.
10D. City-State-Zip	Calverton MD 20705	10D.

NAME	PI/PD DATA	10 Digit Code
11. Shukla, Jagadish		11.
11A. Inst. Code	5300002833 Prior Support Y	11A.
11B. Address 1	Inst of Global Environ Soc	11B.
11C. Address 2	4041 Powder Mill Road, Suite 302	11C.
11D. Dept.	Center for Ocean-Land-Atmosphere Studies	11D.
11E. City-State-Zip	Beltsville MD 20705	11E.

NAME	CO-PI/PD DATA	
12.		12.
12A.		12A.
12B.		12B.
12C.		12C.

13. Title: Predictability of Earth's Climate — Pgm Annc:

13. Title:

14. Managing Organization	CLIMATE AND LARGE-SCALE DYNAMICS	Code 06020106	Code
15. Program Element	CLIMATE & LARGE-SCALE DYNAMICS	5740	
16. Object Class	RESEARCH GRANTS-NOT ELSEWH CLA	4110	

17. Program Reference Codes	0000	1324	EGCH	~~OTHR~~	4444					

18A. Site Visit Flag	19. Fields of Application	Code	Code
18B. Context Statement ID	Climate Related Activities	0319000	

20. % Basic Research	% Major Equipment	21. SBIR Topic ID	Instrumentation
100	0		0
% Applied Research	% Land, Bldg and Fixed Equip		
0	0		
% Education and Training	% Non-Investment Activities		
0	0		

22. Special Program Data Elements (10 Chars. max. In A-M, 8 chars. max. In N-Z; N-Z reserved for whole numbers only)

A:	B:	C:	D: 1976	E:	F:	G:
H:	I:	J:	K:	L:	M:	N:
O:	P:	Q:	R:	S:	T:	U:
V:	W:	X:	Y:	Z:		

NON-AWARD ACTION

23. Withdrawal	24.	25.	26.
☐ P.I./INSTITUTION INITIATED (20)	☐ DECLINATION (10)	☐ RETURNED WITHOUT REVIEW	☐ INAPPROPRIATE FOR NSF (3
☐ PROJECT FUNDED ELSEWHERE (21			

27. Signature, Program Officer	28. Date	29. Signature, Division Director	30. Date
Jay S. Fein		Jarvis L. Moyers	

NSF FORM 1038

Supplement

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE (if not in response to a program announcement/solicitation enter NSF 04-23)	FOR NSF USE ONLY
	NSF PROPOSAL NUMBER
FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)	0631413
ATM - CLIMATE & LARGE-SCALE DYNAMICS	

DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION
04/18/2006	10	06020000 ATM	5740	787160431	08/09/2006 12:12pm S

EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)	SHOW PREVIOUS AWARD NO. IF THIS IS ☐ A RENEWAL ☐ AN ACCOMPLISHMENT-BASED RENEWAL 0332910	IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES ☐ NO ☐ IF YES, LIST ACRONYM(S)

NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE	ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE
Institute of Global Environment and Society	Institute of Global Environment and Society 4041 Powder Mill Road Calverton, MD. 20705
AWARDEE ORGANIZATION CODE (IF KNOWN) 5308002833	
NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE	ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE
PERFORMING ORGANIZATION CODE (IF KNOWN)	

IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions) ☐ SMALL BUSINESS ☐ MINORITY BUSINESS ☐ IF THIS IS A PRELIMINARY PROPOSAL
☐ FOR-PROFIT ORGANIZATION ☐ WOMAN-OWNED BUSINESS THEN CHECK HERE

TITLE OF PROPOSED PROJECT Predictability of Earth's Climate

REQUESTED AMOUNT	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE
$ 20,000	0 months		

CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW
☐ BEGINNING INVESTIGATOR (GPG I.A)
☐ DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C)
☐ PROPRIETARY & PRIVILEGED INFORMATION (GPG I.B, II.C.1.d)
☐ HISTORIC PLACES (GPG II.C.2.j)
☐ SMALL GRANT FOR EXPLOR. RESEARCH (SGER) (GPG II.D.1)
☐ VERTEBRATE ANIMALS (GPG II.D.6) IACUC App. Date _____
☐ HUMAN SUBJECTS (GPG II.D.8)
Exemption Subsection _____ or IRB App. Date _____
☐ INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j)
☐ HIGH RESOLUTION GRAPHICS/OTHER GRAPHICS WHERE EXACT COLOR REPRESENTATION IS REQUIRED FOR PROPER INTERPRETATION (GPG I.G.1)

PI/PD DEPARTMENT	PI/PD POSTAL ADDRESS
Center for Ocean-Land-Atmosphere Studies	4041 Powder Mill Road, Suite 302 Beltsville, MD 20705 United States
PI/PD FAX NUMBER 301-595-9793	

NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address
PI/PD NAME Jagadish Shukla	SC.D.	(b)(6)	301-595-7000	shukla@cola.iges.org
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				

Electronic Signature

SUMMARY PROPOSAL BUDGET — YEAR 1

ORGANIZATION: Institute of Global Environment and Society				FOR NSF USE ONLY: PROPOSAL NO. 0631713	DURATION (months): Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: Jagadish Shukla				AWARD NO. 0332910	Ø	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.Y. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Jagadish Shukla - none	0.00	0.00	0.00	$ 0	$	
2.						
3.						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0		
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00	0		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES	0.00	0.00	0.00	0		
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0		
3. (0) GRADUATE STUDENTS				0		
4. (0) UNDERGRADUATE STUDENTS				0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6. (0) OTHER				0		
TOTAL SALARIES AND WAGES (A + B)				0		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				0		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				0		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)						
TOTAL EQUIPMENT				0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0		
2. FOREIGN				0		
F. PARTICIPANT SUPPORT COSTS (b)(4)						
1. STIPENDS $						
2. TRAVEL						
3. SUBSISTENCE						
4. OTHER						
TOTAL NUMBER OF PARTICIPANTS (b)(4) TOTAL PARTICIPANT COSTS				(b)(4)		
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect costs (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 20,000	$	
M. COST SHARING PROPOSED LEVEL $ Not Shown	AGREED LEVEL IF DIFFERENT $					

PI/PD NAME: Jagadish Shukla	FOR NSF USE ONLY: INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*: James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Proposal for a Workshop on Correcting Tropical Biases on Coupled Climate Models

Justification

All funds are to be used for travel support and costs associated with the workshop. COLA will bear all administrative costs associated with planning and logistics for the workshop. A table showing the costs is given below.

(b) (4) [redacted]

	Persons	Per person	Total
Participant Costs			
Domestic Travelers	20		
Foreign Travelers	1		
Sub-total			
Workshop Logistics			
Meeting Room			
Breakfasts (2)	40		
Lunches (2)	40		
Breaks (3)			
Dinner (1)	30		
Supplies	40		
Sub-total			
Total Direct Costs			
Indirect Costs (b)(4)			
Total Costs (rounded)			
Cost Sharing			
Total Cost to Agencies			$20,000

(b) (4) [redacted]

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION	FOR NSF USE ONLY		
Institute of Global Environment and Society	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - none	0.00	0.00	0.00	$ 0	$
2.					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00	0	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES	0.00	0.00	0.00	0	
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0	
3. (0) GRADUATE STUDENTS				0	
4. (0) UNDERGRADUATE STUDENTS				0	
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (0) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				0	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				0	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				0	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS (b)(4)					
1. STIPENDS $					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS	TOTAL PARTICIPANT COSTS			(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 28,000	$
M. COST SHARING PROPOSED LEVEL $ Not Shown	AGREED LEVEL IF DIFFERENT $				

PI/PD NAME	FOR NSF USE ONLY		
Jagadish Shukla	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
James Kinter			

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

NATIONAL SCIENCE FOUNDATION
Grant Letter

Dr. Jagadish Shukla
President
Institute of Global Environment
and Society, Inc.
4041 Powder Mill Road
Suite 302
Calverton, MD 20705

Notification of NSF Approval of Additional Funding Support

Award No.	ATM-0332910
Amendment No.	002
Release Date:	February 9, 2006
Released By:	Denise O. Young
Amount:	$1,408,000
New Expiration Date:	December 31, 2006

As authorized by the original award, the National Science Foundation hereby releases $1,408,000 for additional support of the award referenced above. The award, with this amendment, now totals $4,082,000 and will expire on December 31, 2006.

The attached budget indicates the amounts, by categories, on which NSF has based its support.

The award is subject to any special conditions applicable to the original grant and is subject to NSF Grant General Conditions (GC-1), dated 6/15/05 available at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gc1605.

Any technical or programmatic questions regarding this notification should be addressed to the cognizant NSF Program Officer: Jay S. Fein, (703) 292-8527, jfein@nsf.gov.

Any award specific questions of an administrative or financial nature should be addressed to the NSF Grants Official at http://www.nsf.gov/bfa/dga/docs/liaison.pdf. The cognizant Grants Official can be identified by associating the three-letter division identifier in the above-referenced award number with the Grants Official for that division on the liaison website.

CFDA No::	47.050
Email address:	

NATIONAL SCIENCE FOUNDATION
Grant Letter

ATM-0332910
002

SUMMARY PROPOSAL BUDGET

Person MOS	cal	acad	sumr	Funds granted By NSF
A. (3.00) Total Senior personnel	(b)(4) & (b)(6)			
B. Other Personnel				
1. (0.00) Post Doctoral associates				
2. (1.00) Other professionals				
3. (0.00) Graduate students				
4. (1.00) Secretarial-clerical				
5. (0.00) Undergraduate students				
6. (4.00) Other				
Total salaries and wages (A+B)				
C. Fringe benefits (if charged as direct cost				
Total salaries wages and fringes (A+B+C)				(b) (4)
D. Total permanent equipment				
E. Travel				
1. Domestic				
2. Foreign				
F. Total participant support costs				
G. Other direct costs				
1. Materials and supplies				
2. Publication costs/page charges				
3. Consultant services				
4. Computer (ADPE) services				
5. Subcontracts				
6. Other				
Total other direct costs				
H. Total direct costs (A through G)				
I. Total indirect costs				
J. Total direct and indirect costs (H+I)				
K. Residual funds / Small business fee				
1. Residual funds (if for further support of current projects GPM 252 and 253)				
2. Small business fee				
L. Amount of this request (J) or (J-K1+K2)				$1,408,000
M. Cost sharing				$0

Huang, Pei-Chiung (Anne)

From: Rozell, Tracy L.
Sent: Monday, December 20, 2004 1:13 PM
To: Huang, Pei-Chiung (Anne)
Subject: FW: Award Id : 0332910, PI: Shukla

-----Original Message-----
From: doyoung@nsf.gov [mailto:doyoung@nsf.gov]
Sent: Monday, December 20, 2004 11:50 AM
To: trozell@nsf.gov
Cc: dgaawd@nsf.gov; trozell@nsf.gov; jfein@nsf.gov
Subject: Award Id : 0332910, PI: Shukla

Dr. Jagadish Shukla
President
Institute of Global Environment
and Society, Inc.
4041 Powder Mill Road
Suite 302
Calverton, MD 20705

Notification of NSF Approval of Additional Funding Support

Award No.	ATM-0332910
Amendment No.	001
Release Date:	December 20, 2004
Released By:	Denise O. Young
Amount:	$1,360,000
New Expiration Date:	December 31, 2005

As authorized by the original award, the National Science Foundation hereby releases $1,360,000 for additional support of the award referenced above. The award, with this amendment, now totals $2,674,000 and will expire on December 31, 2005.

The attached budget indicates the amounts, by categories, on which NSF has based its support.

This additional support is awarded pursuant to the authority of the National Science Foundation Act of 1950, as amended (42 U.S.C. 1861-75.) and is subject to NSF Grant General Conditions (GC-1), dated 07/02 available at http://www.nsf.gov/home/grants/grants_gac.htm. and any special conditions applicable to the original grant.

Any technical or programmatic questions regarding this notification should be addressed to the cognizant NSF Program Officer: Jay S. Fein, (703) 292-8527, jfein@nsf.gov.

Any award specific questions of an administrative or financial nature should be addressed to the NSF Grants Official at http://www.nsf.gov/bfa/dga/liaison.htm. The cognizant Grants Official can be identified by associating the three-letter division identifier in the above-referenced award number with the Grants Official for that division on the liaison website.

CFDA No:: 47.050
Email address:

ATM-0332910
001

SUMMARY PROPOSAL BUDGET

Person MOS	Funds requested By proposer	Funds granted By NSF
A. (3.00) Total Senior personnel	[redacted]	
B. Other Personnel		
1. (0.00) Post Doctoral associates		
2. (1.00) Other professionals		
3. (0.00) Graduate students		
4. (1.00) Secretarial-clerical		
5. (0.00) Undergraduate students		
6. (4.00) Other		
Total salaries and wages (A+B)		
C. Fringe benefits (if charged as direct cost		
Total salaries wages and fringes (A+B+C)		
D. Total permanent equipment	[redacted]	
E. Travel		
1. Domestic		
2. Foreign		
F. Total participant support costs		
G. Other direct costs		
1. Materials and supplies		
2. Publication costs/page charges		
3. Consultant services		
4. Computer (ADPE) services		
5. Subcontracts		
6. Other		
Total other direct costs		
H. Total direct costs (A through G)		
I. Total indirect costs		
J. Total direct and indirect costs (H+I)		
K. Residual funds / Small business fee		
1. Residual funds (if for further support of current projects GPM 252 and 253)		
2. Small business fee		
L. Amount of this request (J) or (J-K1+K2)		$1,360,000
M. Cost sharing		$0

(b)(4) & (b)(6)

(b) (4)

YEAR 3

SUMMARY PROPOSAL BUDGET

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months)	
	Proposed	Granted
AWARD NO.	12	

ORGANIZATION
Institute of Global Environment and Society

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Jagadish Shukla

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6) [redacted]				
2. James L Kinter					
3. Edwin K Schneider					
4. Paul Schopf					
5. David M Straus					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)					
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (4) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
Compute cluster upgrades	(b)(4) [redacted]				
Peripheral equipment					
Storage network disks					
TOTAL EQUIPMENT				(b)(4) [redacted]	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ (b)(4) [redacted]					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS — TOTAL PARTICIPANT COSTS				(b)(4) [redacted]	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
Ind. costs (b)(4) [redacted]					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.J.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 1,408,000	$
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $				

PI/PD NAME	FOR NSF USE ONLY		
Jagadish Shukla	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
James Kinter			

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET YEAR 2

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed / Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla				AWARD NO.	12 /
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI				(b)(4), (b)(6)	
2. James L Kinter					
3. Edwin K Schneider					
4. Paul Schopf					
5. David M Straus					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION (					
7. (2 /) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, E					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (4) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
Compute cluster upgrades Peripheral equipment Storage network disks				(b)(4)	
TOTAL EQUIPMENT				(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $				(b)(4)	
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS				TOTAL PARTICIPANT COSTS	
G. OTHER DIRECT COSTS				(b)(4)	
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BAS				(b)(4)	
Ind. costs (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 1,360,000	$
M. COST SHARING PROPOSED LEVEL $ 0				AGREED LEVEL IF DIFFERENT $	

PI/PD NAME Jagadish Shukla	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD. ARLINGTON, VIRGINIA 22230

Award Date: March 17, 2004
Award No. ATM-0332910
Proposal No. ATM-0332910

Dr. Jagadish Shukla
President
Institute of Global Environment
and Society, Inc.
4041 Powder Mill Road
Suite 302
Calverton, MD 20705

Dear Dr. Shukla:

The National Science Foundation hereby awards a grant of $1,314,000 to Institute of Global Environment and Society, Inc. for support of the project described in the proposal referenced above as modified by revised budget dated November 7, 2003 and NSF to apply the indirect cost rate negotiated with IGES.

This project, entitled "Predictability of Earth's Climate," is under your direction .

This award is effective January 1 , 2004 and expires December 31, 2004.

This is a continuing grant which has been approved on scientific / technical merit for approximately 5 years. Contingent on the availability of funds and the scientific progress of the project, NSF expects to continue support at approximately the following level:

FY 2005	$1,360,000
FY 2006	$1,408,000
FY 2007	$1,457,000
FY 2008	$1,508,000

This grant is awarded pursuant to the authority of the National Science Foundation Act of 1950, as amended (42 U.S.C. 1861-75) and is subject to NSF Grant General Conditions (GC-1), dated 07/02 .

Funds provided for participant support may not be diverted by the grantee to other categories of expense without the prior written approval of the cognizant NSF Program Officer.

The Foundation authorizes the awardee to enter into the proposed contractual arrangements and to fund such arrangements with award funds up to the amount indicated in the approved budget. Such contractual arrangements should contain appropriate provisions consistent with Articles 8.a.3 and 9 of the NSF Grant General Conditions (GC-1)(dated 07/02) or Section 5 of the FDP IV General Terms and Conditions (dated 10/01/02) and any special conditions included in this award.

All materials produced as part of this project, including electronic components such as World Wide Web pages, must include a clear indication of source(s) of support (both NSF and any other contributors.)

The amount granted includes an indirect cost allowance at the rate of (b) (4) total direct costs excluding capital expenditures, participant support and subcontract costs other than the direct subcontract costs associated with the George Mason University subaward, as specified in the approved budget. This is a predetermined fixed rate(s) and any adjustments are subject to the provisions of NSF Grant Policy Manual Section 633.1.b.2.

The attached budget indicates the amounts, by categories, on which NSF has based its support.

The cognizant NSF program official for this grant is Jay S. Fein, (703) 292-8527. The cognizant NSF grants official contact is Alfred W. Wilson, (703) 292-8218.

Sincerely,

Anne C. Doyle
Grants and Agreements Officer

CFDA No. 47.050

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD, ARLINGTON, VIRGINIA 22230

ATM-0332910
000

SUMMARY PROPOSAL BUDGET

	Person MOS cal	Person MOS acad	Person MOS sumr	Funds granted By NSF
A. (3.00) Total Senior personnel	(b)(4) & (b)(6)			
B. Other Personnel				
1. (0.00) Post Doctoral associates				
2. (1.00) Other professionals				
3. (0.00) Graduate students				
4. (1.00) Secretarial-clerical				
5. (0.00) Undergraduate students				
6. (4.00) Other				
Total salaries and wages (A+B)				
C. Fringe benefits (if charged as direct				
Total salaries wages and fringe				(b) (4)
D. Total permanent equipment				
E. Travel				
1. Domestic				
2. Foreign				
F. Total participant support costs				
G. Other direct costs				
1. Materials and supplies				
2. Publication costs/page charges				
3. Consultant services				
4. Computer (ADPE) services				
5. Subcontracts				
6. Other				
Total other direct costs				
H. Total direct costs (A through G)				
I. Total Indirect costs				
J. Total direct and indirect costs (H+I)				$1,314,000
K. Residual funds / Small business fee				
1. Residual funds (if for further support of current projects GPM 252 and 253)				
2. Small business fee				$0
L. Amount of this request (J) or (J-K1+K2)				
M. Cost sharing				

ACTION PROCESSING FORM 11/19/03 AWV

I. RECOMMENDED AWARD DATA

30. Proposal No.	31. Prev. Award No.	32. and 33. Submitting Inst. and Inst. Code		34. Rec. Award Istr.
ATM-0332910		Inst of Global Environ Soc	5300002833	CONT

35. Rec. Eff. Date	36. Award Dur.	37. Name of PI(s)/PD(s)	38. Rec. Natr of Award
01/01/2004	12	Shukla, Jagadish	NEW

39. Title Predictability of Earth's Climate

FINANCIAL CODES

40.	Organization	Pgm. Element	Appr.	Obj. Class	Funded Amount	PO or Recommending Official	DD or Approving Official
1.	06020106	5740	0104	4110	$1,064,000		
	Pgm. Refs:	1324 4444 EGCH					
2.	06020107	1527	0104	4110	$250,000	Lydia Bates	
	Pgm. Refs:	1324 4444 EGCH					
3.	Pgm. Refs:						
4.	Pgm. Refs:						
5.	Pgm. Refs:						
6.	Pgm. Refs:						
7.	Pgm. Refs:						
8.	Pgm. Refs:						

TOTAL RECOMMENDED AMOUNT * $1,314,000.00

41. Future Commitments

FY 2005 $1,360,000.00	FY 2006 $1,408,000.00	FY 2007 $1,457,000.00	FY 2008 $1,508,000.00

42. Special Certifications	Human Subjects	Vert. Animals	
	I.R.B. Exempt	IACUC	

43. Foreign or International Implications

Type(s) of Implications (one or more)	Name of Country or World Region		Award $ for International
☐ 01. International Agreement Research	Code		$120,000
☐ 02. International Collaboration	XX	Worldwide	
☐ 03. Research Outside the United States			
☐ 04. Education Outside the United States			
☐ 05. International Seminar or Workshop			
☑ 06. Travel to Int'l Scientific Conferences			
☐ 07. Other			

44. Signature of Managing Program Officer and Section Head (if Required) and Date
Jay S. Fein 11/12/03 11/18/03 Managing Org 06020106

45. Signature of Managing Division Director and Assistant Director (if Required) and Date
Jarvis L. Moyers 11/17/03

46. Division Funds Certification Signature (if Required) and Date
11/18/03

II. AWARD DATA (DGA USE ONLY)

47. Date of Award	48. Award No. (if different)	49. Award Amount (if different)	50. Cumulative Award

51. Award Duration (if different)	52. Effective Date (if different)	53. Expiration Date	54. Submitting Inst. Code (if different)

55. Award Instrument	56. Natr of Awd (if different)	57. Type of Contract	58. DGA Initials and Date
CONT			

59. Remarks

☐ _____ Month(s) No-Cost Extension From 0 Mode of Support: RSRH
☐ Original NSF Abstract Still Valid This is the first year of a five-year continuing grant.
☐ P.I. Transfer
☐ Pre-College Curriculum

ACTION PROCESSING FORM

1. Proposal No.	2. Award	3. NSF Organization	4. Document Date
ATM-0332910		CLIMATE DYNAMICS PROGRAM	10/21/2003

5. Award Istr	5A. Code	5. Award Istr	5A. Code	5B. Natr of Rqst	5C. Code	5B. Natr of Rqst	5C. Code	6. Req. Eff Date
CONT	2			NEW	1			01/01/2004

7. Date Received	7. Date Received	8. Req. Dur.	8. Req. Dur.	9. Requested Amount	9. Requested Amount
04/12/2003		60		$15,266,000.00	

SUBMITTING INSTITUTION DATA		10 Digit Code
10. Submitting Inst. Code	5300002833	10.
10A. Name	Inst of Global Environ Soc	10A.
10B. Address 1	4041 Powder Mill Road, Suite 302	10B.
10C. Address 2		10C.
10D. City-State-Zip	Calverton MD 20705	10D.

NAME	PI/PD DATA	10 Digit Code
11. Shukla, Jagadish		11.
11A. Inst. Code	5300002833 Prior Support Y	11A.
11B. Address 1	Inst of Global Environ Soc	11B.
11C. Address 2	4041 Powder Mill Road, Suite 302	11C.
11D. Dept.	Center for Ocean-Land-Atmosphere Studies	11D.
11E. City-State-Zip	Beltsville MD 20705	11E.

NAME	CO-PI/PD DATA	
12.		12.
12A.		12A.
12B.		12B.
12C.		12C.

13. Title: Predictability of Earth's Climate

Pgm Annc: NSF 03-2

13. Title:

14. Managing Organization	CLIMATE DYNAMICS PROGRAM	Code 05020108	Code
15. Program Element	CLIMATE DYNAMICS PROGRAM	5740	
16. Object Class	RESEARCH GRANTS-NOT ELSEWH CLA	4110	

17. Program Reference Codes	1324	4444	EGCH							

18A. Site Visit Flag		19. Fields of Application	Code	Code
18B. Context Statement ID		Climate Related Activities	0319000	
20. % Basic Research	% Major Equipment			
100	0			
% Applied Research	% Land, Bldg and Fixed Equip			
0	0			
% Education and Training	% Non-Investment Activities	21. SBIR Topic ID	Instrumentation	
0	0		375,000	

22. Special Program Data Elements (10 Chars. max. in A-M, 8 chars. max. in N-Z; N-Z reserved for whole numbers only)

A:	B:	C:	D: 1976	E:	F:	G:
H:	I:	J:	K:	L:	M:	N:
O:	P:	Q:	R:	S:	T:	U:
V:	W:	X:	Y:	Z:		

NON-AWARD ACTION

23. Withdrawal	24.	25.	26.
P.I./INSTITUTION INITIATED (20; PROJECT FUNDED ELSEWHERE (21	☐ DECLINATION (10)	☐ RETURNED WITHOUT REVIEW	☐ INAPPROPRIATE FOR NSF (3

27. Signature, Program Officer	28. Date	29. Signature, Division Director	30. Date
Jay S. Fein		Jarvis L. Moyers	

NSF FORM 1036

SUMMARY PROPOSAL BUDGET — YEAR 1

FOR NSF USE ONLY		
PROPOSAL NO. 0332910	DURATION (months) Proposed	Granted
AWARD NO.	12	

ORGANIZATION: Institute of Global Environment and Society

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: Jagadish Shukla

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By Proposer	Funds Granted by NSF (if different)
1. Jagadish Shukla - PI				(b)(4), (b)(6)	
2. James L Kinter					
3. Edwin K Schneider					
4. Paul Schopf					
5. David M Straus					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAG					
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
Compute cluster upgrades				(b)(4)	
Peripheral equipment					
Storage network disks					
TOTAL EQUIPMENT				(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $				(b)(4)	
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS	TOTAL PARTICIPANT COSTS				
G. OTHER DIRECT COSTS				(b)(4)	
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BA				(b)(4)	
Ind. costs (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SE GPG II.C.6.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 1,314,000	$

M. COST SHARING PROPOSED LEVEL $ 0 | AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY
Jagadish Shukla	INDIRECT COST RATE VERIFICATION
ORG. REP. NAME*	Date Checked | Dat G Rate Sheet | Initials - ORG
James Kinter	

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Revised Proposal Budget Revision # 2 for 0332910 Submitted On Nov 7 2003 4:08PM Electronic Signature

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	 Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.Y. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Jagadish Shukla - PI				(b)(4), (b)(6)		
2. James L Kinter						
3. Edwin K Schneider						
4. Paul Schopf						
5. David M Straus						
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION						
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES						
2. (5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, E						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (5) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (20) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)				(b)(4)		
TOTAL EQUIPMENT				(b)(4)		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS $				(b)(4)		
2. TRAVEL						
3. SUBSISTENCE						
4. OTHER						
TOTAL NUMBER OF PARTICIPANTS				TOTAL PARTICIPANT COSTS		
G. OTHER DIRECT COSTS				(b)(4)		
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 7,007,000	$	
M. COST SHARING PROPOSED LEVEL $ 0				AGREED LEVEL IF DIFFERENT $		

PI/PD NAME Jagadish Shukla	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget Impact Statement

This proposal is to be funded jointly by the NSF, NOAA and NASA. The original budget submitted with this proposal was for the total cost of the project, to be borne by the three agencies together. The total amount was used, because the review was conducted by the NSF on behalf of the three agencies, NSF, NOAA and NASA. The budget revision is to separate the NSF budget from the total. The other two agencies will provide funding through their own agency mechanisms. There is no anticipated impact on the NSF research to be conducted unless NOAA and/or NASA provide less than that requested of them. In that event, we will talk to the NSF program director about NSF priorities and adjust them accordingly.

Please note that to determine the modified direct costs used in calculating the indirect costs, the equipment and participant costs have been excluded from the total. In place of the total amount of the GMU sub-award, the direct costs of salaries and fringe benefits of those individuals with joint COLA-GMU appointments and the graduate students were included in the modified direct costs. The indirect costs charged by GMU on the subcontract were specifically excluded from the determination of the base amount. This determination is in accordance with prior guidance received from NSF as per the letter from the Chief of the Cost Analysis and Audit Resolution Branch of the NSF (dated 15 April 2003).

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION	FOR NSF USE ONLY		
GEORGE MASON UNIVERSITY	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Edwin K Schneider			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Edwin K Schneider - PI	(b)(4), (b)(6)				
2. James L Kinter					
3. David M Straus					
4.					
5.					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION P					
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ET					
3. (3) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (3) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS				(b)(4)	
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
Off-campus (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 410,380	$

M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY		
Edwin K Schneider	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
James Kinter			

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET YEAR 2

ORGANIZATION	FOR NSF USE ONLY		
GEORGE MASON UNIVERSITY	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Edwin K Schneider			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Edwin K Schneider - PI	(b)(4), (b)(6)				
2. James L Kinter					
3. David M Straus					
4.					
5.					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PA					
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC					
3. (3) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (3) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Off-campus (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.8.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 494,064	$

(b)(4)

M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY		
Edwin K Schneider	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
James Kinter			

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET YEAR 3

ORGANIZATION GEORGE MASON UNIVERSITY				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Edwin K Schneider				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Edwin K Schneider - PI	(b)(4), (b)(6)					
2. James L Kinter						
3. David M Straus						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE						
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES						
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. (3) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (3) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)						
TOTAL EQUIPMENT				0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0		
2. FOREIGN				0		
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS $ 0						
2. TRAVEL 0						
3. SUBSISTENCE 0						
4. OTHER 0						
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						
G. OTHER DIRECT COSTS				(b)(4)		
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Off-campus (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 602,959	$	
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $					

PI/PD NAME Edwin K Schneider	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET YEAR 4

ORGANIZATION	FOR NSF USE ONLY		
GEORGE MASON UNIVERSITY	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Edwin K Schneider			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Edwin K Schneider - PI	(b)(4), (b)(6)				
2. James L Kinter					
3. David M Straus					
4.					
5.					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAG					
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (3) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (3) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Off-campus (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 512,012	$

(b)(4)

M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY		
Edwin K Schneider	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
James Kinter			

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET YEAR 5

ORGANIZATION GEORGE MASON UNIVERSITY				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	 Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Edwin K Schneider				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	 ACAD	 SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Edwin K Schneider - PI				(b)(4), (b)(6)		
2. James L Kinter						
3. David M Straus						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PA						
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES						
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC						
3. (3) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (3) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)						
TOTAL EQUIPMENT				0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0		
2. FOREIGN				0		
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS $ 0						
2. TRAVEL 0						
3. SUBSISTENCE 0						
4. OTHER 0						
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)		
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Off-campus (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 521,228	$	
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $					

PI/PD NAME Edwin K Schneider	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION	FOR NSF USE ONLY		
GEORGE MASON UNIVERSITY	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Edwin K Schnelder			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Edwin K Schnelder - PI					
2. James L Kinter					
3. David M Straus					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICA					
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMM					
3. (16) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (15) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.8.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 2,440,643	$

(b)(4), (b)(6) [redacted]

(b)(4) [redacted]

M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
Edwin K Schnelder	Date Checked	Date Of Rate Sheet	Initials - ORG
ORG. REP. NAME* James Kinter			

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Institute of Global Environment and Society, Inc.

6 May 2003

Dr. Jay S. Fein
Division of Atmospheric Sciences
National Science Foundation
Room 775
National Science Foundation
4201 Wilson Boulevard
Arlington VA 22230

Subject: NSF Proposal 0332910 – "Predictability of Earth's Climate"

Dear Dr. Fein, Jay

Please find enclosed two letters from George Mason University documenting GMU's support for and intent to participate in the above-referenced proposal for the COLA "omnibus" grant for 2004-2008.

The first letter, from Dr. Menas Kafatos, Dean of the GMU School of Computational Sciences, and Dr. Edwin Schneider, who will act as principal investigator for the GMU portion of the proposed work, was included electronically with the FastLane submission. We are sending you the signed original for your files.

The second letter, from Dr. Alan Merten, President of GMU, formally expresses the same intent and documents the legal obligations under which GMU will operate with respect to the sub-award. This letter is also for your files, although it was not included electronically in the FastLane submission.

Please let me know if you have any questions about either of these letters. Thank you.

Sincerely,

J. Shukla
Principal Investigator

James L. Kinter III
Executive Director

4041 Powder Mill Road, Suite 302, Calverton, MD 20705-3106
Telephone: (301) 595-7000 / Fax (301) 595-9793

George Mason University

SCS / SCHOOL OF COMPUTATIONAL SCIENCES

9 April 2003

Dr. J. Shukla
Center for Ocean-Land-Atmosphere Studies
4041 Powder Mill Road, Suite 302
Calverton, MD 20705

Dear Dr. Shukla,

We are pleased to participate in the unsolicited research proposal entitled, "Predictability of the Earth's Climate," that the Center for Ocean-Land-Atmosphere Studies (COLA) is submitting to the National Science Foundation, National Oceanic and Atmospheric Administration and National Aeronautics and Space Administration for the 2004-2008 period. We completely endorse the project, which is described in this proposal, and we hereby agree to participate at the level indicated and according to the budget enclosed.

The project has the potential to significantly advance our quantitative understanding of the realizable predictability of the total climate system on seasonal to decadal time scales. We are committed to maintain the high level of research excellence and scholarship that has been a hallmark of COLA research in the past. The new Climate Dynamics Ph.D. Program at George Mason University (GMU) will provide the educational complement to that research that will serve to train the next generation of climate modelers.

As indicated on the attached budget, the component of this project that will be administered by GMU will support six members of the Climate Dynamics faculty (Profs. DelSole, Huang, Kinter, Kirtman, Schneider and Straus) for (b)(4) & (b)(6) academic year as well as three full-time graduate research assistants (GRA). The University will provide support for the othe(b)(4) & (b)(6) academic year for these faculty members. In addition, three additional GRAs will be provided to students in the Climate Dynamics Program by GMU under the High Potential Graduate Research Assistantship Program.

We anticipate that the combination of COLA research and GMU education will make important contributions to quantifying climate predictability and will quickly become the premier Ph.D. program in climate dynamics in the Nation. We look forward to this exciting prospect.

Sincerely,

Edwin K. Schneider, Professor, Climate Dynamics Program
Menas Kafatos, Dean, School of Computational Sciences

Office of the Dean, 103 Science and Technology I, Fairfax, VA 22030-4444
Phone: 703/993-1990 Fax: 703/993-1980

George Mason University

Fairfax, Virginia 22030-4444

April 11, 2003

Dr. James Kinter, Executive Director
Center for Ocean-Land-Atmosphere Studies
4041 Powder Mill Road, Suite 302
Calverton, MD 20705

Dear Dr. Kinter:

George Mason University (GMU) looks forward to cooperating with the Institute of Global Environment and Society on your proposal. Dr. Edwin Schneider, School of Computational Sciences, is the principal investigator for the University subcontract component of the project.

GMU understands that any subcontract resulting from this proposal will include those clauses required by the prime contract, all clauses required by law on the date of execution of the subcontract, and any other mutually agreeable clauses, terms and conditions except those inconsistent with OMB Circular A-110 (Grants and Agreements with Institutions of Higher Education, etc.) and OMB Circular A-21 (Cost Principles for Educational Institutions), or those not allowed by Virginia state law.

In accordance with OMB Circular A-21, cost reimbursement and fixed price contracts are the appropriate contract vehicles for institutions of higher education. Since not all government-contracting officers are experienced in contracting with universities, GMU requests that the GMU Office of Sponsored Programs be notified should negotiations begin with the government regarding an award of a contract. Notification of GMU during initial negotiations will ensure that the contract contains appropriate clauses for universities and that the execution of a subsequent subcontract is facilitated.

For questions regarding the technical proposal, please feel free to contact Dr. Schneider at (301) 595-7000. Any questions regarding budget or university policies and procedures should be directed to Joanne Carter, Grants Administrator, Office of Sponsored Programs, at 703/993-2976.

Sincerely,

Dr. Alan Merten
President
George Mason University

Enclosures

cc: Dr. E. Schneider

SUMMARY PROPOSAL BUDGET YEAR 1

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Jagadish Shukla - PI				(b)(4), (b)(6)		
2. James L Kinter						
3. Edwin K Schneider						
4. Paul Schopf						
5. David M Straus						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATIO						
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES						
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER,						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (4) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) Compute cluster upgrades Peripheral equipment Storage network disks				(b)(4)		
TOTAL EQUIPMENT				(b)(4)		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ 2. TRAVEL 3. SUBSISTENCE 4. OTHER				(b)(4)		
TOTAL NUMBER OF PARTICIPANTS				TOTAL PARTICIPANT COSTS	(b)(4)	
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Ind. costs (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					$ 1,313,999	$
M. COST SHARING PROPOSED LEVEL $ 0				AGREED LEVEL IF DIFFERENT $		

PI/PD NAME Jagadish Shukla	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Revised Proposal Budget Revision # 1 for 0332910 Submitted On Oct 21 2003 10:09AM Electronic Signature

SUMMARY PROPOSAL BUDGET YEAR 2

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	 Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	 ACAD	 SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Jagadish Shukla - PI	(b)(4), (b)(6)					
2. James L Kinter						
3. Edwin K Schneider						
4. Paul Schopf						
5. David M Straus						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAG						
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES						
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (4) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) Compute cluster upgrades Peripheral equipment Storage network disks	(b)(4)					
TOTAL EQUIPMENT				(b)(4)		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ 2. TRAVEL 3. SUBSISTENCE 4. OTHER	(b)(4)					
TOTAL NUMBER OF PARTICIPANTS		TOTAL PARTICIPANT COSTS				
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Ind. costs (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 1,360,000	$	
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $					

PI/PD NAME Jagadish Shukla	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET YEAR 3

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Jagadish Shukla - PI	(b)(4), (b)(6)					
2. James L Kinter						
3. Edwin K Schneider						
4. Paul Schopf						
5. David M Straus						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAG						
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES						
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (4) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) Compute cluster upgrades Peripheral equipment Storage network disks				(b)(4)		
TOTAL EQUIPMENT				(b)(4)		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ 2. TRAVEL 3. SUBSISTENCE 4. OTHER				(b)(4)		
TOTAL NUMBER OF PARTICIPANTS				TOTAL PARTICIPANT COSTS	(b)(4)	
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Ind. costs (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 1,407,899	$	
M. COST SHARING PROPOSED LEVEL $ 0				AGREED LEVEL IF DIFFERENT $		
PI/PD NAME Jagadish Shukla				FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter				Date Checked	Date Of Rate Sheet	Initials - ORG

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION Institute of Global Environment and Society	FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla	AWARD NO.				
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6) [redacted]				$
2. James L Kinter					
3. Edwin K Schneider					
4. Paul Schopf					
5. David M Straus					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PA[redacted]					
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (4) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING [redacted] Compute cluster upgrades Peripheral equipment Storage network disks	(b)(4) [redacted]				
TOTAL EQUIPMENT				(b)(4) [redacted]	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS (b)(4) [redacted] 1. STIPENDS $ 2. TRAVEL 3. SUBSISTENCE 4. OTHER					
TOTAL NUMBER OF PARTICIPANTS TOTAL PARTICIPANT COSTS				(b)(4) [redacted]	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Ind. costs (b)(4) [redacted])					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 1,457,000	$
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $				
PI/PD NAME Jagadish Shukla	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION				
ORG. REP. NAME* James kinter	Date Checked	Date Of Rate Sheet	Initials - ORG		

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET YEAR 5

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	 Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Jagadish Shukla - PI	(b)(4), (b)(6)					
2. James L Kinter						
3. Edwin K Schneider						
4. Paul Schopf						
5. David M Straus						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE						
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES						
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (4) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)						
Compute cluster upgrades Peripheral equipment Storage network disks				(b)(4)		
TOTAL EQUIPMENT						
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				(b)(4)		
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS $						
2. TRAVEL						
3. SUBSISTENCE						
4. OTHER						
TOTAL NUMBER OF PARTICIPANTS (b)(4) TOTAL PARTICIPANT COSTS						
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
Ind. costs (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 1,608,000	$	
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $					

PI/PD NAME Jagadish Shukla	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

* ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION	FOR NSF USE ONLY		
Institute of Global Environment and Society	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla	AWARD NO.		

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4). (b)(6)				
2. James L Kinter					
3. Edwin K Schneider					
4. Paul Schopf					
5. David M Straus					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAG					
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (5) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (20) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)				(b)(4)	
TOTAL EQUIPMENT				(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ (b)(4)					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 7,046,998	$
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $				

PI/PD NAME	FOR NSF USE ONLY		
Jagadish Shukla	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
James Kinter			

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget Impact Statement

This proposal is to be funded jointly by the NSF, NOAA and NASA. The original budget submitted with this proposal was for the total cost of the project, to be borne by the three agencies together. The total amount was used, because the review was conducted by the NSF on behalf of the three agencies, NSF, NOAA and NASA. The budget revision is to separate the NSF budget from the total. The other two agencies will provide funding through their own agency mechanisms. There is no anticipated impact on the NSF research to be conducted unless NASA and/or NOAA provide less than that requested of them. In that event, we will talk to the NSF program director about NSF priorities and adjust accordingly.

Please note that to determine the modified direct costs used in calculating the indirect costs, the equipment and participant costs have been excluded from the total. In place of the total amount of the GMU sub-award, the direct costs of the salaries and fringe benefits of those individuals with joint COLA-GMU appointments and the graduate students were included in the modified direct costs. The indirect costs charged by GMU on the subcontract were specifically excluded from the determination of the base amount. This determination is in accordance with prior guidance received from NSF as per the letter from the Chief of the Cost Analysis and Audit Resolution Branch of the NSF (dated 15 April 2003).

SUMMARY PROPOSAL BUDGET YEAR 1

ORGANIZATION	FOR NSF USE ONLY		
GEORGE MASON UNIVERSITY	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Edwin K Schneider			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Edwin K Schneider - PI	(b)(4), (b)(6)				
2. James L Kinter					
3. David M Straus					
4.					
5.					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAG					
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (3) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (3) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Off-campus (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 410,380	$

M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
Edwin K Schneider	Date Checked	Date Of Rate Sheet	Initials - ORG
ORG. REP. NAME* James Kinter			

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET YEAR 2

ORGANIZATION GEORGE MASON UNIVERSITY				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Edwin K Schneider				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)		
1. Edwin K Schneider - PI	(b)(4), (b)(6)						
2. James L Kinter							
3. David M Straus							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PA							
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL ASSOCIATES							
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.							
3. (3) GRADUATE STUDENTS							
4. (0) UNDERGRADUATE STUDENTS							
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. (3) OTHER							
TOTAL SALARIES AND WAGES (A + B)							
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)							
TOTAL EQUIPMENT				0			
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0			
2. FOREIGN				0			
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS $ 0							
2. TRAVEL 0							
3. SUBSISTENCE 0							
4. OTHER 0							
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)			
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER							
TOTAL OTHER DIRECT COSTS							
H. TOTAL DIRECT COSTS (A THROUGH G)							
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Off-campus (b)(4)							
TOTAL INDIRECT COSTS (F&A)							
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 494,064	$		
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $						

PI/PD NAME Edwin K Schneider	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET YEAR 3

ORGANIZATION GEORGE MASON UNIVERSITY					FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Edwin K Schneider					AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)		
1. Edwin K Schneider - PI	(b)(4), (b)(6)						
2. James L Kinter							
3. David M Straus							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PA							
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL ASSOCIATES							
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.							
3. (3) GRADUATE STUDENTS							
4. (0) UNDERGRADUATE STUDENTS							
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. (3) OTHER							
TOTAL SALARIES AND WAGES (A + B)							
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)							
TOTAL EQUIPMENT				0			
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0			
2. FOREIGN				0			
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS $ 0							
2. TRAVEL 0							
3. SUBSISTENCE 0							
4. OTHER 0							
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)			
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER							
TOTAL OTHER DIRECT COSTS							
H. TOTAL DIRECT COSTS (A THROUGH G)							
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Off-campus (b)(4))							
TOTAL INDIRECT COSTS (F&A)							
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 602,969	$		
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $						

PI/PD NAME Edwin K Schneider	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET YEAR 4

ORGANIZATION GEORGE MASON UNIVERSITY			FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	 Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Edwin K Schneider			AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	 ACAD	 SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Edwin K Schneider - PI	(b)(4), (b)(6)				
2. James L Kinter					
3. David M Straus					
4.					
5.					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAG					
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (3) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (3) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Off-campus (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 512,012	$
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $				

PI/PD NAME Edwin K Schneider	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET — YEAR 5

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: GEORGE MASON UNIVERSITY

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: Edwin K Schneider

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Edwin K Schneider - PI	(b)(4), (b)(6)				
2. James L Kinter					
3. David M Straus					
4.					
5.					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAG					
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (3) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (3) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Off-campus (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 521,220	$

M. COST SHARING PROPOSED LEVEL $ 0 | AGREED LEVEL IF DIFFERENT $

PI/PD NAME: Edwin K Schneider

ORG. REP. NAME*: James Kinter

FOR NSF USE ONLY — INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

* ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION	FOR NSF USE ONLY		
GEORGE MASON UNIVERSITY	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Edwin K Schnelder			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Edwin K Schnelder - PI				(b)(4), (b)(6)	
2. James L Kinter					
3. David M Straus					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PA					
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC					
3. (15) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (15) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 2,440,643	$
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $				

PI/PD NAME	FOR NSF USE ONLY		
Edwin K Schnelder	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
James Kinter			

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Printed by NSF PPU

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE (If not in response to a program announcement/solicitation enter NSF 03-2)

NSF 03-2

FOR NSF USE ONLY

NSF PROPOSAL NUMBER

0332910

FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)

ATM - CLIMATE DYNAMICS PROGRAM

DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION
				787160431	

EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)

521761388

SHOW PREVIOUS AWARD NO. IF THIS IS
☒ A RENEWAL
☐ AN ACCOMPLISHMENT-BASED RENEWAL

9814295

IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES ☐ NO ☒ IF YES, LIST ACRONYM(S)

NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE

Institute of Global Environment and Society

AWARDEE ORGANIZATION CODE (IF KNOWN)

5300002833

ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE

Institute of Global Environment and Society
4041 Powder Mill Road
Calverton, MD. 20705

NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE

PERFORMING ORGANIZATION CODE (IF KNOWN)

ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE

IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions)
☐ SMALL BUSINESS ☐ MINORITY BUSINESS ☐ FOR-PROFIT ORGANIZATION ☐ WOMAN-OWNED BUSINESS

☐ IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE

TITLE OF PROPOSED PROJECT Predictability of Earth's Climate

REQUESTED AMOUNT	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE
$ 15,266,000	60 months	01/01/04	

CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW

☐ BEGINNING INVESTIGATOR (GPG I.A)
☐ DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C)
☐ PROPRIETARY & PRIVILEGED INFORMATION (GPG I.B, II.C.6)
☐ HISTORIC PLACES (GPG II.C.9)
☐ SMALL GRANT FOR EXPLOR. RESEARCH (SGER) (GPG II.C.11)
☐ VERTEBRATE ANIMALS (GPG II.C.11) IACUC App. Date _____
☐ HUMAN SUBJECTS (GPG II.C.11)
Exemption Subsection _____ or IRB App. Date _____
☐ INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.9)
☐ HIGH RESOLUTION GRAPHICS/OTHER GRAPHICS WHERE EXACT COLOR REPRESENTATION IS REQUIRED FOR PROPER INTERPRETATION (GPG I.E.1)

PI/PD DEPARTMENT
Center for Ocean-Land-Atmosphere Studies

PI/PD POSTAL ADDRESS
4041 Powder Mill Road, Suite 302
Beltsville, MD 20705
United States

PI/PD FAX NUMBER
301-595-9793

NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address
PI/PD NAME Jagadish Shukla	SC.D.	(b)(6)	301-595-7000	shukla@cola.iges.org
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				

Electronic Signature

SUMMARY PROPOSAL BUDGET YEAR 1

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Jagadish Shukla - PI				(b)(4), (b)(6)		
2. James L Kinter						
3. Edwin K Schneider						
4. Paul Schopf						
5. David M Straus						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PA						
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES						
2. (6) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (2) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (0) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) Compute cluster upgrades Peripheral equipment Storage network disks				(b)(4)		
TOTAL EQUIPMENT				(b)(4)		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ 2. TRAVEL 3. SUBSISTENCE 4. OTHER				(b)(4)		
TOTAL NUMBER OF PARTICIPANTS				TOTAL PARTICIPANT COSTS		
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Ind. costs (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 2,926,000	$	
M. COST SHARING PROPOSED LEVEL $ Not Shown				AGREED LEVEL IF DIFFERENT $		

PI/PD NAME Jagadish Shukla	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Jagadish Shukla - PI	(b)(4), (b)(6)					
2. James L Kinter						
3. Edwin K Schneider						
4. Paul Schopf						
5. David M Straus						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAG						
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES						
2. (6) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (2) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (8) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)						
Compute cluster upgrades Peripheral equipment Storage network disks	(b)(4)					
TOTAL EQUIPMENT				(b)(4)		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS	(b)(4)					
1. STIPENDS $						
2. TRAVEL						
3. SUBSISTENCE						
4. OTHER						
TOTAL NUMBER OF PARTICIPANTS	TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS				(b)(4)		
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
Ind. costs (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 2,988,000	$	
M. COST SHARING PROPOSED LEVEL $ Not Shown	AGREED LEVEL IF DIFFERENT $					

PI/PD NAME Jagadish Shukla	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET YEAR 3

ORGANIZATION	FOR NSF USE ONLY		
Institute of Global Environment and Society	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI				(b)(4), (b)(6)	
2. James L Kinter					
3. Edwin K Schneider					
4. Paul Schopf					
5. David M Straus					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION P					
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (6) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ET					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (2) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (0) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
Compute cluster upgrades				(b)(4)	
Peripheral equipment					
Storage network disks					
TOTAL EQUIPMENT				(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $				(b)(4)	
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS	TOTAL PARTICIPANT COSTS			(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
Ind. costs (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 3,051,000	$
M. COST SHARING PROPOSED LEVEL $ Not Shown	AGREED LEVEL IF DIFFERENT $				

PI/PD NAME	FOR NSF USE ONLY		
Jagadish Shukla	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
James Kinter			

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET YEAR 4

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	 Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Jagadish Shukla - PI	(b)(4), (b)(6)					
2. James L Kinter						
3. Edwin K Schneider						
4. Paul Schopf						
5. David M Straus						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE						
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES						
2. (6) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (2) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (8) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) Compute cluster upgrades Peripheral equipment Storage network disks				(b)(4)		
TOTAL EQUIPMENT				(b)(4)		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ 2. TRAVEL 3. SUBSISTENCE 4. OTHER				(b)(4)		
TOTAL NUMBER OF PARTICIPANTS				TOTAL PARTICIPANT COSTS		
G. OTHER DIRECT COSTS				(b)(4)		
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) ind. costs (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 3,116,000	$	
M. COST SHARING PROPOSED LEVEL $ Not Shown				AGREED LEVEL IF DIFFERENT $		

PI/PD NAME Jagadish Shukla	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

* ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

0332910

SUMMARY PROPOSAL BUDGET YEAR 5

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla				AWARD NO.			
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)		
1. Jagadish Shukla - PI	(b)(4), (b)(6)						
2. James L Kinter							
3. Edwin K Schneider							
4. Paul Schopf							
5. David M Straus							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE							
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL ASSOCIATES							
2. (6) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							
3. (0) GRADUATE STUDENTS							
4. (0) UNDERGRADUATE STUDENTS							
5. (2) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. (8) OTHER							
TOTAL SALARIES AND WAGES (A + B)							
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) Compute cluster upgrades Peripheral equipment Storage network disks				(b)(4)			
TOTAL EQUIPMENT				(b)(4)			
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN							
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ 2. TRAVEL 3. SUBSISTENCE 4. OTHER				(b)(4)			
TOTAL NUMBER OF PARTICIPANTS				TOTAL PARTICIPANT COSTS			
G. OTHER DIRECT COSTS				(b)(4)			
1. MATERIALS AND SUPPLIES							
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER							
TOTAL OTHER DIRECT COSTS							
H. TOTAL DIRECT COSTS (A THROUGH G)							
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Ind. costs (b)(4)							
TOTAL INDIRECT COSTS (F&A)							
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 3,183,000	$		
M. COST SHARING PROPOSED LEVEL $ Not Shown				AGREED LEVEL IF DIFFERENT $			
PI/PD NAME Jagadish Shukla				FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION			
ORG. REP. NAME* James Kinter				Date Checked	Date Of Rate Sheet	Initials - ORG	

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

0332910

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION	FOR NSF USE ONLY		
Institute of Global Environment and Society	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6)				
2. James L Kinter					
3. Edwin K Schneider					
4. Paul Schopf					
5. David M Straus					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION					
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (30) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, E					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (10) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (40) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)				(b)(4)	
TOTAL EQUIPMENT				(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $				(b)(4)	
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS				(b)(4)	
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 16,266,000	$

M. COST SHARING PROPOSED LEVEL $ Not Shown AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
Jagadish Shukla	Date Checked	Date Of Rate Sheet	Initials - ORG
ORG. REP. NAME* James Kinter			

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget Explanation

(b)(4) & (b)(6)

[redacted]

this project.

Graduate Students: Funds are requested to support three graduate students engaged in a course of study leading to the Ph.D. degree in a suitable discipline. These students will conduct their dissertation research under direct supervision of COLA scientists. Support for the students is included in the GMU portion of the funding (see below).

Secretarial/Clerical: Full time support is requested in direct cost salaries for the project manager (Avasthy) and an administrative assistant who, under the supervision of the Executive Director of COLA, perform all the administrative duties required for coordination of activities associated with this large

(b)(4) & (b)(6)

[redacted]

Permanent Equipment

(b) (4)

[redacted]

Travel

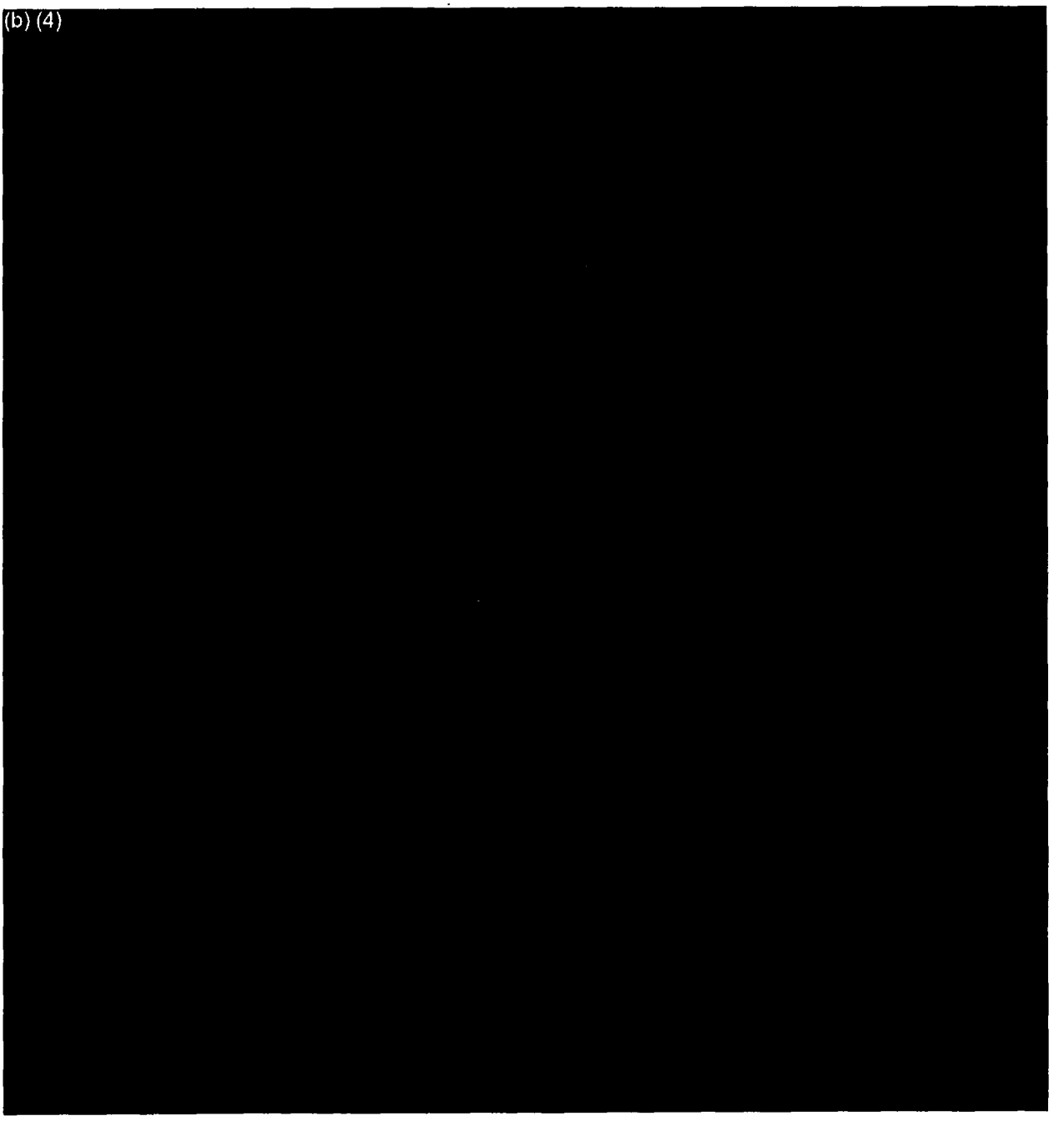
(b) (4)

[redacted]

Participant Support

Support is requested for the COLA Visitor Program. The Visitor Program sponsors visits to COLA by distinguished scientists and experts in climate modeling for the purpose of fostering collaboration and consultation on this and other projects. In the case of this project, extensive collaborative research is anticipated with scientists from NCAR and the NOAA ARCs. Funds are requested for 10 experts in climate modeling and climate diagnostics to visit COLA for periods of five to

(b) (4)



Special remarks about Post-doctoral associates

This budget does not include any support for post-doctoral associates, because it was not possible to include such a line item within the budget guidelines from the agencies and because the highest priority was given to continue to support the scientists who have been working at COLA for many years. For a center like COLA, it is vitally important that it has a post-doctoral program. Although the agencies have given the budget guideline, the agencies have also indicated that this matter will be discussed at a later stage in the review process for this proposal.

SUMMARY PROPOSAL BUDGET — YEAR 1

ORGANIZATION GEORGE MASON UNIVERSITY				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	 Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Edwin K Schnoldor				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Edwin K Schnoldor - PI	(b)(4), (b)(6)					
2. James L Kinter						
3. David M Straus						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE						
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES						
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. (3) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (3) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)						
TOTAL EQUIPMENT				(b)(4)		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS $	(b)(4)					
2. TRAVEL						
3. SUBSISTENCE						
4. OTHER						
TOTAL NUMBER OF PARTICIPANTS		TOTAL PARTICIPANT COSTS		(b)(4)		
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Off-campus (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 410,380	$	
M. COST SHARING PROPOSED LEVEL $ Not Shown		AGREED LEVEL IF DIFFERENT $				

PI/PD NAME Edwin K Schnoldor	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

0332910

SUMMARY PROPOSAL BUDGET YEAR 2

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: GEORGE MASON UNIVERSITY

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: Edwin K Schneider

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Edwin K Schneider - PI	(b)(4), (b)(6)				
2. James L Kinter					
3. David M Straus					
4.					
5.					
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE					
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (3) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (3) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Off-campus (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 494,064	$

M. COST SHARING PROPOSED LEVEL $ Not Shown | AGREED LEVEL IF DIFFERENT $

PI/PD NAME: Edwin K Schneider

ORG. REP. NAME*: James Kinter

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET YEAR 3

ORGANIZATION GEORGE MASON UNIVERSITY				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Edwin K Schneider				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Edwin K Schneider - PI	(b)(4), (b)(6)					
2. James L Kinter						
3. David M Straus						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAG						
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES						
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. (3) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (3) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)						
TOTAL EQUIPMENT				0		
E. TRAVEL 1. DOMESTIC (INCL., CANADA, MEXICO AND U.S. POSSESSIONS)				0		
2. FOREIGN				0		
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS $ 0						
2. TRAVEL 0						
3. SUBSISTENCE 0						
4. OTHER 0						
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)		
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Off-campus (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 502,959	$	
M. COST SHARING PROPOSED LEVEL $ Not Shown	AGREED LEVEL IF DIFFERENT $					

PI/PD NAME Edwin K Schneider	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

0332910

SUMMARY PROPOSAL BUDGET YEAR 4

ORGANIZATION GEORGE MASON UNIVERSITY				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	 Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Edwin K Schneider				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Edwin K Schneider - PI				(b)(4), (b)(6)		
2. James L Kinter						
3. David M Straus						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAG						
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES						
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. (3) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (3) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)						
TOTAL EQUIPMENT				0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0		
2. FOREIGN				0		
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS $ 0						
2. TRAVEL 0						
3. SUBSISTENCE 0						
4. OTHER 0						
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)		
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Off-campus (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 512,012	$	
M. COST SHARING PROPOSED LEVEL $ Not Shown	AGREED LEVEL IF DIFFERENT $					

PI/PD NAME Edwin K Schneider	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

* ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

0332910

SUMMARY PROPOSAL BUDGET — YEAR 5

ORGANIZATION GEORGE MASON UNIVERSITY				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Edwin K Schneider				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Edwin K Schneider - PI	(b)(4), (b)(6)				$	
2. James L Kinter						
3. David M Straus						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE						
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES						
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. (3) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (3) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)						
TOTAL EQUIPMENT				0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0		
2. FOREIGN				0		
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS $ 0						
2. TRAVEL 0						
3. SUBSISTENCE 0						
4. OTHER 0						
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)		
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Off-campus (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 521,226	$	
M. COST SHARING PROPOSED LEVEL $ Not Shown	AGREED LEVEL IF DIFFERENT $					

PI/PD NAME Edwin K Schneider	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION	FOR NSF USE ONLY		
GEORGE MASON UNIVERSITY	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Edwin K Schneider			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Edwin K Schneider - PI	(b)(4), (b)(6)				$
2. James L Kinter					
3. David M Straus					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE					
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL ASSOCIATES					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (15) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (15) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 2,440,643	$

M. COST SHARING PROPOSED LEVEL $ Not Shown | AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY		
Edwin K Schneider	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
James Kinter			

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget Explanation for GMU Sub-award

(b)(4) & (b)(6) [redacted]

*Post-Doctoral Associates.*None.

Other Professionals. None.

Graduate Students: Funds are requested to provide graduate research assistantships and tuition support to three graduate students engaged in a course of study leading to the Ph.D. degree in a suitable discipline. These students will conduct their dissertation research under direct supervision of the faculty of the GMU Climate Dynamics Program.

Secretarial/Clerical: None.

Other: None. Huang, DelSole, & Kirtman (See pg 1 of overall budget explanation

11/12/03
Kinter told me that he was unable to add Huang, DelSole and Kirtman via fastlane. this note confirms that funds under "other" supports these three scientists just

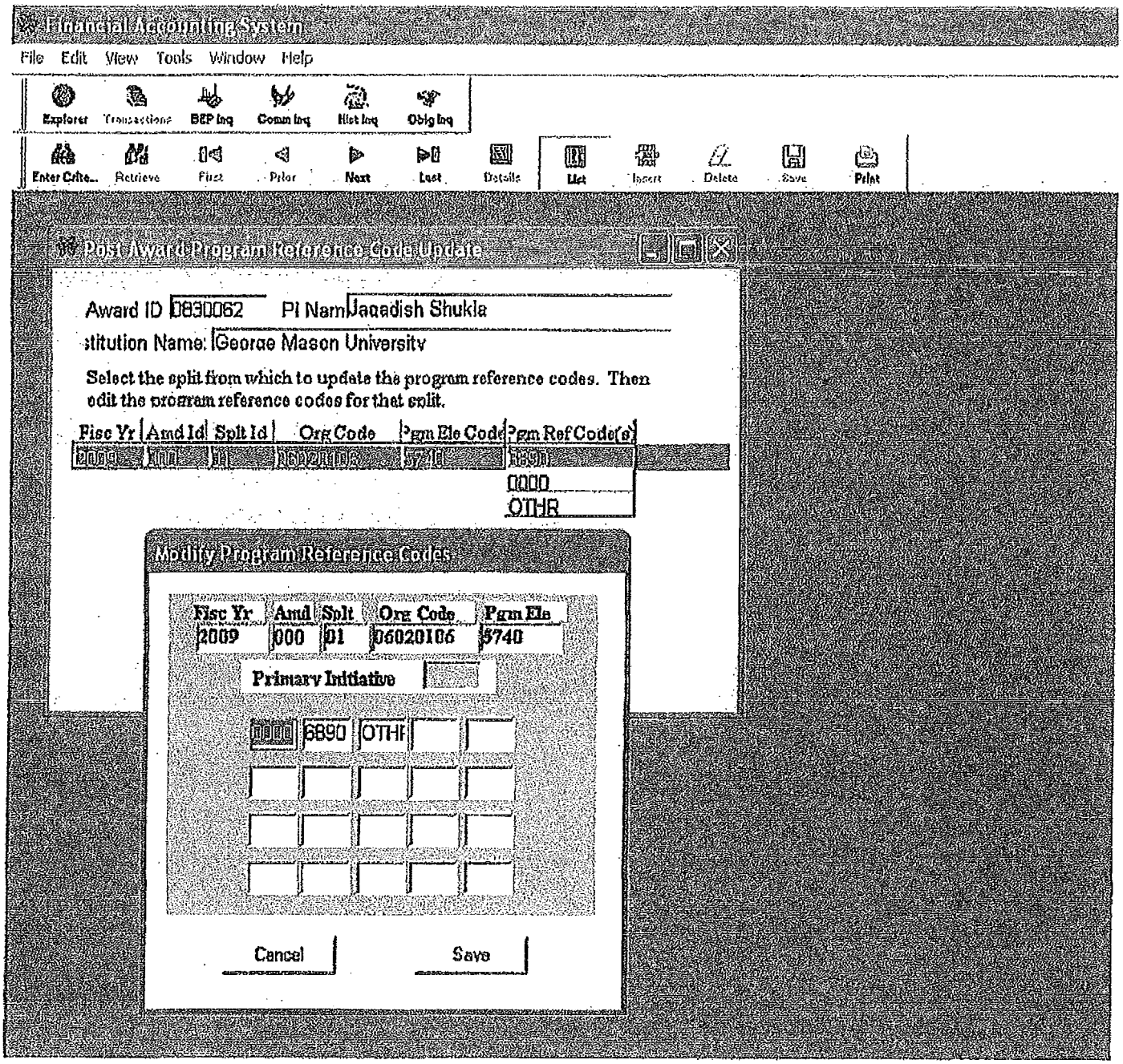
Permanent Equipment
None.

Travel
None.

Participant Support
None.

Other Direct Costs
Funds are requested to pay the tuition for three (3) graduate students.

Indirect Costs
Indirect costs associated with this project will be charged at the off-campus rate of (b) (4) [redacted] modified total direct costs (total direct costs excluding equipment, participant costs and tuition).


Financial Accounting System
File Edit View Tools Window Help
Explorer Transactions BEP Inq Comm Inq Hist Inq Oblg Inq
Enter Crite... Retrieve First Prior Next Last Details List Insert Delete Save Print
Post Award Program Reference Code Update
Award ID 0830062 PI Nam Jagadish Shukla
stitution Name: George Mason University
Select the split from which to update the program reference codes. Then edit the program reference codes for that split.
Fisc Yr Amd Id Split Id Org Code Pgm Ele Code Pgm Ref Code(s)
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OTHR
Modify Program Reference Codes
Fisc Yr Amd Split Org Code Pgm Ele
2009 000 01 06020106 5740
Primary Initiative
0000 6890 OTHR
Cancel
Save

Correspondence_0830062 (2)

From: NSFARREviewer@nsf.gov
Sent: 03/07/2013; 12:53 PM
To: mlaskofs@gmu.edu
CC: pmiller5@gmu.edu
Subject: Acceleration of NSF Recovery Act (ARRA) Waiver Awards

Dear Authorized Organizational Representative:

You are receiving this email because your organization currently has one or more active ARRA awards. This message identifies the current status of these awards and should help inform their management going forward.

In accordance with the Office of Management and Budget (OMB) Memorandum M-11-34,?"Accelerating Spending of Remaining Funds from the American Recovery and Reinvestment Act for Discretionary Grant Programs,"?ARRA expenditures beyond September 30, 2013 require a waiver from OMB. The awards listed below have been included in NSF's waiver request and can continue in accordance with the terms and conditions of the award:

Div Code/ Award # | PI Name | Unexpended Balance as of 12/31/12

AGS /<0830062> | Shukla, Jagadish | $ 1,133,561

AST /<0847409> | Rosenberg, Jessica | $ 351,962

ECCS/<0846649> | Li, Qiliang | $ 106,812

Regardless of an award's current status, all awardees are encouraged to responsibly accelerate expenditures and are reminded that expenditures must be allowable pursuant to the applicable cost principles and terms of the award. Payment requests must be necessary to meet current needs. Please be aware that awardees will still have time to closeout and draw down funds to cover costs properly incurred prior to the expiration date of the award.

For additional information, please refer to the Acceleration-related Frequently Asked Questions (FAQs) found on NSF's Recovery Act site at: http://www.nsf.gov/recovery. If you have award-specific questions, please contact the NSF Program Officer designated for the award. General inquiries regarding NSF's implementation of OMB Memo M-11-34 may be emailed to: mailto:NSFARREviewer@nsf.gov.

Thank you for your continued assistance in managing the acceleration of your ARRA awards.

Policy Office
Division of Institution and Award Support, National Science Foundation
Telephone: (703) 292-8243
Email: mailto:NSFARREviewer@nsf.gov

This form should be completed by program staff within NSF Divisions, and submit to your Directorate/Office Front Office. Directorates/Offices will then submit only those requests that they believe have a compelling and defendable rationale to ARRA@nsf.gov.

ARRA Expenditure Waiver Request Form

(It is not necessary to submit waiver requests for CAREER awards, as NSF will be requesting a programmatic waiver for this program)

NSF Directorate/NSF Division	Geosciences/Atmospheric and Geospace Sciences
Program Name	Climate and Large-Scale Dynamics
Program Officer/Contact Person	Eric DeWeaver
Number of awards for which waiver is requested	2
Award Number(s) (enter all applicable award numbers if more than one):	0830068 0830062
Program description	

Waiver criteria: *Check one (or more) of the applicable waiver criteria listed below.*

☒ The project is long-term by design, and acceleration would compromise core programmatic goals (you must list below *reasons* the project is long term by design and why acceleration would be impossible).

☐ The project must undergo complex environmental review that cannot be completed within this timeframe.

☐ Contractual commitments between the awardee and vendors/subrecipients legally prevent adjusting the timeline for spending (you must list below the contractual relationships at issue, including employment commitments).

☐ Special circumstances exist (examples of special circumstances might include unnecessary harm or unreasonable risk to vertebrate animals or human subjects involved in the research; natural events; severe weather complications affecting field work in polar regions; or unavoidable complications from complex international science projects).

Provide a compelling and defendable narrative supporting the applicable criteria you have checked above (attach additional pages if necessary):

The awards are parts of a collaborative five-year grant that supports 15 scientists at the Center for Ocean-Land-Atmosphere Studies (COLA) and 8 faculty members and 5 graduate students in the Climate Dynamics PhD program at George Mason University (GMU). This is a unique project whose long-term goal is to establish and quantify the predictability of climate. The project end date is 31 August 2014, so accelerated spending will result in termination of the project 11 months sooner than originally planned. This will not only seriously disrupt the phased work plan but it will also jeopardize the employment of the long-term scientific staff working on this project and therefore the opportunity to continue the project in the future.

In addition to the above, list and explain any additional existing barriers that prevent acceleration of spending:

The work is being done by a well-established team of uniquely-qualified and experienced scientists. Accelerated spending will jeopardize the stability of employment of the long-term staff members on this project. The project completion cannot be accomplished by the short-term hiring of several new researchers.

Please let us know if the award(s)/program falls into an apparent grouping around which a waiver request may be drafted:

COLA is a unique, long-term research center that supports 15 scientists and other staff who have been working together as integral members of a well-focused team for over 20 years.

Correspondence_0830062 (4)

From: nsfarrareviewer@nsf.gov
Sent: 02/07/2012; 5:51 PM
To: jshukla@gmu.edu
CC: mlaskofs@gmu.edu; Fein, Jay S.
Subject: Important Information about the Expiration of Your NSF ARRA Award <0830062> and Revised Deadline to Contact NSF

Dear Colleague:

You are receiving this email because you are currently the Principal Investigator (PI) or co-PI for NSF grant <0830062>, which was awarded with American Recovery and Reinvestment Act (ARRA) funds. On September 15, 2011, the Office of Management and Budget (OMB) issued Memorandum M-11-34, "Accelerating Spending of Remaining Funds from the American Recovery and Reinvestment Act for Discretionary Grant Programs" (http://www.whitehouse.gov/sites/default/files/omb/memoranda/2011/m11-34.pdf). This memo specifically directs federal agencies to take steps to ensure that grantees complete ARRA projects by September 30, 2013. NSF will not have the authority to approve the extension of any ARRA award beyond this date without a waiver from OMB.

On December 13, 2011, NSF issued a notice (http://www.nsf.gov/recovery/acceleration.pdf) regarding the Foundation's implementation of this OMB directive, stipulating that, regardless of an award's current expiration date, grantees are strongly encouraged to responsibly accelerate expenditures for all active ARRA grants. Please remember that, in accordance with the terms and conditions of the award, all expenditures must be allowable pursuant to the applicable cost principles and that requested payments must be necessary to meet current needs.

Please be advised that your award currently expires on 8/31/2014. Unless OMB approves a waiver for your award to continue beyond September 30, 2013, NSF will amend the expiration date of your award to comply with the OMB directive. Because your award currently expires after September 2013, you must contact your cognizant NSF Program Officer in writing (and copy your organization's sponsored projects office) by March 2, 2012, with either a plan to accelerate completion of your project or to request that a waiver be sought for you to complete the project as originally planned. If you anticipate that it will be vital for completion of your project for NSF to request a waiver from OMB, you must follow the guidelines in the NSF notice (http://www.nsf.gov/recovery/acceleration.pdf) and include a compelling, defendable rationale based on one or more of the OMB waiver criteria. NSF will then evaluate all submitted requests to determine whether they will be included in our agency waiver request package to OMB.

Also be advised that the deadline to contact your NSF Program Officer by March 2, 2012, is earlier than the date specified in the NSF notice (http://www.nsf.gov/recovery/acceleration.pdf). This is necessary for NSF to prepare and submit the Foundation's waiver package to OMB by June 2012. OMB has instructed agencies to request waivers sparingly and indicated that they will be granted only due to compelling legal, policy, or operational challenges. Information has not been provided on when responses to waiver requests will be issued.

If you have any questions regarding your ability to complete your project on or before September 30, 2013, please contact your NSF Program Officer copied on this email as soon as possible. General inquiries regarding NSF's implementation notice for OMB memo M-11-34 (http://www.whitehouse.gov/sites/default/files/omb/memoranda/2011/m11-34.pdf) may be directed to the following:

Policy Office
Division of Institution and Award Support National Science Foundation
Telephone: (703) 292-8243
Email: mailto:NSFARRAReviewer@nsf.gov

Correspondence_0830062 (5)

From: Dodson, Martha Ione
Sent: Friday, January 27, 2012 10:59 AM
To: DeWeaver, Eric Thomas
Cc: Huang, Pei-Chiung (Anne); DiGiovanna, Deanna Lea
Subject: RE: ARRA spendout at GMU

Eric,

Although I agree that there does not appear to be any restriction on re-budgeting the way they suggest, I think they should go to NSF's webpage on ARRA-funded awards to review all the requirements, just so they can be assured that they are complying with everything. It is good that they are being pro-active about the accelerated spending requirement on ARRA awards.

Yesterday I provided Anne with the link to our ARRA webpage. Here it is if you need it: Here is the link: http://www.nsf.gov/recovery/

Martha

From: DeWeaver, Eric Thomas
Sent: Thursday, January 12, 2012 6:00 PM
To: Dodson, Martha Ione
Subject: FW: ARRA spendout at GMU

Dear Martha,

I am taking over from Jay as the program manager for COLA, which was funded through ARRA funds. I have been in contact with Drs. Kinter and Shukla regarding the spendout of ARRA funds, and they believe they have a strategy to do this. I will be happy to discuss this with you at your convenience.

As part of this correspondence I received the email below from Dr. Shukla, asking if he is allowed to rebudget funds intended for tuition (in item B.6, Other Direct Costs) to pay for stipends and salary instead (this is for AGS-0830062). I have looked at the AAG section on rebudgeting and I do not see any restriction on rebudgeting tuition, so my answer would be that Dr. Shukla is allowed to rebudget at his discretion. However, I've been advised that there may be additional constraints because this is an ARRA award. Do you know of any reason why Dr. Shukla would be restricted from rebudgeting tuition to salary and stipends?

Thanks very much, Eric

------ Forwarded Message
From: J Shukla <shukla@iges.org>
Date: Thu, 12 Jan 2012 14:59:45 -0500
To: Eric DeWeaver <edeweave@nsf.gov>
Cc: "James L. Kinter, III" <kinter@cola.iges.org>
Subject: ARRA spendout at GMU

Dear Eric,

Both Jim and I have concluded that we will spend the full NSF ARRA award at COLA and at GMU by the

end of August 2013.

I have one specific question about the GMU part of the award. The amount of student tuition money in the award is more than we can spend (this happened in part because GMU made a university-wide change in policy that for Ph.D. graduate students GMU will charge the in-state tuition rather than out-of-state tuition which was budgeted in the proposal). In order to be able to spend this additional tuition money, we will require your approval to revise the budget and re-budget tuition costs to stipend and salary costs. Of course all the funds are already at GMU, but I am not familiar with the rules of revising budgets for ARRA awards, especially because overhead was not included on tuition costs. Any guidance you can provide on this question will be appreciated.

Regards,
Shukla

------ End of Forwarded Message

From: Dodson, Martha Ione
Sent: Thursday, January 26, 2012 4:17 PM
To: Huang, Pei-Chiung (Anne)
Subject: RE: ARRA spendout at GMU (AGS-0830062)

Anne,

I would suggest that they review the information on the ARRA website on NSF's website. Here is the
link: http://www.nsf.gov/recovery/

Martha

From: Huang, Pei-Chiung (Anne)
Sent: Thursday, January 26, 2012 4:11 PM
To: Dodson, Martha Ione
Cc: DeWeaver, Eric Thomas
Subject: RE: ARRA spendout at GMU (AGS-0830062)
Importance: High

Hi Martha,

Please help.

Thanks!
Anne
X4723

From: DeWeaver, Eric Thomas
Sent: Thursday, January 26, 2012 3:49 PM
To: Huang, Pei-Chiung (Anne)
Subject: FW: ARRA spendout at GMU (AGS-0830062)

Hi Anne, is there anyone who can advise me on special rules applying to ARRA funds? Shukla got a lot
of ARRA funds for COLA, and the question is whether he can rebudget tuition costs to fund stipends
and salaries. For regular grants there is no restriction against this, but Ruth suggested that there could
be special rules for ARRA money. Thanks, Eric

------- Forwarded Message
From: J Shukla <shukla@iges.org>
Date: Thu, 26 Jan 2012 11:36:45 -0500
To: Eric DeWeaver <edeweave@nsf.gov>
Cc: "James L. Kinter, III" <kinter@cola.iges.org>
Subject: Re: ARRA spendout at GMU

Dear Eric,

Yes indeed, based on the NSF guidance it is entirely OK to re-budget. I just wanted to get some
guidance from you because this is an ARRA award. I intend to go forward with re-budgeting unless I
hear otherwise.

Regards,
Shukla

On Jan 12, 2012, at 6:39 PM, Eric DeWeaver wrote:
Re: ARRA spendout at GMU

Correspondence_0830062 (5)

Hi Shukla, I don't see any reason why you can't rebudget from tuition to salary and stipends, based on the language in the NSF Awards Administration Guide. However, I've been cautioned that there may be special issues because this is ARRA money, so I have forwarded your request to my contact in the Division of Grants and Agreements. I will let you know if she finds any restrictions. Best, Eric

On 1/12/12 2:59 PM, "J Shukla" <shukla@iges.org> wrote:

Dear Eric,

Both Jim and I have concluded that we will spend the full NSF ARRA award at COLA and at GMU by the end of August 2013.

I have one specific question about the GMU part of the award. The amount of student tuition money in the award is more than we can spend (this happened in part because GMU made a university-wide change in policy that for Ph.D. graduate students GMU will charge the in-state tuition rather than out-of-state tuition which was budgeted in the proposal). In order to be able to spend this additional tuition money, we will require your approval to revise the budget and re-budget tuition costs to stipend and salary costs. Of course all the funds are already at GMU, but I am not familiar with the rules of revising budgets for ARRA awards, especially because overhead was not included on tuition costs. Any guidance you can provide on this question will be appreciated.

Regards,
Shukla

------ End of Forwarded Message

From: Huang, Pei-Chiung (Anne)
Sent: Thursday, January 26, 2012 4:11 PM
To: Dodson, Martha Ione
Cc: DeWeaver, Eric Thomas
Subject: RE: ARRA spendout at GMU (AGS-0830062)

Importance: High

Hi Martha,

Please help.

Thanks!
Anne
X4723

From: DeWeaver, Eric Thomas
Sent: Thursday, January 26, 2012 3:49 PM
To: Huang, Pei-Chiung (Anne)
Subject: FW: ARRA spendout at GMU (AGS-0830062)

Hi Anne, is there anyone who can advise me on special rules applying to ARRA funds? Shukla got a lot of ARRA funds for COLA, and the question is whether he can rebudget tuition costs to fund stipends and salaries. For regular grants there is no restriction against this, but Ruth suggested that there could be special rules for ARRA money. Thanks, Eric

------ Forwarded Message
From: J Shukla <shukla@iges.org>
Date: Thu, 26 Jan 2012 11:36:45 -0500
To: Eric DeWeaver <edeweave@nsf.gov>
Cc: "James L. Kinter, III" <kinter@cola.iges.org>
Subject: Re: ARRA spendout at GMU

Dear Eric,

Yes indeed, based on the NSF guidance it is entirely OK to re-budget. I just wanted to get some guidance from you because this is an ARRA award. I intend to go forward with re-budgeting unless I hear otherwise.

Regards,
Shukla

On Jan 12, 2012, at 6:39 PM, Eric DeWeaver wrote:

Re: ARRA spendout at GMU

Hi Shukla, I don't see any reason why you can't rebudget from tuition to salary and stipends, based on the language in the NSF Awards Administration Guide. However, I've been cautioned that there may be special issues because this is ARRA money, so I have forwarded your request to my contact in the Division of Grants and Agreements. I will let you know if she finds any restrictions. Best, Eric

On 1/12/12 2:59 PM, "J Shukla" <shukla@iges.org> wrote:

Correspondence_0830062 (4)

Dear Eric,

Both Jim and I have concluded that we will spend the full NSF ARRA award at COLA and at GMU by the
end of August 2013.

I have one specific question about the GMU part of the award. The amount of student tuition money
in the award is more than we can spend (this happened in part because GMU made a university-wide
change in policy that for Ph.D. graduate students GMU will charge the in-state tuition rather than out-
of-state tuition which was budgeted in the proposal). In order to be able to spend this additional
tuition money, we will require your approval to revise the budget and re-budget tuition costs to
stipend and salary costs. Of course all the funds are already at GMU, but I am not familiar with the
rules of revising budgets for ARRA awards, especially because overhead was not included on tuition
costs. Any guidance you can provide on this question will be appreciated.

Regards,
Shukla

------ End of Forwarded Message

Correspondence_0830062 (5)

From: nsfarrareviewer@nsf.gov
Sent: 01/06/2012; 4:54 PM
To: mlaskofs@gmu.edu
CC: pmiller5@gmu.edu
Subject: FederalReporting.gov Submission due January 14th - NSF's 2nd Reminder to George Mason University

Preliminary records retrieved by the National Science Foundation (NSF) from FederalReporting.gov as of the morning of January 6, 2012 indicate that a report has not been submitted for one or more of your organization's awards. Please note that a report submission for your organization is expected for the award(s) listed below in accordance with Section 1512 of the American Recovery and Reinvestment Act of 2009 (ARRA) by January 10, 2012. The Office of Management and Budget has issued an extended submission period, and reports can be submitted through January 14, 2012 without being flagged as late. If you have not done so already, please ensure that you submit a report for the following award(s) and receive confirmation from FederalReporting.gov:

<0830062>;<0846649>;<0847409>;<0855393>;<0901236>;<0902146>;<0904253>;<0905189>;<0907325>;<0919179>;<0934824>;<0940922>

The schedule for reporting activities this quarter is included below:

? January 1 - 10: Recipients enter and submit reports;
? January 11 - 14: Extended submission period;
? January 15 - 17: Recipients review and revise data;
? January 18 - 29: Agencies conduct data quality review and notify recipients of necessary corrections; Recipients make corrections;
? January 30: Reports are published on Recovery.gov

NSF encourages your organization to complete reporting EARLY to avoid any reporting or technical system issues and to use copy forward functionality to link your reports.

Please consult NSF-specific ARRA reporting guidance (http://www.nsf.gov/pubs/policydocs/arra/arradatamodel_10410.pdf) and NSF's Common Reporting Errors Guidance (http://www.nsf.gov/recovery/ARRA-NSFCommonReporting%20ErrorsGuidance.pdf) for assistance in completing your report(s).

Detailed guidance regarding ARRA Recipient Reporting policies, procedures, and deadlines is available on the following websites:

http://www.Recovery.gov; and
http://www.FederalReporting.gov.

Any questions regarding ARRA recipient reporting may be directed to the NSF ARRA Recipient Reporting Team at mailto:NSFARRAReviewer@nsf.gov.

Sincerely,

National Science Foundation

, Pei-Chiung (Anne)
lay, January 12, 2012 4:05 PM
:uth E.; DeWeaver, Eric Thomas
RRA spendout at GMU

As long as same set of rules apply to ARRA, then simply follow Ruth's forwarded guideline. Please upload any
l for record.

3:36 PM

MU

ebudget between cost categories per NSF policy without NSF approval, if the rebudgeting does not cause a significant change
time. Usually significant means a change of 25% or more. Rearrangements/Alterations are probably not applicable—this
) the PAPP:

Alterations

grams, NSF does not normally make grants for construction or facility improvements. However, rearrangement and alteration costs
ruction (i.e., rearrangements and alterations aggregating less than $25,000) may be allowable under NSF grants to adapt space or
structure to accomplish the objective of the NSF-supported activity, provided that the:

ual or a foreign institution;

: consistent with project purposes and is architecturally suitable for conversion;

ration are essential to the project supported by the grant; and

ally be occupied by the project. In situations where the space is rented, in order for the costs of the rearrangement and alteration
: must secure a lease for the length of the project. (See AAG Chapter V.C.3.)

rations under $25,000 may be approved by grantees. For rearrangements and alterations expenditures exceeding $25,000, the
approval from NSF via use of the Notification and Request module in FastLane. Otherwise, any plans for such rearrangement or

set forth in the proposal. If approved by NSF, such approval will be indicated in the grant. Note that Appendix A, Contract contains various requirements concerning contracts for construction or repair in excess of $2,000.

roposed constitutes a significant change, they would submit a Fastlane request for NSF approval. I'm copying Anne in case she

! 3:14 PM

GMU

d to rebudget tuition money to "stipend and salary costs". I don't see anything in AAG that suggests he needs to ask In Exhibit II there is a reference to "Rearrangements/Alterations in excess of $25,000" and I'm sure this will be more than llowed to rebduget? This is for AGS-0830062, the COLA grant at GMU. Thanks very much, Eric

0500
sf.gov>
cola.iges.org>

it we will spend the full NSF ARRA award at COLA and at GMU by the end of August 2013.

: the GMU part of the award. The amount of student tuition money in the award is more than we can spend (this happened in sity-wide change in policy that for Ph.D. graduate students GMU will charge the in-state tuition rather than out-of-state tuition sal). In order to be able to spend this additional tuition money, we will require your approval to revise the budget and re- d salary costs. Of course all the funds are already at GMU, but I am not familiar with the rules of revising budgets for ARRA ead was not included on tuition costs. Any guidance you can provide on this question will be appreciated.

Correspondence_0830062 (7)

From: Dodson, Martha Ione
Sent: Wednesday, April 13, 2011 10:34 AM
To: Fein, Jay S.
Cc: Joyce, Robert
Subject: RE: Kinter, COLA, IGES, 0830068 and Shukla, GMU, 0830062

Jay,

My apologies for the delay in responding to your question. I did have the chance to look at this collaborative. I see that the Institute of Global Environment and Society (IGES) is the lead on this two-award collaborative. You stated that the Lead wants to accept an offer to be brought into George Mason University as a research lab, which is the non-lead collaborator on this project, and they want to transfer their award to GMU. The awards were made with ARRA funding.

Unfortunately, we cannot transfer an ARRA award if any funds have been drawn down from the award. In this case, IGES has drawn down funds and so we cannot give them permission for the grant transfer. This is a hard and fast rule from the Policy Office.

I know this isn't the answer that they were hoping for but we have to abide by the rules governing ARRA-funded awards.

Martha

From: Fein, Jay S.
Sent: Thursday, April 07, 2011 2:39 PM
To: Dodson, Martha Ione
Subject: Kinter, COLA, IGES, 0830068 and Shukla, GMU, 0830062

Hi Martha: This is a large ARRA collaborative.

There's a lot of background information I can provide if you see a path toward my objective, but for now, here is the question.

COLA, IGES is a GMU-affililated, not-for-profit research lab. Shukla is a Professor at GMU and also President of IGES (under which COLA resides). About 5-6 COLA researchers are also faculty members at GMU.

These ARRA grants cover the same research. The budget is split between COLA and GMU; tuition and student costs are funded to GMU and research staff, rental space, etc., are funded at COLA.

Recently GMU offered to bring all of IGES, COLA into the university as a department lab. That's an attractive offer for COLA, IGES and they want to accept it.

So, Kinter and Shukla asked me if the COLA grant could be transferred to GMU. Kinter will be a professor at GMU and he and Shukla would be PI, coPI.

They and I were told no, because the collaborative is funded under ARRA. I believe that the issue is

reporting on ARRA grants must be done by the original grantees (I could be mistaken about this).

What this means is that COLA, IGES, instead of dissolving will have to retain its identity as a research
lab.

Is this the case?

Thanks and sorry for the question being asked again. The COLA IGES management (Shukla and Kinter)
are concerned about the cost and complication involved in staying open as an institution.

Jay

Correspondence_0830062 (11)

From: Jones, Thomas J
Sent: Tuesday, July 27, 2010 3:01 PM
To: Huang, Pei-Chiung (Anne); Joel, Ruth E.
Cc: Fein, Jay S.
Subject: RE: arra grants transfer

Ruth, Anne, and Jay,

Thank you for the inquiry.

Since the organization would have submitted the required quarterly ARRA project report,
and they have spent funds on this award, NSF will not be able to approve a grant transfer of
the award. With that being the case, the only course of action is to:

1) have the awardee institution to request a PI/Co-PI change or Add-PI
2) the awardee would then need to submit a request to contract or transfer the project
effort. Please keep in mind that the awardee institution will still have the requirement to submit the ARRA quarterly report. That responsibility is not transferred to the subaward institution.

I hope that this information is helpful.

Thank you,

Tom

From: Huang, Pei-Chiung (Anne)
Sent: Tuesday, July 27, 2010 2:14 PM
To: Joel, Ruth E.; Jones, Thomas J
Cc: Fein, Jay S.
Subject: RE: arra grants transfer

Also, this is a set collaborative grants if it matters.

From: Joel, Ruth E.
Sent: Tuesday, July 27, 2010 2:02 PM
To: Jones, Thomas J
Cc: Fein, Jay S.; Huang, Pei-Chiung (Anne)
Subject: FW: arra grants transfer

Tom

The institution has spent some funds already on the ARRA award (0830068) that they want to
transfer. Does this mean that transfer option is out? Is there some workaround for situation if
transfer not possible–close out the award and make new award perhaps.

Would you let us know your thoughts on this or should we discuss with Martha or Bob Joyce.

Ruth Joel, AGS
rjoel@nsf.gov
x4706

From: Fein, Jay S.

Correspondence_0830062 (11)

Sent: Monday, July 26, 2010 5:55 PM
To: Joel, Ruth E.
Subject: arra grants transfer

Ruth: Please find out if an ARRA grant can be transfered from one collaborating institution to
the second collaborating institution. The specific grants are Kinter's (IGES, COLA) ~7M/5 yrs
and (GMU) Shukla's ~3M/5 yrs (0830062).

The transfer would be from IGES to GMU. The reason is that IGES would become an institute
within GMU.

jay

NATIONAL SCIENCE FOUNDATION
Diary Note

Name: jfein
Date: 08/12/2009 04:37 PM
Keyword: (b)(4) [redacted]
Note:
D.N.
Subject: 0830068 and
Kinter, COLA and Shukla, GMU
Justifications (b)(4) [redacted]

I approve awarding (b)(4) [redacted]

IGES, COLA is a not-for-profit laboratory with no state support.

Jay S. Fein
08/12/09

NATIONAL SCIENCE FOUNDATION
Grant Letter

Award Date: March 5, 2014
Award No. AGS-0830062
Amendment No. 001

Mr. Michael Laskofski:
Director, Office of Sponsored Programs
George Mason University
4400 University Drive
Fairfax, VA 22030-4422

Dear Mr. Laskofski:

By letter dated August 30, 2009 the sum of $3,798,208 was awarded to George Mason University under the direction of Jagadish Shukla for support of the project entitled:

"Collaborative Research: Predictability of the Physical Climate System."

This award is funded under the American Recovery and Reinvestment Act of 2009 (ARRA) (Public Law 111-5). Recipient reporting for ARRA awards has been repealed by Congress as of February 1, 2014. Therefore, the January 2014 reporting cycle was the last time you will be required to report on your ARRA award.

Recipients must still comply with reporting requirements in standard NSF award conditions (Research Terms and Conditions or Grant General Conditions, as applicable).

Except as modified by this amendment, the grant conditions remain unchanged.

The cognizant NSF program official for this grant is Eric T. DeWeaver (703) 292-8527. The cognizant NSF grants and agreements official contact is Brenda T. Thomas (703) 292-4830.

Sincerely,

Jamie H. French
Grants and Agreements Officer

CFDA No. 47.082
mlaskofs@gmu.edu

NATIONAL SCIENCE FOUNDATION
Grant Letter

Award Date: August 30, 2009
Award No. ATM-0830062
Proposal No. ATM-0830062

Mr. Michael Laskofski:
Director, Office of Sponsored Programs
George Mason University
4400 UNIVERSITY DR
FAIRFAX, VA 22030-4444

Dear Mr. Laskofski:

The National Science Foundation hereby awards a grant of $3,798,208 to George Mason University for support of the project described in the proposal referenced above as modified by revised budget dated August 24, 2009.

This project, entitled "Collaborative Research: Predictability of the Physical Climate System," is under the direction of Jagadish Shukla, in collaboration with the following proposals

Proposal No:	PI Name/Institution
0830068	James L. Kinter, Institute of Global Environment and Society, Inc.

This award is effective September 1 , 2009 and expires August 31, 2014.

This award is funded under the American Recovery and Reinvestment Act of 2009 (ARRA) (Public Law 111-5) and is subject to the ARRA Terms and Conditions, dated May, 2009, available on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=arra0509

This grant is awarded pursuant to the authority of the National Science Foundation Act of 1950, as amended (42 U.S.C. 1861-75) and is also subject to Research Terms and Conditions (RTC, dated July 2008) and the NSF RTC Agency-Specific Requirements (dated January 2009) are available at http://www.nsf.gov/awards/managing/rtc.jsp. This institution is a signatory to the Federal Demonstration Partnership (FDP) Phase V Agreement which requires active institutional participation in new or ongoing FDP demonstrations and pilots..

The attached budget indicates the amounts, by categories, on which NSF has based its support.

Please view the project reporting requirements for this award at the following web address [https://www.fastlane.nsf.gov/researchadmin/prsLoginHome.do?awdID=0830062].

The cognizant NSF program official for this grant is Jay S. Fein, (703) 292-8527.
The cognizant NSF grants official contact is Anna-Lee M. Misiano, (703) 292-4339.

Sincerely,

Robert F. Joyce
Grants and Agreements Officer

CFDA No. 47.082
mlaskofs@gmu.edu

NATIONAL SCIENCE FOUNDATION
Grant Letter

ATM-0830062
000

SUMMARY PROPOSAL BUDGET

Person MOS	cal	acad	sumr	Funds granted By NSF
A. (30.00) Total Senior personnel	(b)(4) & (b)(6)			
B. Other Personnel				
1. (0.00) Post Doctoral associates				
2. (0.00) Other professionals				
3. (21.00) Graduate students				
4. (0.00) Secretarial-clerical				
5. (0.00) Undergraduate students				
6. (5.00) Other				
Total salaries and wages (A+B)				
C. Fringe benefits (if charged as direct cost)				
Total salaries wages and fringes (A+B+C)				
D. Total permanent equipment				(b) (4)
E. Travel				
1. Domestic				
2. Foreign				
F. Total participant support costs				
G. Other direct costs				
1. Materials and supplies				
2. Publication costs/page charges				
3. Consultant services				
4. Computer (ADPE) services				
5. Subcontracts				
6. Other				
Total other direct costs				
H. Total direct costs (A through G)				
I. Total indirect costs				
J. Total direct and indirect costs (H+I)				
K. Residual funds / Small business fee				
1. Residual funds (if for further support of current projects AAG I.D.2 and I.D.3)				
2. Small business fee				
L. Amount of this request (J) or (J-K1+K2)				$3,798,208
M. Cost sharing				$0

ACTION PROCESSING FORM

I. RECOMMENDED AWARD DATA

30. Proposal No.	31. Prev. Award No.	32. and 33. Submitting Inst. and Inst. Code		34. Rec. Award Istr.
ATM-0830062		George Mason University	0037499000	STND

35. Rec. Eff. Date	36. Award Dur.	37. Name of PI(s)/PD(s)	38. Rec. Natr of Award
09/15/2009	60	Shukla, Jagadish	NEW

39. Title Collaborative Research: Predictability of the Physical Climate System

40. FINANCIAL CODES

	Organization	Pgm. Element	Appr.	Obj. Class	Funded Amount	PO or Recommending Official	DD or Approving Official
1.	06020106	5740	01R9	4110	$3,798,208		
	Pgm. Refs:	0000 OTHR					
2.	Pgm. Refs:						
3.	Pgm. Refs:						
4.	Pgm. Refs:						
5.	Pgm. Refs:						
6.	Pgm. Refs:						
7.	Pgm. Refs:						
8.	Pgm. Refs:						

TOTAL RECOMMENDED AMOUNT * $3,798,208.00

41. Future Commitments

FY	FY	FY	FY

42. Special Certifications

☐ Human Subjects ☐ I.R.B. ☐ Exempt ☐ Vert. Animals ☐ IACUC

43. Foreign or International Implications

	43c. Name of Country Code	Name	Intl Collaboration
43a. Any foreign or international Activity ?			
43b. Any NSF-funded students traveling internationally ?			

44. Signature of Managing Program Officer and Section Head (If Required) and Date — Jay S. Fein *Jay S. Fein 08/03/09* — Managing Org 06020106

45. Signature of Managing Division Director and Assistant Director (If Required) and Date — Jarvis L. Moyers *Rich Behnke for 08/03/09*

46. Division Funds Certification Signature (If Required) and Date *[signature] 9.5.09*

II. AWARD DATA (DGA USE ONLY)

47. Date of Award	48. Award No. (If different)	49. Award Amount (If different)	50. Cumulative Award

51. Award Duration (If different)	52. Effective Date (If different)	53. Expiration Date	54. Submitting Inst. Code (If different)

55. Award Instrument	56. Natr of Awd (If different)	57. Type of Contract	58. DGA Initials and Date
STND			

59. Remarks

☐ ______ Month(s) No-Cost Extension From ______ To: ______ Mode of Support: ~~NONE~~ *Research*

☐ Original NSF Abstract Still Valid

☐ P.I. Transfer

☐ Pre-College Curriculum

Collaborative w/ ATM-0830068, J. Kinter at IGES.

COMPUTER GENERATED FORM 1036 NSF FORM 1036 (09/96)

NATIONAL SCIENCE FOUNDATION

PROPOSAL BUDGET

FOR NSF USE ONLY

ORGANIZATION	PROPOSAL NO.	DURATION (months) Proposed	Granted
George Mason University			
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: Shukla, Jagadish	AWARD NO. 0830062		

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUM	Funds Requested by proposer	Funds granted by NSF (if different)
1.				(b)(4), (b)(6)	
2.					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)					
7. (30) TOTAL SENIOR PERSONNEL (1-6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (21) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (5) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENIFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENIFITS (A + B + C)					

D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5000.)			
1	$		
2	$		
3	$		
Others: (see budget comment page ...)	$		
TOTAL EQUIPMENT			0
E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)			0
2. FOREIGN			0
F. PARTICIPANT SUPPORT COSTS			
1. STIPENDS $			
2. TRAVEL			
3. SUBSISTENCE			
4. OTHER			
(0) TOTAL PARTICIPANT COSTS		(b)(4)	
G. OTHER DIRECT COSTS			
1. MATERIALS AND SUPPLIES			
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION			
3. CONSULTANT SERVICES			
5. COMPUTER SERVICES			
5. SUBAWARDS			
6. OTHER			
TOTAL OTHER DIRECT COSTS			
H. TOTAL DIRECT COSTS (A THROUGH G)			
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)			
TOTAL INDIRECT COSTS (F&A)			
J. TOTAL DIRECT AND INDIRECT COSTS (A THROUGH G)			
K. FEES			
K1 RESIDUAL FUNDS			
K2 SMALL BUSINESS FEE			
L. AMOUNT OF THIS REQUEST (J) OR (J - K1 + K2)	$		$ 3,798,208

M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $		
PI/PD TYPED NAME & SIGNATURE*	DATE	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION	
ORG. REP. TYPED NAME & SIGNATURE*	DATE	Date Checked: Date of Rate Sheet: Initials - ORG	

NSF Form 1030 (10/02) Supersedes all previous editions

*SIGNATURES REQUIRED ONLY FOR REVISED BUDGET (OPG ILB)

SUMMARY PROPOSAL BUDGET YEAR 1

ORGANIZATION	FOR NSF USE ONLY		
George Mason University	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6)				
2. Kyung Chiu - Faculty Associate					
3. Timothy Delsole - Faculty Associate					
4. Bohua Huang - Faculty Associate					
5. Edwin K Schneider - Faculty Associate					
6. (1) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE					
7. (6) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (6) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS	(b)(4)				
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Modified Total Direct C(b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				707,810	

M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY		
Jagadish Shukla	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
Shandra watson			

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Revised Proposal Budget Revision # 2 for 0830062 Submitted On Aug 24 2009 9:59AM Electronic Signature

SUMMARY PROPOSAL BUDGET COMMENTS - Year 1

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Straus, David M - Faculty Associate	(b)(4) & (b)(6)			

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION	FOR NSF USE ONLY		
George Mason University	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6)				
2. Kyung Chin - Faculty Associate					
3. Timothy Delsole - Faculty Associate					
4. Bohua Huang - Faculty Associate					
5. Edwin K Schneider - Faculty Associate					
6. (1) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE					
7. (6) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (5) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Modified Total Direct Costs (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				732,186	

M. COST SHARING PROPOSED LEVEL $ 0 AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
Jagadish Shukla	Date Checked	Date Of Rate Sheet	Initials - ORG
ORG. REP. NAME* Shandra watson			

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 2

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Straus, David M - Faculty Associate	(b)(4) & (b)(6)			

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION	FOR NSF USE ONLY		
George Mason University	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6)				
2. Kyung Chin - Faculty Associate					
3. Timothy Delsole - Faculty Associate					
4. Bohua Huang - Faculty Associate					
5. Edwin K Schneider - Faculty Associate					
6. (1) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)					
7. (6) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (5) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Modified Total Direct Costs ((b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				757,900	
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $				

PI/PD NAME	FOR NSF USE ONLY		
Jagadish Shukla	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
Shandra watson			

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 3

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Straus, David M - Faculty Associate				(b)(4) & (b)(6)

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION	FOR NSF USE ONLY		
George Mason University	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6)				
2. Kyung Chin - Faculty Associate					
3. Timothy Delsole - Faculty Associate					
4. Bohua Huang - Faculty Associate					
5. Edwin K Schneider - Faculty Associate					
6. (1) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)					
7. (6) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (3) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
Modified Total Direct Costs (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				706,644	

M. COST SHARING PROPOSED LEVEL $ 0 AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
Jagadish Shukla	Date Checked	Date Of Rate Sheet	Initials - ORG
ORG. REP. NAME* Shandra watson			

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 4

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Straus, David M - Faculty Associate				(b)(4) & (b)(6)

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION	FOR NSF USE ONLY		
George Mason University	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI				(b)(4), (b)(6)	
2. Kyung Ghin - Faculty Associate					
3. Timothy Delsole - Faculty Associate					
4. Bohua Huang - Faculty Associate					
5. Edwin K Schneider - Faculty Associate					
6. (1) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATIO					
7. (6) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER,					
3. (3) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) (b)(4) Modified Total Direct Costs					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				814,768	

M. COST SHARING PROPOSED LEVEL $ 0 AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
Jagadish Shukla	Date Checked	Date Of Rate Sheet	Initials - ORG
ORG. REP. NAME* Shandra watson			

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 5

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Straus, David M - Faculty Associate				(b)(4) & (b)(6)

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION	FOR NSF USE ONLY		
George Mason University	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6)				
2. Kyung Chin - Faculty Associate					
3. Timothy Delsole - Faculty Associate					
4. Bohua Huang - Faculty Associate					
5. Edwin K Schneider - Faculty Associate					
6. (1) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)					
7. (6) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (21) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (6) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				3,798,208	

(b)(4)

M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY		
Jagadish Shukla	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
Shandra Watson			

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget Impact Statement

The budget includes more than (b)(4) & (b)(6) salary support for most of the senior scientists because, their GMU appointments provide (b)(4) & (b)(6) support. They conduct research in collaboration with IGES which is a not-for-profit laboratory with no state support, i.e., is totally on ?soft? funding. The research to be conducted will be done in the mode of a research team, that is, scientists working together to accomplish the project's central goal, which is to improve understanding of the potential predictability of climate and to work with operational climate prediction centers to help them achieve this potential.

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION	FOR NSF USE ONLY		
George Mason University	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6)				
2. Kyung Chin - Faculty Associate					
3. Timothy Dalsole - Faculty Associate					
4. Bohua Huang - Faculty Associate					
5. Edwin K Schneider - Faculty Associate					
6. (1) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)					
7. (6) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (5) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Modified Total Direct Costs (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				707,810	
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $				

PI/PD NAME	FOR NSF USE ONLY		
Jagadish Shukla	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
Carol-Ann Courtney			

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Revised Proposal Budget Revision # 1 for 0830062 Submitted On Jun 23 2009 11:23AM Electronic Signature

SUMMARY PROPOSAL BUDGET COMMENTS - Year 1

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Straus, David M - Faculty Associate	(b)(4) & (b)(6)			

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION	FOR NSF USE ONLY		
George Mason University	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6)				
2. Kyung Chin - Faculty Associate					
3. Timothy Delsole - Faculty Associate					
4. Bohua Huang - Faculty Associate					
5. Edwin K Schneider - Faculty Associate					
6. (1) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE					
7. (6) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (5) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
Modified Total Direct Costs (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				732,108	

M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
Jagadish Shukla	Date Checked	Date Of Rate Sheet	Initials - ORG
ORG. REP. NAME* Carol-Ann Courtney			

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 2

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Straus, David M - Faculty Associate	(b)(4) & (b)(6)			

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION	FOR NSF USE ONLY		
George Mason University	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6)				
2. Kyung Chin - Faculty Associate					
3. Timothy Delsole - Faculty Associate					
4. Bohua Huang - Faculty Associate					
5. Edwin K Schneider - Faculty Associate					
6. (1) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE					
7. (6) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (5) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Modified Total Direct C (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				757,900	
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $				

PI/PD NAME	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
Jagadish Shukla	Date Checked	Date Of Rate Sheet	Initials - ORG
ORG. REP. NAME* Carol-Ann Courtney			

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 3

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Straus, David M - Faculty Associate	(b)(4) & (b)(6)			

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION	FOR NSF USE ONLY		
George Mason University	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6)				
2. Kyung Chin - Faculty Associate					
3. Timothy Delsole - Faculty Associate					
4. Bohua Huang - Faculty Associate					
5. Edwin K Schneider - Faculty Associate					
6. (1) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE					
7. (6) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (3) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Modified Total Direct C (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				785,544	

M. COST SHARING PROPOSED LEVEL $ 0 AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
Jagadish Shukla	Date Checked	Date Of Rate Sheet	Initials - ORG
ORG. REP. NAME* Carol-Ann Courtney			

* ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 4

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Straus, David M - Faculty Associate	(b)(4) & (b)(6)			

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION	FOR NSF USE ONLY		
George Mason University	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6)				
2. Kyung Chin - Faculty Associate					
3. Timothy Delsole - Faculty Associate					
4. Bohua Huang - Faculty Associate					
5. Edwin K Schneider - Faculty Associate					
6. (1) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAG					
7. (6) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (3) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					

D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)		
TOTAL EQUIPMENT	0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)	0	
2. FOREIGN	0	
F. PARTICIPANT SUPPORT COSTS		
1. STIPENDS $ 0		
2. TRAVEL 0		
3. SUBSISTENCE 0		
4. OTHER 0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS	(b)(4)	
G. OTHER DIRECT COSTS		
1. MATERIALS AND SUPPLIES		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION		
3. CONSULTANT SERVICES		
4. COMPUTER SERVICES		
5. SUBAWARDS		
6. OTHER		
TOTAL OTHER DIRECT COSTS		
H. TOTAL DIRECT COSTS (A THROUGH G)		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Modified Total Direct Costs (b)(4)		
TOTAL INDIRECT COSTS (F&A)		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)		
K. RESIDUAL FUNDS		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)	814,766	

M. COST SHARING PROPOSED LEVEL $ 0 AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY		
Jagadish Shukla	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
Carol-Ann Courtney			

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 5

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Straus, David M - Faculty Associate	(b)(4) & (b)(6)			

SUMMARY PROPOSAL BUDGET

Cumulative

FOR NSF USE ONLY

ORGANIZATION	PROPOSAL NO.	DURATION (months) Proposed	Granted
George Mason University			
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6)				
2. Kyung Chin - Faculty Associate					
3. Timothy Dolsole - Faculty Associate					
4. Bohua Huang - Faculty Associate					
5. Edwin K Schneider - Faculty Associate					
6. (1) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE					
7. (6) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (21) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (5) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					

D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)		
TOTAL EQUIPMENT	0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)	0	
2. FOREIGN	0	
F. PARTICIPANT SUPPORT COSTS		
1. STIPENDS $ 0		
2. TRAVEL 0		
3. SUBSISTENCE 0		
4. OTHER 0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS	(b)(4)	
G. OTHER DIRECT COSTS		
1. MATERIALS AND SUPPLIES		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION		
3. CONSULTANT SERVICES		
4. COMPUTER SERVICES		
5. SUBAWARDS		
6. OTHER		
TOTAL OTHER DIRECT COSTS		
H. TOTAL DIRECT COSTS (A THROUGH G)		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)		
TOTAL INDIRECT COSTS (F&A)		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)		
K. RESIDUAL FUNDS		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)	3,798,208	

M. COST SHARING PROPOSED LEVEL $ 0 AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
Jagadish Shukla	Only Checked	Date Of Rate Sheet	Initials - ORG
ORG. REP. NAME* Carol-Ann Courtney			

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget Impact Statement

The revised budget has requests support for five Ph.D. students for five years, whereas the previous budget had support for only three Ph.D. students for five years. The budget includes Graduate Research Assistantship for 20 hours per week for the academic year and for 40 hours a week during the summer for all the five Ph.D. students. This enhanced budget will help in building capacity and educating young climate dynamicists who will be trained in climate modeling and application of climate models for climate prediction for the benefit of society.

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION Institute of Global Environment and Society			FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR James L Kinter			AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested by proposer	Funds granted by NSF (if different)
1. James L Kinter - Director				(b)(4), (b)(6)	
2. Timothy DelSole					
3. Paul Dirmeyer					
4. Bohua Huang					
5. Benjamin Kirtman					
6. (4) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE					
7. (9) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (1) POST DOCTORAL SCHOLARS					
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) additional disk capacity replacement of obsolete peripheral equipment upgrades to COLA clusters and file servers				(b)(4)	
TOTAL EQUIPMENT				(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ 2. TRAVEL 3. SUBSISTENCE 4. OTHER				(b)(4)	
TOTAL NUMBER OF PARTICIPANTS			TOTAL PARTICIPANT COSTS		
G. OTHER DIRECT COSTS				(b)(4)	
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect costs (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				1,342,189	
M. COST SHARING PROPOSED LEVEL $ 0			AGREED LEVEL IF DIFFERENT $		

PI/PD NAME James L Kinter	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Revised Proposal Budget Revision # 2 for 0830068 Submitted On Jul 31 2009 7:38PM Electronic Signature

SUMMARY PROPOSAL BUDGET COMMENTS - Year 1

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Klinger, Barry - Schneider, Edwin - Straus, David - TBD, Decadal -	(b)(4) & (b)(6)			

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION	FOR NSF USE ONLY		
Institute of Global Environment and Society	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
James L Kinter			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. James L Kinter - Director	(b)(4), (b)(6)				
2. Timothy DelSole					
3. Paul Dirmeyer					
4. Bohua Huang					
5. Benjamin Kirtman					
6. (4) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)					
7. (9) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (1) POST DOCTORAL SCHOLARS					
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) additional disk capacity; replacement of obsolete peripheral equipment; upgrades to COLA clusters and file servers				(b)(4)	
TOTAL EQUIPMENT				(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ (b)(4)					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS (b)(4) TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect costs (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				1,389,612	

M. COST SHARING PROPOSED LEVEL $ 0 AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
James L Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG
ORG. REP. NAME* James Kinter			

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 2

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Klinger, Barry -	(b)(4) & (b)(6)			
Schneider, Edwin -				
Straus, David -				
TBD, Decadal -				

SUMMARY PROPOSAL BUDGET YEAR 3

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	 Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR James L Kinter				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. James L Kinter - Director	[redacted]					
2. Timothy DelSole						
3. Paul Dirmeyer						
4. Bohua Huang						
5. Benjamin Kirtman						
6. (4) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)						
7. (9) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (1) POST DOCTORAL SCHOLARS						
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (1) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) additional disk capacity replacement of obsolete peripheral equipment upgrades to COLA clusters and file servers				[redacted]		
TOTAL EQUIPMENT				[redacted]		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ 2. TRAVEL 3. SUBSISTENCE 4. OTHER				[redacted]		
TOTAL NUMBER OF PARTICIPANTS				TOTAL PARTICIPANT COSTS		
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect costs [redacted]						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				1,439,408		
M. COST SHARING PROPOSED LEVEL $ 0				AGREED LEVEL IF DIFFERENT $		

PI/PD NAME James L Kinter	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 3

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Klinger, Barry -	(b)(4) & (b)(6)			
Schneider, Edwin -				
Straus, David -				
TBD, Decadal -				

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed / Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR James L Kinter				AWARD NO.	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.Y. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. James L Kinter - Director	(b)(4), (b)(6)				
2. Timothy DelSole					
3. Paul Dirmeyer					
4. Dohua Huang					
5. Benjamin Kirtman					
6. (4) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)					
7. (9) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (1) POST DOCTORAL SCHOLARS					
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) additional disk capacity replacement of obsolete peripheral equipment upgrades to COLA clusters and file servers				(b)(4)	
TOTAL EQUIPMENT					(b)(4)
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ 2. TRAVEL 3. SUBSISTENCE 4. OTHER				(b)(4)	
TOTAL NUMBER OF PARTICIPANTS				TOTAL PARTICIPANT COSTS	(b)(4)
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect costs (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					1,469,708
M. COST SHARING PROPOSED LEVEL $ 0				AGREED LEVEL IF DIFFERENT $	
PI/PD NAME James L Kinter				FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION	
ORG. REP. NAME* James Kinter				Date Checked / Date Of Rate Sheet / Initials - ORG	

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 4

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Klinger, Barry - Schneider, Edwin - Straus, David - TBD, Decadal -	(b)(4) & (b)(6)			

SUMMARY PROPOSAL BUDGET YEAR 5

ORGANIZATION	FOR NSF USE ONLY		
Institute of Global Environment and Society	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
James L Kinter			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. James L Kinter - Director				(b)(4), (b)(6)	
2. Timothy DelSole					
3. Paul Dirmeyer					
4. Bohua Huang					
5. Benjamin Kirtman					
6. (4) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)					
7. (0) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (1) POST DOCTORAL SCHOLARS					
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000)					
additional disk capacity				(b)(4)	
replacement of obsolete peripheral equipment					
upgrades to COLA clusters and file servers					
TOTAL EQUIPMENT				(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS				(b)(4)	
1. STIPENDS $					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
Indirect costs (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				1,541,180	

M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY		
James L Kinter	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
James Kinter			

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 5

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Klinger, Barry - Schneider, Edwin - Straus, David - TBD, Decanal -	(b)(4) & (b)(6)			

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION	FOR NSF USE ONLY		
Institute of Global Environment and Society	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
James L Kinter			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. James L Kinter - Director				(b)(4), (b)(6)	
2. Timothy DelSole					
3. Paul Dirmeyer					
4. Bohua Huang					
5. Benjamin Kirtman					
6. (4) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAG					
7. (9) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (6) POST DOCTORAL SCHOLARS					
2. (15) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (5) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (5) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)				(b)(4)	
TOTAL EQUIPMENT				(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $				(b)(4)	
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				7,202,295	

M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
James L Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG
ORG. REP. NAME* James Kinter			

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget Impact Statement

The second revision of the budget is to remove a TBD post-doctoral research associate from the staff of the project. The position will be requested in a separate proposal. The impact on the amount of the request is less than 10% of the five-year total.

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR James L Kinter				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. James L Kinter - Director	(b)(4), (b)(6)					
2. Timothy DelSole						
3. Paul Dirmeyer						
4. Bohua Huang						
5. Benjamin Kirtman						
6. (4) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)						
7. (9) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (2) POST DOCTORAL SCHOLARS						
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (1) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) additional disk capacity replacement of obsolete peripheral equipment upgrades to COLA clusters and file servers				(b)(4)		
TOTAL EQUIPMENT						
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				(b)(4)		
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ 2. TRAVEL 3. SUBSISTENCE 4. OTHER				(b)(4)		
TOTAL NUMBER OF PARTICIPANTS				TOTAL PARTICIPANT COSTS		
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect costs (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						1,466,613
M. COST SHARING PROPOSED LEVEL $ 0				AGREED LEVEL IF DIFFERENT $		

PI/PD NAME	FOR NSF USE ONLY		
James L Kinter	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
James Kinter			

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Revised Proposal Budget Revision # 1 for 0830068 Submitted On Jun 26 2009 5:24PM Electronic Signature

SUMMARY PROPOSAL BUDGET COMMENTS - Year 1

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Klinger, Barry - Schneider, Edwin - Straus, David - TBD, Decadal -	(b)(4) & (b)(6)			

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR James L Kinter				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. James L Kinter - Director				(b)(4), (b)(6)		
2. Timothy DelSole						
3. Paul Dirmeyer						
4. Bohua Huang						
5. Benjamin Kirtman						
6. (4) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAG						
7. (9) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (2) POST DOCTORAL SCHOLARS						
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (1) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) additional disk capacity replacement of obsolete peripheral equipment upgrades to COLA clusters and file servers				(b)(4)		
TOTAL EQUIPMENT				(b)(4)		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ 2. TRAVEL 3. SUBSISTENCE 4. OTHER				(b)(4)		
TOTAL NUMBER OF PARTICIPANTS				TOTAL PARTICIPANT COSTS		
G. OTHER DIRECT COSTS				(b)(4)		
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect costs (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				1,514,952		
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $					

PI/PD NAME James L Kinter	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 2

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Klinger, Barry - Schneider, Edwin - Straus, David - TBD, Docadal -	(b)(4) & (b)(6)			

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION	FOR NSF USE ONLY		
Institute of Global Environment and Society	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
James L Kinter			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. James L Kinter - Director	(b)(4), (b)(6)				
2. Timothy DelSole					
3. Paul Dirmeyer					
4. Bohua Huang					
5. Benjamin Kirtman					
6. (4) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION)					
7. (9) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (1) POST DOCTORAL SCHOLARS					
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ET					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
additional disk capacity (b)(4)					
replacement of obsolete peripheral equipment					
upgrades to COLA clusters and file servers					
TOTAL EQUIPMENT				(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS (b)(4)					
1. STIPENDS $					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS				(b)(4)	
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
Indirect costs ((b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				1,439,406	

M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
James L Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG
ORG. REP. NAME*			
James Kinter			

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 3

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Klinger, Barry - Schneider, Edwin - Straus, David - TBD, Decadal -	(b)(4) & (b)(6)			

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION	FOR NSF USE ONLY		
Institute of Global Environment and Society	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
James I. Kinter			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. James I. Kinter - Director				(b)(4), (b)(6)	
2. Timothy DelSole					
3. Paul Dirmeyer					
4. Bohua Huang					
5. Benjamin Kirtman					
6. (4) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PA					
7. (9) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (1) POST DOCTORAL SCHOLARS					
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000) additional disk capacity replacement of obsolete peripheral equipment upgrades to COLA clusters and file servers				(b)(4)	
TOTAL EQUIPMENT				(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $				(b)(4)	
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS				(b)(4)	
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect costs (Rate: 65.0000, Base: 909489)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				1,499,709	

M. COST SHARING PROPOSED LEVEL $ 0 AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
James I. Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG
ORG. REP. NAME* James Kinter			

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 4

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Klinger, Barry - Schneider, Edwin - Straus, David - TBD, Decadal -	(b)(4) & (b)(6)			

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION Institute of Global Environment and Society			FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR James L Kinter			AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. James L Kinter - Director	(b)(4), (b)(6)				
2. Timothy DelSole					
3. Paul Dirmeyer					
4. Bohua Huang					
5. Benjamin Kirtman					
6. (4) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAG					
7. (9) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (1) POST DOCTORAL SCHOLARS					
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) additional disk capacity replacement of obsolete peripheral equipment upgrades to COLA clusters and file servers				(b)(4)	
TOTAL EQUIPMENT					
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				(b)(4)	
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ 2. TRAVEL 3. SUBSISTENCE 4. OTHER					
TOTAL NUMBER OF PARTICIPANTS			TOTAL PARTICIPANT COSTS	(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect costs (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				1,541,180	
M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $				

PI/PD NAME James L Kinter	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 5

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Klinger, Barry - Schneider, Edwin - Straus, David - TBD, Decadal -	(b)(4) & (b)(6)			

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION	FOR NSF USE ONLY		
Institute of Global Environment and Society	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
James L Kinter			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. James L Kinter - Director				(b)(4), (b)(6)	
2. Timothy DelSole					
3. Paul Dirmeyer					
4. Bohua Huang					
5. Benjamin Kirtman					
6. (4) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION					
7. (9) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (7) POST DOCTORAL SCHOLARS					
2. (15) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, E					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (5) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (5) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)				(b)(4)	
TOTAL EQUIPMENT				(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS				(b)(4)	
1. STIPENDS $					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				7,451,769	

M. COST SHARING PROPOSED LEVEL $ 0	AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
James L Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG
ORG. REP. NAME* James Kinter			

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget Impact Statement

The original budget was a total multi-agency budget that included the contributions from NSF, NOAA and NASA. The revised budget only includes the NSF contribution, because the other agencies (NOAA and NASA) have chosen to fund their contributions through separate awards to IGES.

The revised budget reflects an increased level of effort to support one additional scientist at the post-doc level for 5 years, and one additional post-doc (b)(4) & for 2 years. The former will receive training in advanced Earth system modeling. The latter will participate in the application of very high resolution models (IFS from ECMWF and NICAM from Japan) to US supercomputers.

Corrected : 03/27/2008

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE (If not in response to a program announcement/solicitation enter NSF 04-1)	FOR NSF USE ONLY
PD 06-5740	NSF PROPOSAL NUMBER
FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)	0830068
ATM - GEO/ATM - Climate & Large-Scale Dynamics	

DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION
03/14/2008	1	06020000 ATM	5740	787160431	03/27/2008 8:04pm

EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)	SHOW PREVIOUS AWARD NO. IF THIS IS ☐ A RENEWAL ☐ AN ACCOMPLISHMENT-BASED RENEWAL	IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES ☐ NO ☒ IF YES, LIST ACRONYM(S)
521761388		

NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE	ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE
Institute of Global Environment and Society	Institute of Global Environment and Society 4041 Powder Mill Road, Suite 302 Calverton, MD. 207053109
AWARDEE ORGANIZATION CODE (IF KNOWN) 5300002833	
NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE	ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE
PERFORMING ORGANIZATION CODE (IF KNOWN)	

IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions) ☐ SMALL BUSINESS ☐ FOR-PROFIT ORGANIZATION ☐ MINORITY BUSINESS ☐ WOMAN-OWNED BUSINESS ☐ IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE

TITLE OF PROPOSED PROJECT **Collaborative Research: Predictability of the Physical Climate System**

REQUESTED AMOUNT	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE
$ 16,973,461	60 months	01/01/09	

CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW

☐ BEGINNING INVESTIGATOR (GPG I.G.2)
☐ DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C)
☐ PROPRIETARY & PRIVILEGED INFORMATION (GPG I.D, II.C.1.d)
☐ HISTORIC PLACES (GPG II.C.2.j)
☐ SMALL GRANT FOR EXPLOR. RESEARCH (SGER) (GPG II.D.1)
☐ VERTEBRATE ANIMALS (GPG II.D.6) IACUC App. Date _____
PHS Animal Welfare Assurance Number _____
☐ HUMAN SUBJECTS (GPG II.D.6) Human Subjects Assurance Number _____
Exemption Subsection _____ or IRB App. Date _____
☐ INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j)
☐ HIGH RESOLUTION GRAPHICS/OTHER GRAPHICS WHERE EXACT COLOR REPRESENTATION IS REQUIRED FOR PROPER INTERPRETATION (GPG I.G.1)

PI/PD DEPARTMENT	PI/PD POSTAL ADDRESS
COLA	4041 Powder Mill Road, Suite 302 Calverton, MD 207053106 United States
PI/PD FAX NUMBER 301-595-9793	

NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address
PI/PD NAME James L Kinter	PhD	(b)(6)	301-595-7000	kinter@coln.lges.org
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				

Electronic Signature

CERTIFICATION PAGE

Certification for Authorized Organizational Representative or Individual Applicant:

By signing and submitting this proposal, the Authorized Organizational Representative or Individual Applicant is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding debarment and suspension, drug-free workplace, and lobbying activities (see below), nondiscrimination, and flood hazard insurance (when applicable) as set forth in the NSF Proposal & Award Policies & Procedures Guide, Part I: the Grant Proposal Guide (GPG) (NSF 08-1). Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U. S. Code, Title 18, Section 1001).

Conflict of Interest Certification

In addition, if the applicant institution employs more than fifty persons, by electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative of the applicant institution is certifying that the institution has implemented a written and enforced conflict of interest policy that is consistent with the provisions of the NSF Proposal & Award Policies & Procedures Guide, Part II, Award & Administration Guide (AAG) Chapter IV.A; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the institution's expenditure of any funds under the award, in accordance with the institution's conflict of interest policy. Conflicts which cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

Drug Free Work Place Certification

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Drug Free Work Place Certification contained in Exhibit II-3 of the Grant Proposal Guide.

Debarment and Suspension Certification

(If answer "yes", please provide explanation.)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency? Yes (b) (4) No (b) (4)

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Debarment and Suspension Certification contained in Exhibit II-4 of the Grant Proposal Guide.

Certification Regarding Lobbying

The following certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding $100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding $150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Certification Regarding Nondiscrimination

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative is providing the Certification Regarding Nondiscrimination contained in Exhibit II-6 of the Grant Proposal Guide.

Certification Regarding Flood Hazard Insurance

Two sections of the National Flood Insurance Act of 1968 (42 USC §4012a and §4106) bar Federal agencies from giving financial assistance for acquisition or construction purposes in any area identified by the Federal Emergency Management Agency (FEMA) as having special flood hazards unless the:

(1) community in which that area is located participates in the national flood insurance program; and
(2) building (and any related equipment) is covered by adequate flood insurance.

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant located in FEMA-designated special flood hazard areas is certifying that adequate flood insurance has been or will be obtained in the following situations:

(1) for NSF grants for the construction of a building or facility, regardless of the dollar amount of the grant; and
(2) for other NSF Grants when more than $25,000 has been budgeted in the proposal for repair, alteration or improvement (construction) of a building or facility.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE		SIGNATURE	DATE
NAME James L Kinter		Electronic Signature	Mar 14 2008 5:10PM
TELEPHONE NUMBER 301-595-7000	ELECTRONIC MAIL ADDRESS kinter@cola.iges.org		FAX NUMBER 301-595-9793

*SUBMISSION OF SOCIAL SECURITY NUMBERS IS VOLUNTARY AND WILL NOT AFFECT THE ORGANIZATION'S ELIGIBILITY FOR AN AWARD. HOWEVER, THEY ARE AN INTEGRAL PART OF THE INFORMATION SYSTEM AND ASSIST IN PROCESSING THE PROPOSAL. SSN SOLICITED UNDER NSF ACT OF 1950, AS AMENDED.

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE (If in response to a program announcement/solicitation enter NSF 03-1)	FOR NSF USE ONLY
PD 06-5740	NSF PROPOSAL NUMBER
FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)	0830062
ATM - GEO/ATM - Climate & Large-Scale Dynamics	

DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION
03/14/2008	1	06020000 ATM	5740	077817450	03/27/2008 8:04pm S

EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)	SHOW PREVIOUS AWARD NO. IF THIS IS ☐ A RENEWAL ☐ AN ACCOMPLISHMENT-BASED RENEWAL	IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES ☐ NO ☒ IF YES, LIST ACRONYM(S)
540836354		

NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE	ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE
George Mason University	George Mason University 4400 University Drive, MSN 4C6 Fairfax, VA. 220304443
AWARDEE ORGANIZATION CODE (IF KNOWN) 0037499000	
NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE	ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE
PERFORMING ORGANIZATION CODE (IF KNOWN)	

IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions) ☐ SMALL BUSINESS ☐ FOR-PROFIT ORGANIZATION ☐ MINORITY BUSINESS ☐ WOMAN-OWNED BUSINESS

☐ IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE

TITLE OF PROPOSED PROJECT: Collaborative Research: Predictability of the Physical Climate System

REQUESTED AMOUNT	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE
$ 3,298,209	60 months	01/01/09	

CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW

☐ BEGINNING INVESTIGATOR (GPG I.G.2)
☐ DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C)
☐ PROPRIETARY & PRIVILEGED INFORMATION (GPG I.D, II.C.1.d)
☐ HISTORIC PLACES (GPG II.C.2.j)
☐ SMALL GRANT FOR EXPLOR. RESEARCH (SGER) (GPG II.D.1)
☐ VERTEBRATE ANIMALS (GPG II.D.5) IACUC App. Date _____
PHS Animal Welfare Assurance Number _____
☐ HUMAN SUBJECTS (GPG II.D.6) Human Subjects Assurance Number _____
Exemption Subsection _____ or IRB App. Date _____
☐ INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j)
_____
☐ HIGH RESOLUTION GRAPHICS/OTHER GRAPHICS WHERE EXACT COLOR REPRESENTATION IS REQUIRED FOR PROPER INTERPRETATION (GPG I.G.1)

PI/PD DEPARTMENT	PI/PD POSTAL ADDRESS
George Mason University	4400 University Drive Fairfax, VA 22030 United States
PI/PD FAX NUMBER 301-595-9793	

NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address
PI/PD NAME Jagadish Shukla	ScD	(b)(6)	301-595-7000	jshukla@gmu.edu
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				

Electronic Signature

CERTIFICATION PAGE

Certification for Authorized Organizational Representative or Individual Applicant:

By signing and submitting this proposal, the Authorized Organizational Representative or Individual Applicant is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding debarment and suspension, drug-free workplace, and lobbying activities (see below), nondiscrimination, and flood hazard insurance (when applicable) as set forth in the NSF Proposal & Award Policies & Procedures Guide, Part I: the Grant Proposal Guide (GPG) (NSF 08-1). Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U. S. Code, Title 18, Section 1001).

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In addition, if the applicant institution employs more than fifty persons, by electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative of the applicant institution is certifying that the institution has implemented a written and enforced conflict of interest policy that is consistent with the provisions of the NSF Proposal & Award Policies & Procedures Guide, Part II, Award & Administration Guide (AAG) Chapter IV.A; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the institution's expenditure of any funds under the award, in accordance with the institution's conflict of interest policy. Conflicts which cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

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Debarment and Suspension Certification

(If answer "yes", please provide explanation.)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency?

Yes (b) (4) No (b) (4)

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Debarment and Suspension Certification contained in Exhibit II-4 of the Grant Proposal Guide.

Certification Regarding Lobbying

The following certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding $100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding $150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

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Certification Regarding Flood Hazard Insurance

Two sections of the National Flood Insurance Act of 1968 (42 USC §4012a and §4106) bar Federal agencies from giving financial assistance for acquisition or construction purposes in any area identified by the Federal Emergency Management Agency (FEMA) as having special flood hazards unless the:

(1) community in which that area is located participates in the national flood insurance program; and
(2) building (and any related equipment) is covered by adequate flood insurance.

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant located in FEMA-designated special flood hazard areas is certifying that adequate flood insurance has been or will be obtained in the following situations:

(1) for NSF grants for the construction of a building or facility, regardless of the dollar amount of the grant; and
(2) for other NSF Grants when more than $26,000 has been budgeted in the proposal for repair, alteration or improvement (construction) of a building or facility.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE	SIGNATURE	DATE
NAME Karen G Cohn	Electronic Signature	Mar 14 2008 5:20PM

TELEPHONE NUMBER	ELECTRONIC MAIL ADDRESS	FAX NUMBER
703-993-4104	kcohn@gmu.edu	703-993-2296

*SUBMISSION OF SOCIAL SECURITY NUMBERS IS VOLUNTARY AND WILL NOT AFFECT THE ORGANIZATION'S ELIGIBILITY FOR AN AWARD. HOWEVER, THEY ARE AN INTEGRAL PART OF THE INFORMATION SYSTEM AND ASSIST IN PROCESSING THE PROPOSAL. SSN SOLICITED UNDER NSF ACT OF 1950, AS AMENDED.

0830062

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR James L Kinter				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-month CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. James L Kinter - Director	(b)(4), (b)(6)					
2. Benjamin Cash						
3. Timothy DelSole						
4. Paul Dirmeyer						
5. Bohua Huang						
6. (10) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION P						
7. (15) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (1) POST DOCTORAL SCHOLARS						
2. (6) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ET						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (1) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) additional disk capacity $ (b) (4) replacement of obsolete peripheral equipment upgrades to COLA clusters and file servers						
TOTAL EQUIPMENT				(b)(4)		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ (b)(4) 2. TRAVEL 3. SUBSISTENCE 4. OTHER						
TOTAL NUMBER OF PARTICIPANTS				TOTAL PARTICIPANT COSTS		
G. OTHER DIRECT COSTS				(b)(4)		
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect costs (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 3,288,161	$	
M. COST SHARING PROPOSED LEVEL $ Not Shown				AGREED LEVEL IF DIFFERENT $		

PI/PD NAME James L Kinter	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

0830068

SUMMARY PROPOSAL BUDGET COMMENTS - Year 1

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Jin, Emilia -	(b)(4) & (b)(6)			
Kirtman, Benjamin -				
Klinger, Barry -				
Krishnamurthy, V. -				
Misra, Vasubandhu -				
Peglon, Kathy -				
Schneider, Edwin -				
Straus, David -				
TBD, Decadal -				
TBD, ENSO -				

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION Institute of Global Environment and Society					FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR James L Kinter					AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)		
1. James L Kinter - Director	(b)(4) & (b)(6)				$		
2. Benjamin Cash							
3. Timothy DelSole							
4. Paul Dirmeyer							
5. Bohua Huang							
6. (10) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)							
7. (15) TOTAL SENIOR PERSONNEL (1 - 6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (1) POST DOCTORAL SCHOLARS							
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							
3. (0) GRADUATE STUDENTS							
4. (0) UNDERGRADUATE STUDENTS							
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. (1) OTHER							
TOTAL SALARIES AND WAGES (A + B)							
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) additional disk capacity replacement of obsolete peripheral equipment upgrades to COLA clusters and file servers	(b)(4)						
TOTAL EQUIPMENT				(b)(4)			
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN							
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ 2. TRAVEL 3. SUBSISTENCE 4. OTHER	(b)(4)						
TOTAL NUMBER OF PARTICIPANTS	TOTAL PARTICIPANT COSTS			(b)(4)			
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER							
TOTAL OTHER DIRECT COSTS							
H. TOTAL DIRECT COSTS (A THROUGH G)							
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect costs (b)(4)							
TOTAL INDIRECT COSTS (F&A)							
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							
K. RESIDUAL FUNDS							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 3,340,325	$		
M. COST SHARING PROPOSED LEVEL $ Not Shown	AGREED LEVEL IF DIFFERENT $						

PI/PD NAME James L Kinter	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

0830068

SUMMARY PROPOSAL BUDGET COMMENTS - Year 2

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Jin, Emilia -	(b)(4) & (b)(6)			
Kirtman, Benjamin -				
Klinger, Barry -				
Krishnamurthy, V. -				
Misra, Vasubandhu -				
Pegion, Kathy -				
Schneider, Edwin -				
Straus, David -				
TBD, Decadal -				
TBD, ENSO -				

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR James I. Kinter				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. James I. Kinter - Director	(b)(4), (b)(6)					
2. Benjamin Cash						
3. Timothy DelSole						
4. Paul Dirmeyer						
5. Bohua Huang						
6. (10) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE						
7. (15) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (1) POST DOCTORAL SCHOLARS						
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (1) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) additional disk capacity replacement of obsolete peripheral equipment upgrades to COLA clusters and file servers	(b)(4)					
TOTAL EQUIPMENT				(b)(4)		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ 2. TRAVEL 3. SUBSISTENCE 4. OTHER	(b)(4)					
TOTAL NUMBER OF PARTICIPANTS	TOTAL PARTICIPANT COSTS			(b)(4)		
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect costs (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 3,393,536	$	
M. COST SHARING PROPOSED LEVEL $ Not Shown	AGREED LEVEL IF DIFFERENT $					

PI/PD NAME James I. Kinter	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 3

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Jin, Emilia - Kirtman, Benjamin - Klinger, Barry - Krishnamurthy, V. - Misra, Vasubandhu - Peglon, Kathy - Schneider, Edwin - Straus, David - TBD, Decadal - TBD, ENSO -	(b)(4) & (b)(6)			

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION	FOR NSF USE ONLY		
Institute of Global Environment and Society	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
James L Kinter			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. James L Kinter - Director	(b)(4), (b)(6)				
2. Benjamin Cash					
3. Timothy DelSole					
4. Paul Dirmeyer					
5. Bohua Huang					
6. (10) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)					
7. (15) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (1) POST DOCTORAL SCHOLARS					
2. (6) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (0) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) additional disk capacity; replacement of obsolete peripheral equipment; upgrades to COLA clusters and file servers				(b)(4)	
TOTAL EQUIPMENT				(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $	(b)(4)				
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS	TOTAL PARTICIPANT COSTS			(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect costs (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 3,440,040	$
M. COST SHARING PROPOSED LEVEL $ Not Shown	AGREED LEVEL IF DIFFERENT $				

PI/PD NAME	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
James L Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG
ORG. REP. NAME* James Kinter			

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 4

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Jin, Emilia -	(b)(4) & (b)(6)			
Kirtman, Benjamin -				
Klinger, Barry -				
Krishnamurthy, V. -				
Misra, Vasubandhu -				
Peglon, Kathy -				
Schneider, Edwin -				
Straus, David -				
TBD, Decadal -				
TBD, ENSO -				

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	 Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR James L Kinter				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	 ACAD	 SUMR	Funds Requested By proposer		Funds granted by NSF (if different)
1. James L Kinter - Director	(b)(4), (b)(6)					
2. Benjamin Cash						
3. Timothy DelSole						
4. Paul Dirmeyer						
5. Bohua Huang						
6. (10) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE						
7. (15) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (1) POST DOCTORAL SCHOLARS						
2. (6) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (1) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $6,000.) additional disk capacity replacement of obsolete peripheral equipment upgrades to COLA clusters and file servers				(b)(4)		
TOTAL EQUIPMENT				(b)(4)		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS 1. STIPENDS $ 2. TRAVEL 3. SUBSISTENCE 4. OTHER				(b)(4)		
TOTAL NUMBER OF PARTICIPANTS				TOTAL PARTICIPANT COSTS	(b)(4)	
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Indirect costs (Rate: (b)(4))						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 3,503,379	$	
M. COST SHARING PROPOSED LEVEL $ Not Shown				AGREED LEVEL IF DIFFERENT $		

PI/PD NAME James L Kinter	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* James Kinter	Date Checked	Date Of Rate Sheet	Initials - ORG

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 5

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Jin, Emilia -	(b)(4) & (b)(6)			
Kirtman, Benjamin -				
Kilnger, Barry -				
Krishnamurthy, V. -				
Misra, Vasubandhu -				
Pegion, Kathy -				
Schneider, Edwin -				
Straus, David -				
TBD, Decadal -				
TBD, ENSO -				

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION Institute of Global Environment and Society				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	 Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR James L Kinter				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. James L Kinter - Director	(b)(4), (b)(6)					
2. Benjamin Cash						
3. Timothy DelSole						
4. Paul Dirmeyer						
5. Bohua Huang						
6. (10) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE						
7. (15) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (5) POST DOCTORAL SCHOLARS						
2. (30) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (5) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (5) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)	(b)(4)					
TOTAL EQUIPMENT				(b)(4)		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS	(b)(4)					
1. STIPENDS $						
2. TRAVEL						
3. SUBSISTENCE						
4. OTHER						
TOTAL NUMBER OF PARTICIPANTS		TOTAL PARTICIPANT COSTS				
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 16,973,461	$	
M. COST SHARING PROPOSED LEVEL $ Not Shown		AGREED LEVEL IF DIFFERENT $				

(b)(4)

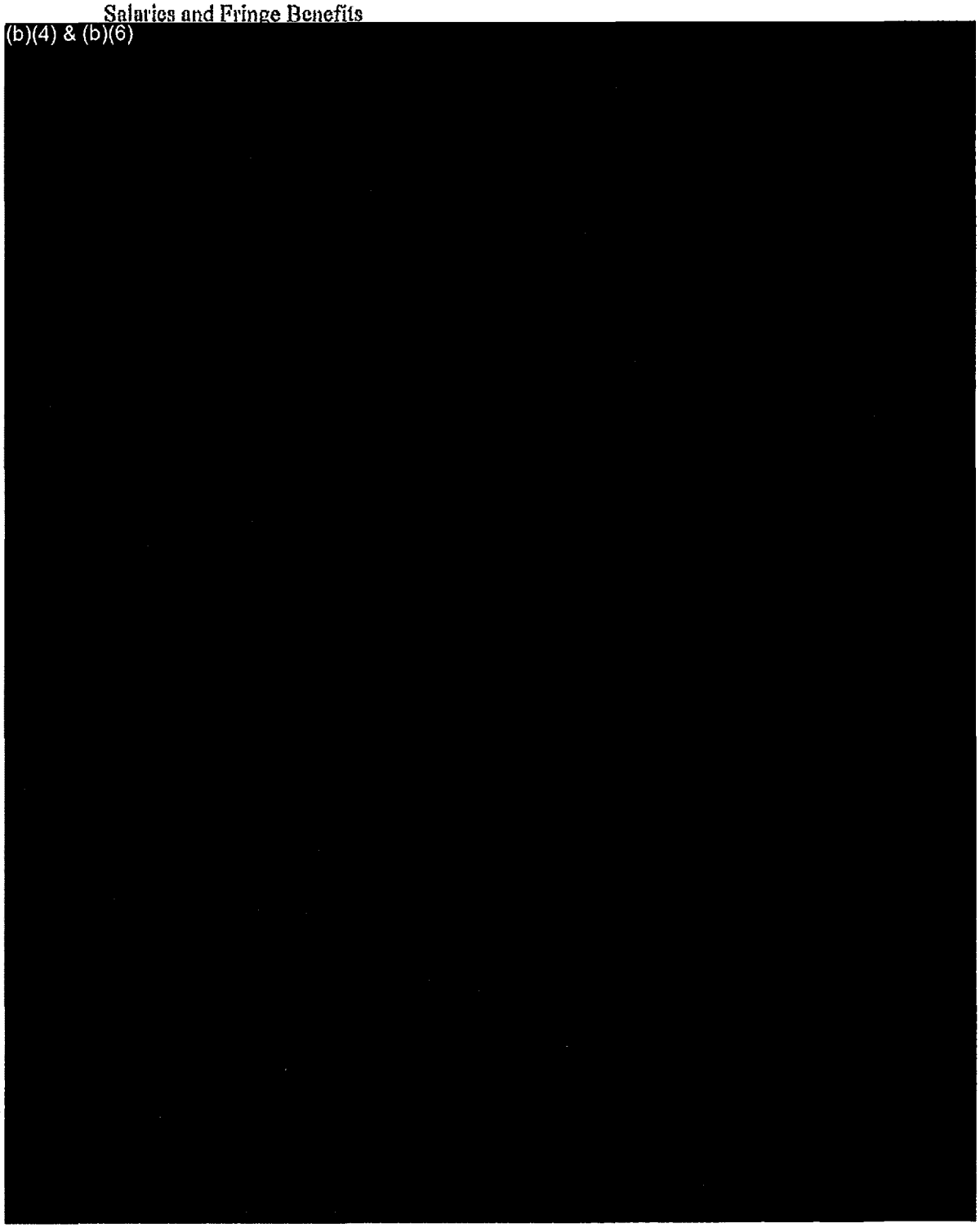
PI/PD NAME	FOR NSF USE ONLY		
James L Kinter	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
James Kinter			

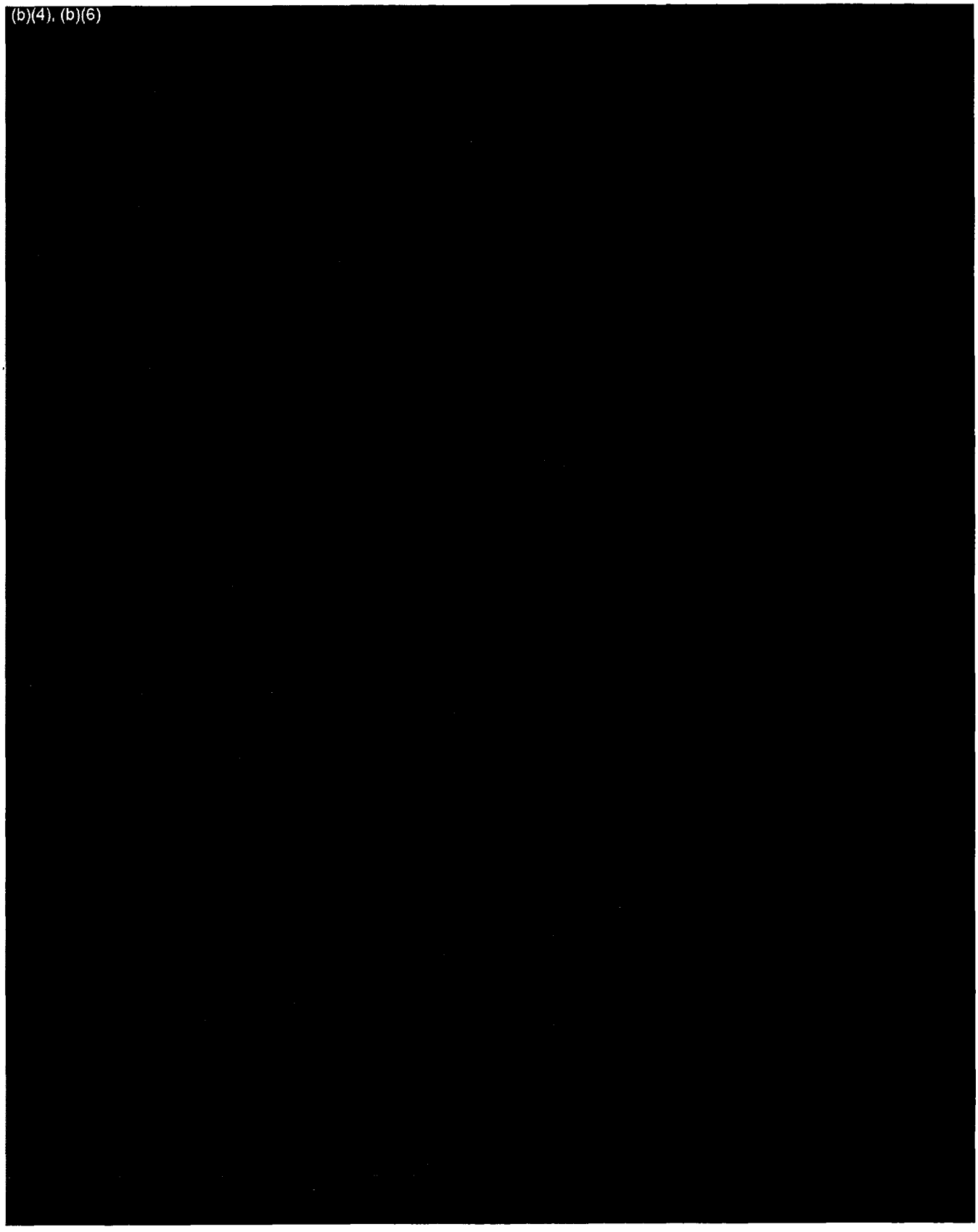
C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget Explanation

Salaries and Fringe Benefits

(b)(4) & (b)(6)




(b)(4), (b)(6)

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION	FOR NSF USE ONLY		
George Mason University	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By Proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6)				
2. Kyung Chin - Faculty Associate					
3. Timothy Delsole - Faculty Associate					
4. Bohua Huang - Faculty Associate					
5. Edwin K Schneider - Faculty Associate					
6. (1) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)					
7. (6) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (3) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
Modified Total Direct Costs (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 591,629	$
M. COST SHARING PROPOSED LEVEL $ Not Shown	AGREED LEVEL IF DIFFERENT $				

PI/PD NAME	FOR NSF USE ONLY		
Jagadish Shukla	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
Karen Cohn			

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 1

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Straus, David M - Faculty Associate	(b)(4) & (b)(6)			

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION	FOR NSF USE ONLY		
George Mason University	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6)				
2. Kyung Chin - Faculty Associate					
3. Timothy Delsole - Faculty Associate					
4. Bohua Huang - Faculty Associate					
5. Edwin K Schneider - Faculty Associate					
6. (1) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE					
7. (6) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (3) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Modified Total Direct Costs (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 623,719	$

M. COST SHARING PROPOSED LEVEL $ Not Shown	AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
Jagadish Shukla	Date Checked	Date Of Rate Sheet	Initials - ORG
ORG. REP. NAME* Karen Cohn			

2 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 2

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Straus, David M - Faculty Associate	(b)(4) & (b)(6)			

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION George Mason University				FOR NSF USE ONLY PROPOSAL NO.	DURATION (months) Proposed	 Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Jagadish Shukla				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Jagadish Shukla - PI	(b)(4), (b)(6)					
2. Kyung Chin - Faculty Associate						
3. Timothy Dolsole - Faculty Associate						
4. Bohua Huang - Faculty Associate						
5. Edwin K Schneider - Faculty Associate						
6. (1) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE						
7. (6) TOTAL SENIOR PERSONNEL (1 - 6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS						
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. (3) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (1) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)						
TOTAL EQUIPMENT				0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0		
2. FOREIGN				0		
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS $ 0						
2. TRAVEL 0						
3. SUBSISTENCE 0						
4. OTHER 0						
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)		
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Modified Total Direct Costs (b)(4)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 657,667	$	
M. COST SHARING PROPOSED LEVEL $ Not Shown				AGREED LEVEL IF DIFFERENT $		

PI/PD NAME Jagadish Shukla	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* Karen Cohn	Date Checked	Date Of Rate Sheet	Initials - ORG

3 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 3

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Straus, David M - Faculty Associate	(b)(4) & (b)(6)			

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION: George Mason University	FOR NSF USE ONLY — PROPOSAL NO. / DURATION (months): Proposed / Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: Jagadish Shukla	AWARD NO.

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6) [redacted]				$
2. Kyung Chin - Faculty Associate					
3. Timothy Delsole - Faculty Associate					
4. Bohua Huang - Faculty Associate					
5. Edwin K Schneider - Faculty Associate					
6. (1) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)					
7. (6) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (3) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4) [redacted]	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Modified Total Direct Costs (b)(4) [redacted])					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 693,587	$
M. COST SHARING PROPOSED LEVEL $ Not Shown	AGREED LEVEL IF DIFFERENT $				

PI/PD NAME: Jagadish Shukla	FOR NSF USE ONLY — INDIRECT COST RATE VERIFICATION
ORG. REP. NAME*: Karen Cohn	Date Checked / Date Of Rate Sheet / Initials - ORG

4 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 4

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Straus, David M - Faculty Associate				(b)(4) & (b)(6)

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION	FOR NSF USE ONLY		
George Mason University	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4),(b)(6)				
2. Kyung Chin - Faculty Associate					
3. Timothy Delsole - Faculty Associate					
4. Bohua Huang - Faculty Associate					
5. Edwin K Schneider - Faculty Associate					
6. (1) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)					
7. (6) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (3) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (1) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) Modified Total Direct Costs (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 731,607	$

M. COST SHARING PROPOSED LEVEL $ Not Shown | AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY		
Jagadish Shukla	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
Karen Cohn			

5 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET COMMENTS - Year 5

Other Senior Personnel Name - Title	Cal	Acad	Sumr	Funds Requested
Straus, David M - Faculty Associate				(b)(4) & (b)(6)

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION	FOR NSF USE ONLY		
George Mason University	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Jagadish Shukla			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. Jagadish Shukla - PI	(b)(4), (b)(6)				
2. Kyung Chin - Faculty Associate					
3. Timothy Delsole - Faculty Associate					
4. Bohua Huang - Faculty Associate					
5. Edwin K Schneider - Faculty Associate					
6. (1) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)					
7. (6) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (0) POST DOCTORAL SCHOLARS					
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (15) GRADUATE STUDENTS					
4. (0) UNDERGRADUATE STUDENTS					
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. (5) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ 0					
2. TRAVEL 0					
3. SUBSISTENCE 0					
4. OTHER 0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				(b)(4)	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 3,290,209	$

M. COST SHARING PROPOSED LEVEL $ Not Shown | AGREED LEVEL IF DIFFERENT $

PI/PD NAME	FOR NSF USE ONLY		
Jagadish Shukla	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
Karen Cohn			

* ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget Justification

Salaries and Fringe Benefits

(b)(4) & (b)(6)

[redacted]

Award ID: 9910853 Pgm Org Code:

Awards selection criteria

Open Closed All

Award Id	Inst Id

Award CGI Status Maintenance - Award ID 9910853 - 07/25/2003 10:09

Project Report for this FY: No report found.

Fiscal Year	CGI Status	CGI Amount	Current Budget Amt.
2002	Awarded	249,989	249,989
2003	Funds committed in FAS	249,961	249,961

CGI Actions

Ok Print Cancel History

Jay Shukla / George Mason

Ready

Muir, Joyce

To: shukla@cola.iges.org
Cc: Fein, Jay S.
Subject: 2nd Reminder Continuing Grant Increment

Annual Report for Continuing Grant Increment
Award No. ATM-9910853
Incremental Amount for FY 02: $249,989
Grant Expiration Date: September 30, 2002
Annual Report Due Date: May 31, 2002

PLEASE NOTE. Since Dr. Fein must develop a spend out plan for this fiscal year, we must have your report in immediately. Thank you.

Dear Dr. Shukla:

The above referenced proposal is due for an increment, and the Annual Report must be submitted through FastLane. You can access The FastLane Reporting System from the NSF Home Page at <<https://www.fastlane.nsf.gov>> , or you can go directly to the new project reporting system at <<https://www.fastlane.nsf.gov/cgi-bin/NSF_PrlRpt>>

The Program Officer responsible for your grant is Dr. Jay S. Fein, Climate Dynamics Program. He can be reached by phone at (703) 292-8527, or by E-mail at www.jfein@nsf.gov

Thank you in advance for your report. If you have any questions, please give me a call.

PLEASE NOTE: Any overdue Final Reports that are not submitted to any program in NSF will block the processing of your increment.

Joyce Muir
Program Assistant
Climate Dynamics
(703) 292-8527

Joyce
Joyce Muir, Program Assistant
Climate Dynamics Program
Physical Meteorology Program
(703) 292-8527
(fax) (703) 292-9022

NATIONAL SCIENCE FOUNDATION
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
HISTORY REPORT

Date: 07/26/1999
Time: 14:46:23

PI/PD NAME: Jagadish Shukla
DEGREE: SC.D.
GENDER: M
HANDICAP: N
DEGREE YR: (b)(6)
CITIZENSHIP: C

PRIM ADDRESS: Center for Ocean-Land-Atmosphere Studies
4041 Powder Mill Road, Suite 302
Calverton MD 20705

PHONE: 301-595-7000 **FAX:** 301-595-9793
EMAIL ADDR: shukla@cola.iges.org

COI TYPE: No conflict of interests. **ORG:** **EFF DATE:**

STATUS CODE	DATE	PROP	AWARD	AMD	ORG CODE	AMOUNT	DUR	ROLE	RECEIVED	FPR DUE

(b)(4) & (b)(6)

NATIONAL SCIENCE FOUNDATION
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
HISTORY REPORT

PI/PD NAME: Jagadish Shukla **DEGREE:** SC.D.

GENDER: M **HANDICAP:** N **DEGREE YR:** (b)(6)

CITIZENSHIP: C

PRIM ADDRESS: Center for Ocean-Land-Atmosphere Studies
4041 Powder Mill Road, Suite 302
Calverton MD 20705

PHONE: 301-595-7000 **FAX:** 301-595-9793

EMAIL ADDR: shukla@cola.iges.org

COI TYPE: No conflict of interests. **ORG:** **EFF DATE:**

STATUS CODE	DATE	PROP	AWARD	AMD	ORG CODE	AMOUNT	DUR	ROLE	RECEIVED	FPR DUE
(b)(4) & (b)(6)										

DN
Subject: ATM 9910853 PI, J. Shukla, GMU

The PI is the President of the not-for-profit research organization, The Institute of Global Environment and Society (IGES) and a professor at GMU. (b)(4), (b)(6) [redacted] The items above were not included in the award to IGES.

With the exception of the cover sheet, budget, etc., this proposal from GMU is identical to that which was peer reviewed. It has been submitted separately by GMU in order to save the extra subcontract indirect costs associated with a subcontract to GMU from IGES. The same procedure was used by IGES in 1995, when the PI became affiliated with GMU (see Tab B).

I recommend a five-year award at the levels of:

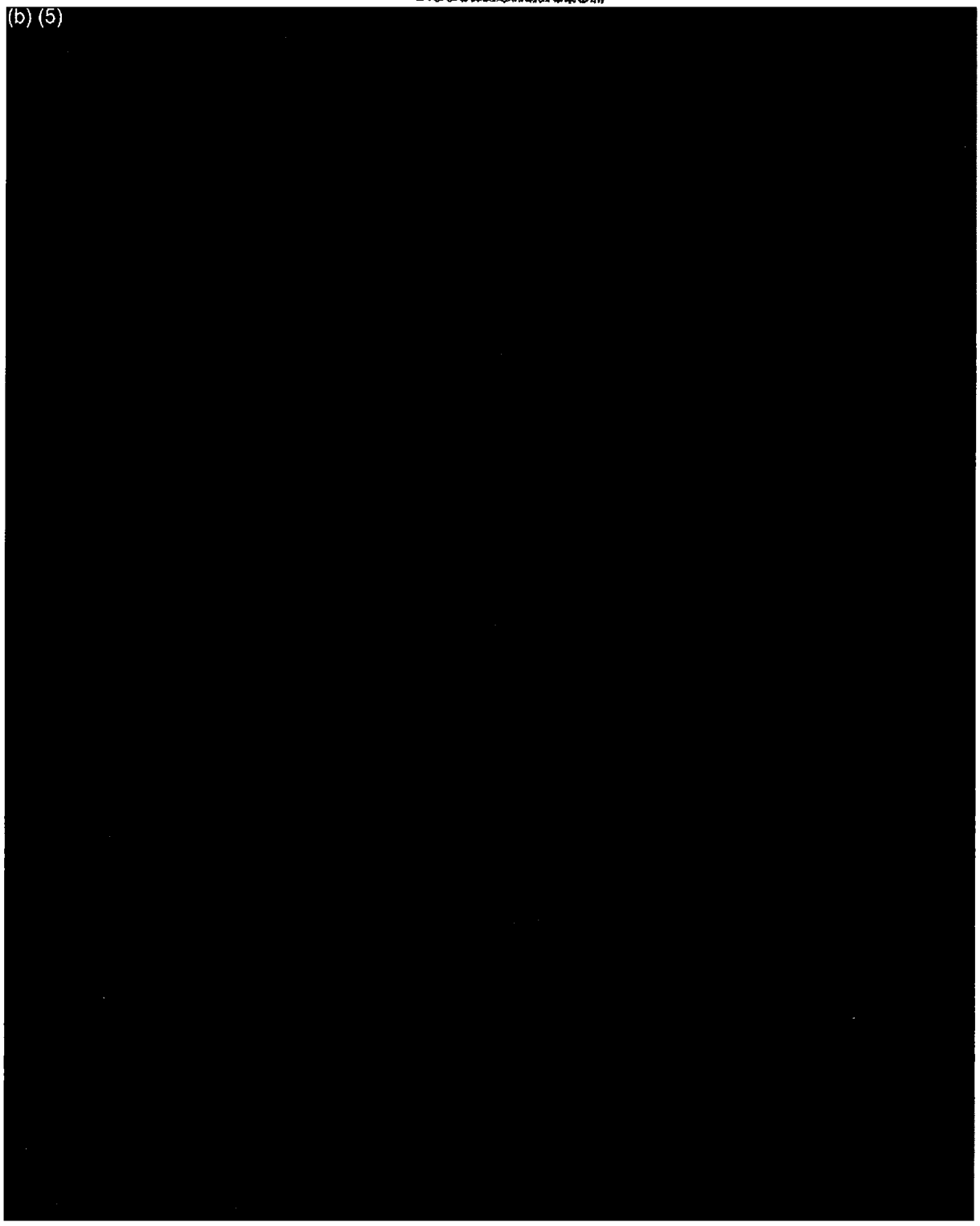
FY 1999:	$249,920
FY 2000:	$249,814
FY 2001:	$249,957
FY 2002:	$249,989
FY 2003:	$249, 961

There is no overlap between this award and others of the PI, although his grant to IGES is complimentary to this award.

Jay S. Fein
7/28/99

Recommendation

(b) (5)



There is no overlap between this award and others of the PIs, although they are related and complementary.

Jay S. Fein
CDP
12/30/98

cc: P. Stephens, NSF
M. Eakin, NOAA
K. Bergman, NASA

DN
SUBJECT: ATM 93 21354 PI, J. Shukla, IGES

The FY 1995, second year commitment for the subject grant is $900,000 from NSF. The PI, who is the President of the Institute of Global Environment and Society (IGES) has recently h

(b) (4), (b) (5), (b) (6)

[redacted]

action required on his part. NOAA will (b) (5) [redacted].

There is no overlap between this award and others of the PI.

Jay S. Fein
3/14/95

George Mason University

Fairfax, Virginia 22030-4444
(703) 993-1000
TDD: (703) 993-1002

2 July 1999

Dr. J. Fein, Program Director
Climate Dynamics Program, Room 775
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Dear Jay:

Please find enclosed two copies of a proposal entitled, "Predictability and Variability of the Present Climate."

The research proposed here is an integral part of the work approved in the NSF grant ATM-98-14295. The purpose of this letter proposal is to request that a portion of the funds from this grant (for the P.I. and student support) be awarded to the George Mason University. As described below, approval of this request will help establish an education and thesis research program at GMU and enhance the student involvement in COLA research.

1. Since COLA left the University of Maryland, we have been working closely with area universities so that COLA can continue to be involved with the education and training of graduate students. GMU has offered me a tenured professorship in the Institute of Computational Sciences and Informatics (CSI), and I continue to be the President of IGES.

2. In the original approved proposal, support for graduate students at area universities was explicitly included.

3. GMU has agreed that COLA will remain my principle place of research work. My status as a faculty member gives me the opportunity to train graduate students by involving them in COLA research. GMU has also agreed that some of the graduate courses in climate dynamics and global changewill be given at the COLA premises. It is our intention to allow graduate students from other area universities to also attend courses offered at COLA.

4. This proposal include(b)(4) & (b)(6)y salary. (b)(4) & (b)(6) salary. Please note that the budget for the COLA omnibus proposal (or any other COLA proposal) does not include any effort/salary for me. This is the only proposal that(b)(4) & (b)(6) salary.

5. The proposed budget for GMU component is within the approved budget and no additional funds are being requested.

If you have any further questions or clarifications on this proposal, please give me a call.

Thank you.

Cc: M. Black (CSI)

Yours sincerely,

Shukla

J. Shukla

recycled paper

NATIONAL SCIENCE FOUNDATION
Grant Letter

Award Date: October 5, 2004
Award No. ATM-9910853
Amendment No. 005

Ann T. McGuigan, Ph.D.
Director, Office of Sponsored Programs
George Mason University
4400 University Drive
Fairfax, VA 22030-4443

Dear Dr. McGuigan:

By letter dated September 24, 1999, as amended, the sum of $1,249,641 was awarded to George Mason University, under the direction of Jagadish Shukla for support of the project entitled:

"Predictability and Variability of the Present Climate."

The purpose of this amendment is to extend the expiration date of the grant from September 30, 2004 to September 30, 2005 without additional funds in order to allow for the completion of the agreed level of effort.

Except as modified by this amendment, the grant conditions remain unchanged.

The cognizant NSF program official for this grant is Jay S. Fein (703) 292-8527.
The cognizant NSF grants official is Denise O. Young (703) 292-8216.

Sincerely,

Denise O. Young
Grants and Agreements Officer

CFDA No. 47.050
mbarnhar@gmu.edu

NATIONAL SCIENCE FOUNDATION
Notification/Request

Award:9910853 PI Name:Shukla, Jagadish

Request Type	NSF Approved No-Cost Extension
Award Number	9910853
Award Title	Predictability and Variability of the Present Climate
NSF Status	Approved by Grants Official.
NSF Status Updated By	Denise O. Young
NSF Status Date	10/05/04
Recommended By	Jay S. Fein
Recommendation Date	10/04/04
Recommended Expiration Date	09/30/05
Recommendation Text	The PI and his group are conducting excellent research and are mentoring very good students. I recommend that NSF (b) (5) [redacted]
Prepared By	Jagadish Shukla
Submitted By	Karen G. Cohn
Submitted Date	10/01/04
Revised Exp Date	09/30/05
Amount	150000.00
Justification	Several elements of the project are still ongoing and involve graduate students in their final year of study. A no-cost extension is requested to support the research and the graduate students.
Plan For Use	Same as originally approved. To support graduate students and post-docs.
Explanation For Late Request	The P.I. was on travel for the last two weeks for grant related work.

Rozell, Tracy L.

From:	jgrzecho@nsf.gov
Sent:	Monday, August 11, 2003 10:02 AM
To:	mbarnhar@gmu.edu
Cc:	dgaawd@nsf.gov; trozell@nsf.gov; jfein@nsf.gov
Subject:	Award Id : 9910853, PI: Shukla

Award Date August 11, 2003
Grant No. ATM-9910853
Amendment No. 004

Ann T. McGuigan, Ph.D.
Director, Office of Sponsored Programs
George Mason University
4400 University Drive
Fairfax, VA 22030-4443

Dear Dr. McGuigan:

The National Science Foundation hereby awards $249,961 to George Mason University for additional support of the project being funded by the above-referenced award.

This project, under the direction of Jagadish Shukla, is entitled:

"Predictability and Variability of the Present Climate."

This award with this amendment totals $1,249,641 and expires September 30, 2004.

This grant is awarded pursuant to the authority of the National Science Foundation Act of 1950, as amended (42 U.S.C. 1861-75.) and is subject to NSF Grant General Conditions (GC-1), dated 07/02.

Except as modified by this amendment, the grant conditions remain unchanged.

The attached budget indicates the amounts, by categories, on which NSF has based its support.

The cognizant NSF program official for this grant is Jay S. Fein (703) 292-8527.
The cognizant NSF grants official contact is Denise O. Young (703) 292-8216.

Sincerely,

John K. Grzechowiak
Grants Officer
CFDA No: 47.050
mbarnhar@gmu.edu

SUMMARY
PROPOSAL BUDGET

Yr 5: 09/01/03 - 08/31/04

FOR NSF USE ONLY

ORGANIZATION	PROPOSAL NO.	DURATION (MONTHS) Proposed	Granted
GEORGE MASON UNIVERSITY			
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR	AWARD NO.		

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and other Senior Associates (List each separately with title, A. 7. show number in brackets)	NSF Funded Person-months CAL	ACA	SUMR	Funds Requested By Proposer	Funds Granted By NSF (If Different)
1. Jagadish Shukla PI				(b)(4), (b)(6)	
2. TBD Research Scientist					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. ( ) POST DOCTORAL ASSOCIATES					
2. ( ) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (3) GRADUATE STUDENTS Doctoral students					
4. ( ) UNDERGRADUATE STUDENTS					
5. ( ) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. ( ) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000)					
TOTAL EQUIPMENT				(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND US POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
( ) TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS					
1. MATERIAL AND SUPPLIES				(b)(4)	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER Tuition					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II. D. 7. j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$249,981	$

M. COST SHARING: PROPOSED LEVEL $ AGREED LEVEL IF DIFFERENT $

PI/PD TYPED NAME AND SIGNATURE*	DATE	FOR NSF USE ONLY INDIRECT COSTS RATE VERIFICATION		
ORG. REP. TYPED NAME AND SIGNATURE* Margaret E. Hanson, Proposal Manager Office of Sponsored Programs	DATE	Date Checked	Date Of Rate Sheet	Initials - ORG

NSF Form 1030 (10/98) Supersedes All Previous Editions

*SIGNATURES REQUIRED ONLY FOR REVISED BUDGET (IF REQUESTED)

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD, ARLINGTON, VIRGINIA 22230

Award Date July 3, 2002
Grant No. ATM-9910853
Amendment No. 003

Ann T. McGuigan, Ph.D.
Director, Office of Sponsored Programs
George Mason University
4400 University Drive
Fairfax, VA 22030-4443

Dear Dr. McGuigan:

The National Science Foundation hereby awards $249,989 to George Mason University for additional support of the project being funded by the above-referenced award.

This project, under the direction of Jagadish Shukla, is entitled:

"Predictability and Variability of the Present Climate."

This award with this amendment totals $999,680 and expires September 30, 2003.

This grant is awarded pursuant to the authority of the National Science Foundation Act of 1950, as amended (42 U.S.C. 1861-75.) and is subject to NSF Grant General Conditions (GC-1), dated 07/02.

Except as modified by this amendment, the grant conditions remain unchanged.

The attached budget indicates the amounts, by categories, on which NSF has based its support.

The cognizant NSF program official for this grant is Jay S. Fein (703) 292-8527.
The cognizant NSF grants official contact is Denise O. Young (703) 292-8216.

Sincerely,

Denise O. Young
Grants Officer

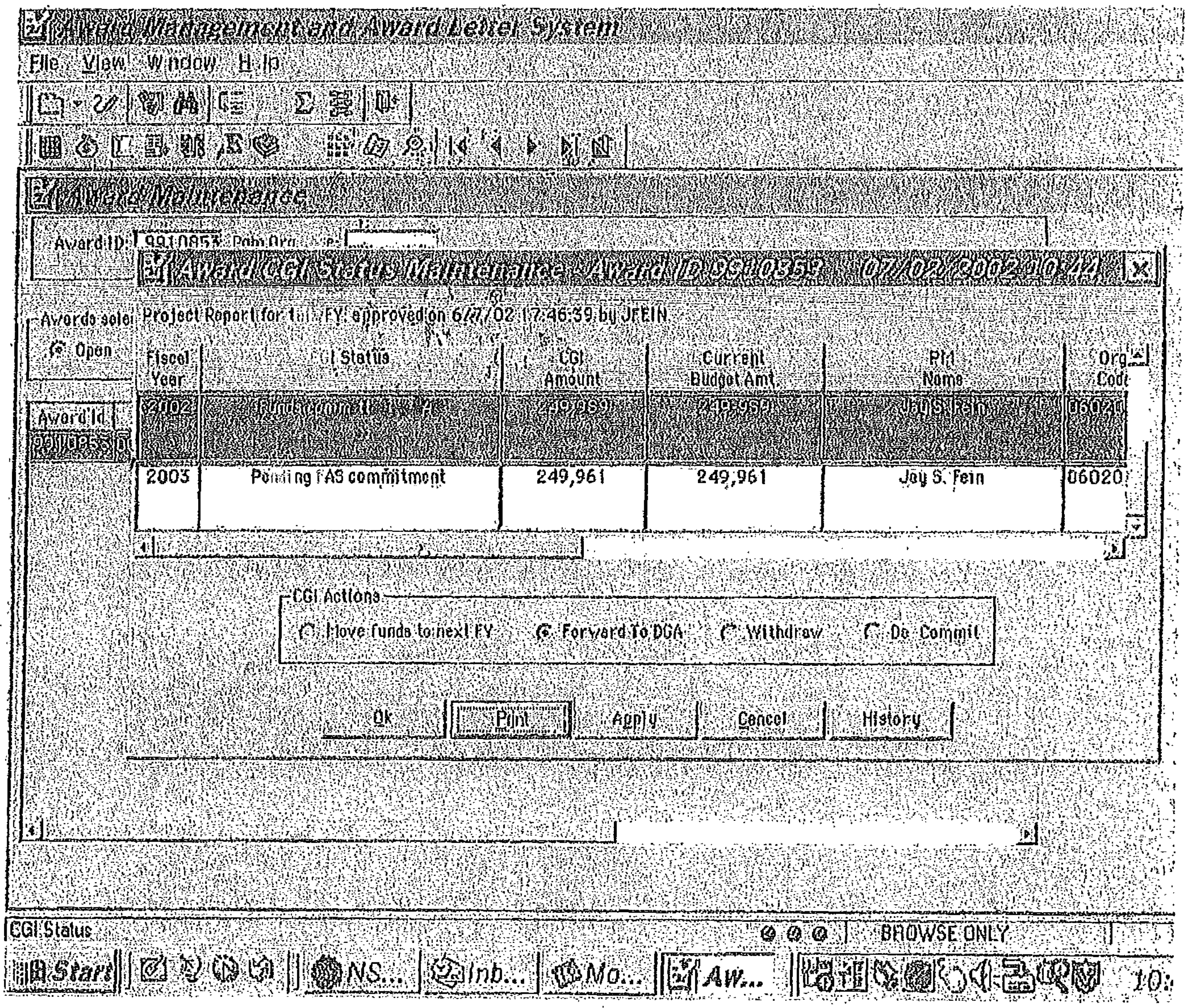
CFDA No: 47.050
mbarnhar@gmu.edu

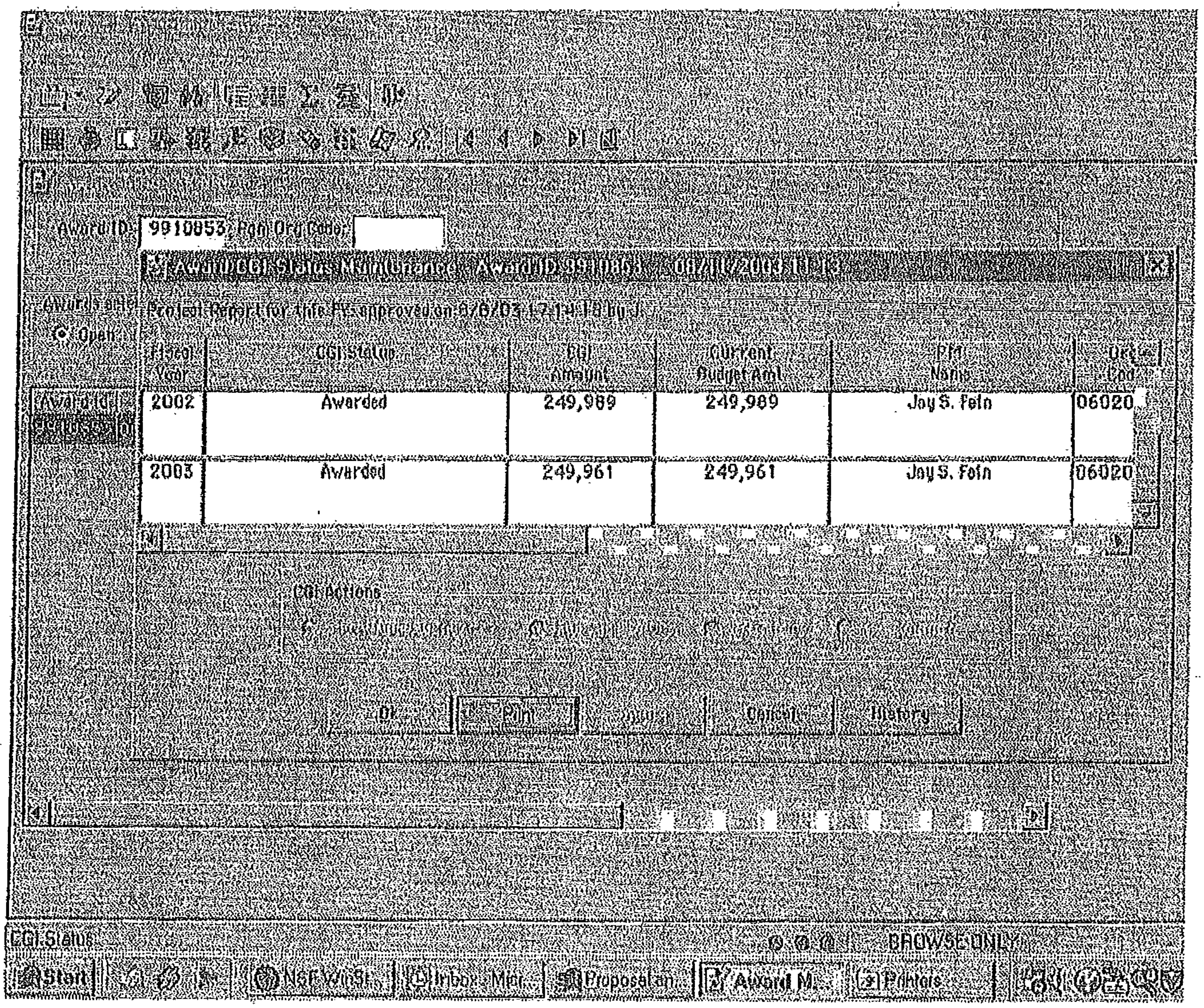
NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD, ARLINGTON, VIRGINIA 22230

ATM-9910863
003

SUMMARY PROPOSAL BUDGET

	Person MOS cal	acad	sumr	Funds granted By NSF
A. (2.00) Total Senior personnel	(b)(4) & (b)(6)			
B. Other Personnel				
1. (0.00) Post Doctoral associates				
2. (0.00) Other professionals				
3. (3.00) Graduate students				
4. (0.00) Secretarial-clerical				
5. (0.00) Undergraduate students				
6. (0.00) Other				
Total salaries and wages (A+B)				
C. Fringe benefits (if charged as direct c				
Total salaries wages and fringes				
D. Total permanent equipment				(b) (4)
E. Travel				
1. Domestic				
2. Foreign				
F. Total participant support costs				
G. Other direct costs				
1. Materials and supplies				
2. Publication costs/page charges				
3. Consultant services				
4. Computer (ADPE) services				
5. Subcontracts				
6. Other				
Total other direct costs				
H. Total direct costs (A through G)				
I. Total indirect costs				
J. Total direct and indirect costs (H+I)				
K. Residual funds / Small business fee				
1. Residual funds (if for further support of current projects GPM 252 and 253)				
2. Small business fee				
L. Amount of this request (J) or (J-K1+K2)				$249,989
M. Cost sharing				$0


Award Management and Award Letter System
File View Window Help
Award Maintenance
Award ID: 9910853
Award CGI Status Maintenance - Award ID 9910859 07/02/2002 10:44
Project Report for ... FY approved on 6/7/02 17:46:39 by JFEIN
Fiscal Year
CGI Status
CGI Amount
Current Budget Amt
PI Name
Org Code
2003
Pending FAS commitment
249,961
249,961
Jay S. Fein
06020
CGI Actions
Move funds to next FY
Forward To DGA
Withdraw
De-Commit
Ok
Print
Apply
Cancel
History
CGI Status
BROWSE ONLY
Start


Award ID: 9910853
Fund Org Code:
Open
Award Id
Fiscal Year
CGI Status
CGI Amount
Current Budget Amt
PM Name
2002
Awarded
249,989
249,989
Jay S. Fein
06020
2003
Awarded
249,961
249,961
Jay S. Fein
06020
CGI Actions
Ok
Print
Cancel
History
CGI Status
BROWSE ONLY
Start
NSF WinSt...
Inbox - Micr...
Proposal an...
Award M...
Printers

ATM-9910853
004

SUMMARY PROPOSAL BUDGET

Person MOS

	cal	acad	sumr	Funds granted By NSF
A. (2.00) Total Senior personnel	(b)(4) & (b)(6)			
B. Other Personnel				
1. (0.00) Post Doctoral associates				
2. (0.00) Other professionals				
3. (3.00) Graduate students				
4. (0.00) Secretarial-clerical				
5. (0.00) Undergraduate students				
6. (0.00) Other				
Total salaries and wages (A+B)				
C. Fringe benefits (if charged as direct cost)				
Total salaries wages and fringes (A+B+C)				
D. Total permanent equipment				(b) (4)
E. Travel				
1. Domestic				
2. Foreign				
F. Total participant support costs				
G. Other direct costs				
1. Materials and supplies				
2. Publication costs/page charges				
3. Consultant services				
4. Computer (ADPE) services				
5. Subcontracts				
6. Other				
Total other direct costs				
H. Total direct costs (A through G)				
I. Total indirect costs				
J. Total direct and indirect costs (H+I)				
K. Residual funds / Small business fee				
1. Residual funds (if for further support of current projects GPM 252 and 253)				
2. Small business fee				
L. Amount of this request (J) or (J-K1+K2)				$249,961
M. Cost sharing				$0

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD, ARLINGTON, VIRGINIA 22230

Award Date August 7, 2001
Grant No. ATM-9910853
Amendment No. 002

Ann T. McGuigan, Ph.D.
Director, Office of Sponsored Programs
George Mason University
4400 University Drive
Fairfax, VA 22030-4443

Dear Dr. McGuigan:

The National Science Foundation hereby awards $249,957 to George Mason University for additional support of the project being funded by the above-referenced award.

This project, under the direction of Jagadish Shukla, is entitled:

"Predictability and Variability of the Present Climate."

This award with this amendment totals $749,691 and expires September 30, 2002.

This grant is awarded pursuant to the authority of the National Science Foundation Act of 1950 (42 U.S.C. 1861 et seq.) and is subject to Grant General Conditions (GC-1) dated 04/01.

Except as modified by this amendment, the grant conditions remain unchanged.

The attached budget indicates the amounts, by categories, on which NSF has based its support.

The cognizant NSF program official for this grant is Jay S. Fein (703) 292-8527.
The cognizant NSF grants official contact is Denise O. Young (703) 292-8216.

Sincerely,

Denise O. Young
Grants Officer

CFDA No: 47.050
mbarnhar@gmu.edu

SUMMARY
PROPOSAL BUDGET

Yr 4: 09/01/02 - 08/31/03

ORGANIZATION	FOR NSF USE ONLY		
GEORGE MASON UNIVERSITY	PROPOSAL NO. 9910853	DURATION (MONTHS) Proposed 12	Granted
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR	AWARD NO.		

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and other Senior Associates (List each separately with title, A. 7. show number in brackets)	NSF Funded Person-months	Funds Requested By	Funds Granted By NSF (if different)
1. Jagadish Shukla PI	(b)(4), (b)(6)		
2. TBD Research Scientist			
3.			
4.			
5.			
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)			
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)			
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)			
1. ( ) POST DOCTORAL ASSOCIATES			
2. ( ) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			
3. (3) GRADUATE STUDENTS Doctoral students			
4. ( ) UNDERGRADUATE STUDENTS			
5. ( ) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)			
6. ( ) OTHER			
TOTAL SALARIES AND WAGES (A + B)			
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)			
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)			
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000)			
TOTAL EQUIPMENT		(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND US POSSESSIONS)			
2. FOREIGN			
F. PARTICIPANT SUPPORT COSTS			
1. STIPENDS $			
2. TRAVEL			
3. SUBSISTENCE			
4. OTHER			
( ) TOTAL PARTICIPANT COSTS			
G. OTHER DIRECT COSTS			
1. MATERIAL AND SUPPLIES		(b)(4)	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION			
3. CONSULTANT SERVICES			
4. COMPUTER SERVICES			
5. SUBAWARDS			
6. OTHER Tuition			
TOTAL OTHER DIRECT COSTS			
H. TOTAL DIRECT COSTS (A THROUGH G)			
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) (b)(4)			
TOTAL INDIRECT COSTS (F&A)			
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)			
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II. D. 7. j.)			
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)		$249,989	$
M. COST SHARING: PROPOSED LEVEL $	AGREED LEVEL IF DIFFERENT $		

PI/PD TYPED NAME AND SIGNATURE*	DATE	FOR NSF USE ONLY		
		INDIRECT COSTS RATE VERIFICATION		
ORG. REP. TYPED NAME AND SIGNATURE*	DATE	Date Checked	Date Of Rate Sheet	Initials - ORG
Margaret E. Hanson, Proposal Manager Office of Sponsored Programs				

NSF Form 1030 (10/98) Supersedes All Previous Editions

*SIGNATURES REQUIRED ONLY FOR REVISED BUDGET (GPG III. C)

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD, ARLINGTON, VIRGINIA 22230

Award Date August 7, 2001
Grant No. ATM-9910853
Amendment No. 002

Ann T. McGuigan, Ph.D.
Director, Office of Sponsored Programs
George Mason University
4400 University Drive
Fairfax, VA 22030-4443

Dear Dr. McGuigan:

The National Science Foundation hereby awards $249,957 to George Mason University for additional support of the project being funded by the above-referenced award.

This project, under the direction of Jagadish Shukla, is entitled:

"Predictability and Variability of the Present Climate."

This award with this amendment totals $749,691 and expires September 30, 2002.

This grant is awarded pursuant to the authority of the National Science Foundation Act of 1950 (42 U.S.C. 1861 et seq.) and is subject to Grant General Conditions (GC-1) dated 04/01.

Except as modified by this amendment, the grant conditions remain unchanged.

The attached budget indicates the amounts, by categories, on which NSF has based its support.

The cognizant NSF program official for this grant is Jay S. Fein (703) 292-8527.
The cognizant NSF grants official contact is Denise O. Young (703) 292-8216.

Sincerely,

Denise O. Young
Grants Officer

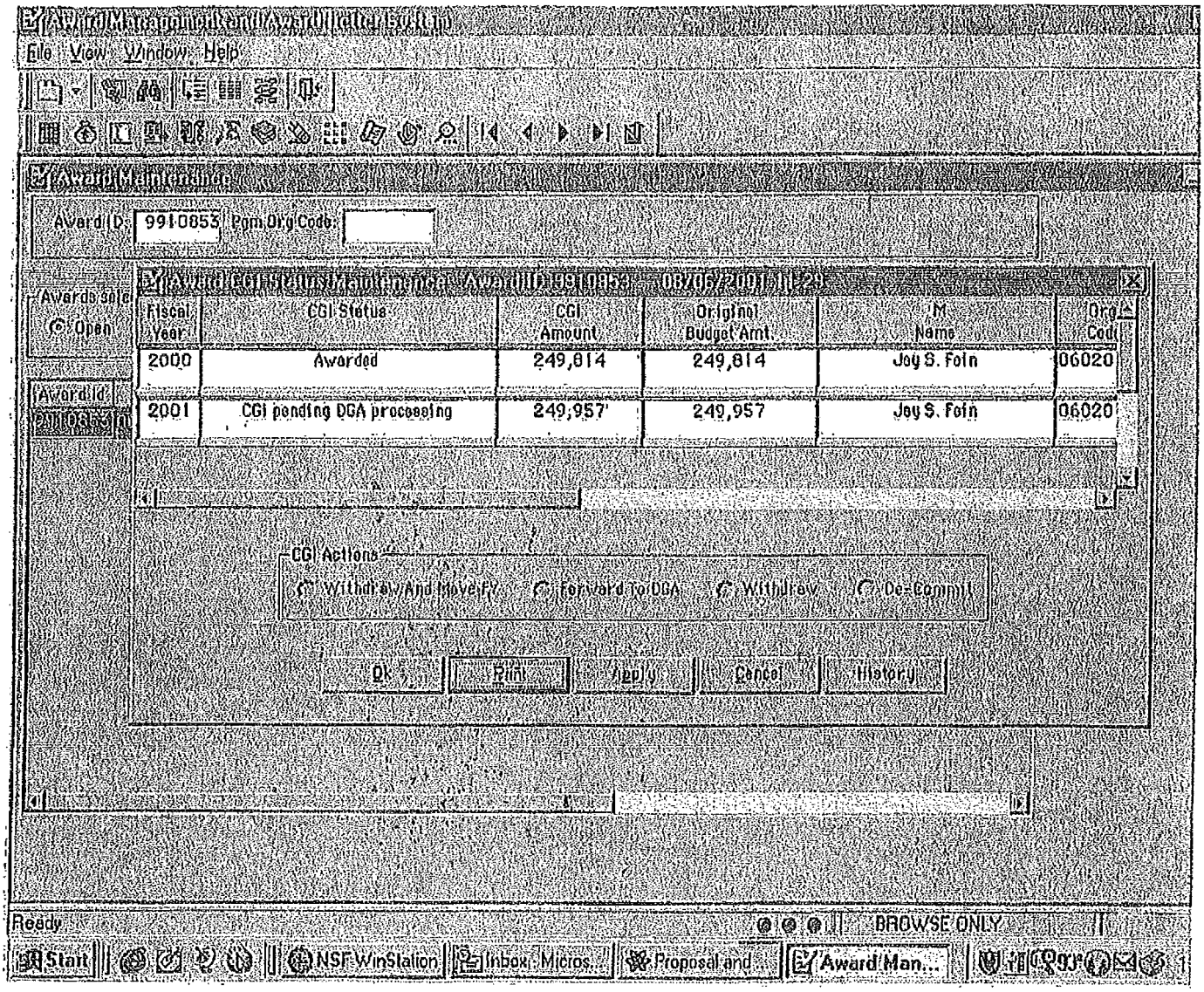
CFDA No: 47.050
mbarnhar@gmu.edu

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD, ARLINGTON, VIRGINIA 22230

ATM-9910853
002

SUMMARY PROPOSAL BUDGET

	Person MOS cal	acad	sumr		Funds granted By NSF
A. (2.00) Total Senior personnel	(b)(4) & (b)(6)				
B. Other Personnel					
1. (0.00) Post Doctoral associates					
2. (0.00) Other professionals					
3. (3.00) Graduate students					
4. (0.00) Secretarial-clerical					
5. (0.00) Undergraduate students					
6. (0.00) Other					
Total salaries and wages (A+B)					
C. Fringe benefits (if charged as direct c					
Total salaries wages and fringes					
D. Total permanent equipment					(b) (4)
E. Travel					
1. Domestic					
2. Foreign					
F. Total participant support costs					
G. Other direct costs					
1. Materials and supplies					
2. Publication costs/page charges					
3. Consultant services					
4. Computer (ADPE) services					
5. Subcontracts					
6. Other					
Total other direct costs					
H. Total direct costs (A through G)					
I. Total indirect costs					
J. Total direct and indirect costs (H+I)					
K. Residual funds / Small business fee					
1. Residual funds (If for further support of current projects GPM 252 and 253)					
2. Small business fee					
L. Amount of this request (J) or (J-K1+K2)					$249,957
M. Cost sharing					$0


File View Window Help
Award Information
Award ID: 9910853 Pgm Org Code:
Awards selected
Open
Award Id
Fiscal Year
CGI Status
CGI Amount
Original Budget Amt
PI Name
Org Code
2000
Awarded
249,814
249,814
Joy S. Foin
06020
2001
CGI pending DGA processing
249,957
249,957
Joy S. Foin
06020
CGI Actions
Withdraw And Move F
Forward to DGA
Withdraw
De-Commit
Ok
Print
Apply
Cancel
History
Ready
BROWSE ONLY
Start
NSF WinStation
Inbox - Micros...
Proposal and...
Award Man...

SUMMARY
PROPOSAL BUDGET

..: 09/01/01 - 08/31/02

ORGANIZATION	FOR NSF USE ONLY		
GEORGE MASON UNIVERSITY	PROPOSAL NO.	DURATION (MONTHS) Proposed	Granted
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR	AWARD NO.		

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and other Senior Associates (List each separately with title, A. 7. show number in brackets)	NSF Funded Person-months CAL	ACA	SUMR	Funds Requested By Proposer	Funds Granted By NSF (If Different)
1. Jagadish Shukla PI				(b)(4), (b)(6)	
2. TBD Research Scientist					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. ( ) POST DOCTORAL ASSOCIATES					
2. ( ) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (3) GRADUATE STUDENTS Doctoral students					
4. ( ) UNDERGRADUATE STUDENTS					
5. ( ) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. ( ) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000)					
TOTAL EQUIPMENT					
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND US POSSESSIONS)				(b)(4)	
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
( ) TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS				(b)(4)	
1. MATERIAL AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER Tuition					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II. D. 7. j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$249,957	$

M. COST SHARING: PROPOSED LEVEL $ AGREED LEVEL IF DIFFERENT $

PI/PD TYPED NAME AND SIGNATURE*	DATE	FOR NSF USE ONLY		
		INDIRECT COSTS RATE VERIFICATION		
ORG. REP. TYPED NAME AND SIGNATURE*	DATE	Date Checked	Date Of Rate Sheet	Initials - ORG
Margaret E. Hanson, Proposal Manager Office of Sponsored Programs				

NSF Form 1030 (10/99) Supersedes All Previous Editions

SIGNATURES REQUIRED ONLY FOR REVISED BUDGET (GPG III. C)

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD, ARLINGTON, VIRGINIA 22230

Award Date June 28, 2000
Grant No. ATM-9910853
Amendment No. 001

Ms. Margaret E. Hanson
Assistant Director for Preaward andDevelopment
George Mason University
4400 University Drive
Fairfax, VA 22030-4443

Dear Ms. Hanson:

The National Science Foundation hereby awards $249,814 to George Mason University for additional support of the project being funded by the above-referenced award.

This project, under the direction of Jagadish Shukla, is entitled:

"Predictability and Variability of the Present Climate."

This award with this amendment totals $499,734 and expires September 30, 2001.

This grant is awarded pursuant to the authority of the National Science Foundation Act of 1950 (42 U.S.C. 1861 et seq.) and is subject to GC-1 Grant General Conditions (10/98).

Except as modified by this amendment, the grant conditions remain unchanged.

The attached budget indicates the amounts, by categories, on which NSF has based its support.

The cognizant NSF program official for this grant is Jay S. Fein (703) 306-1527.
The cognizant NSF grants official contact is Denise O. Young (703) 306-1216.

Sincerely,

Denise O. Young
Grants Officer

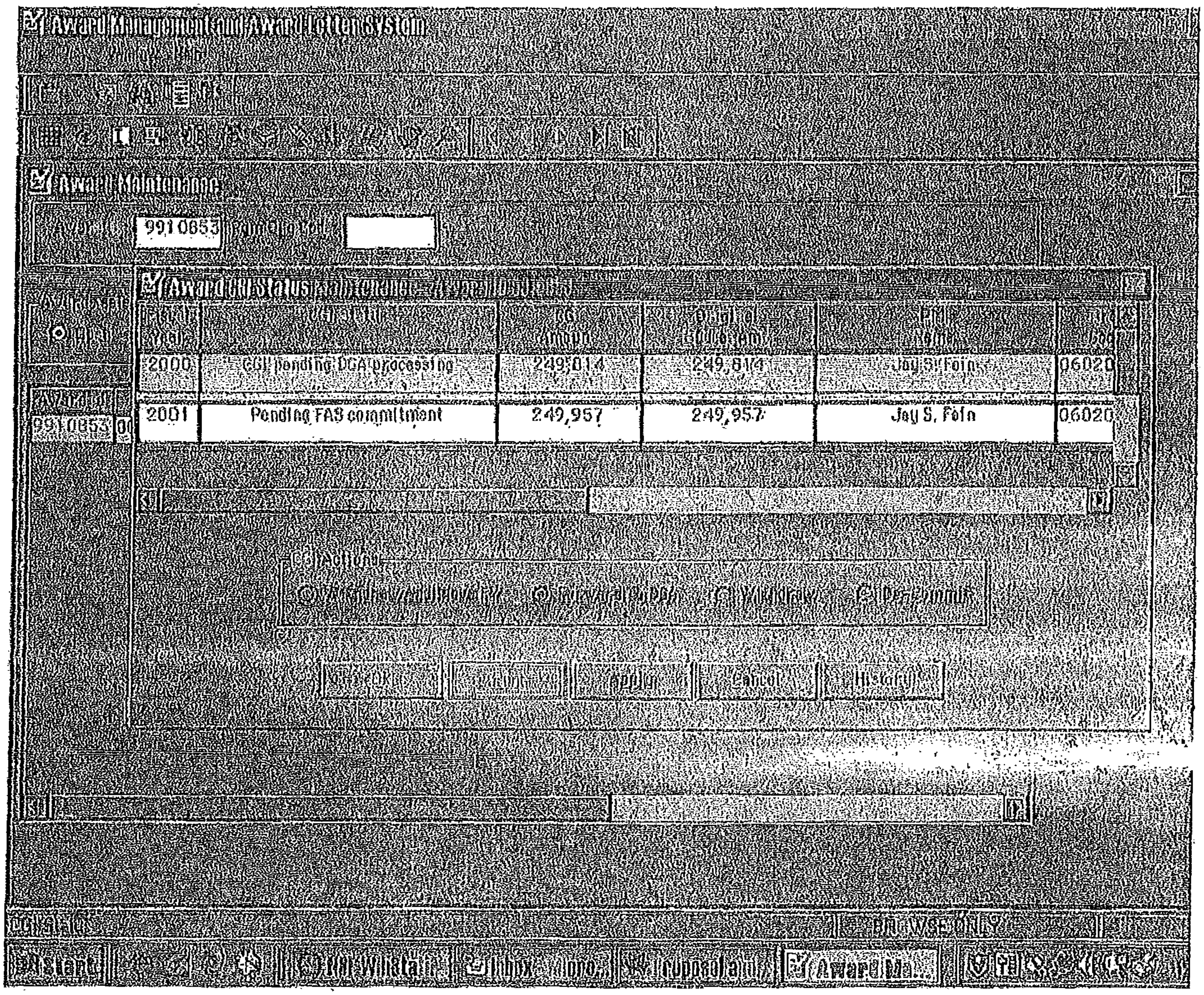
CFDA No: 47.050
mhanson@gmu.edu

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD, ARLINGTON, VIRGINIA 22230

ATM-9910853
001

SUMMARY PROPOSAL BUDGET

	Person MOS cal	acad	sumr	Funds granted By NSF
A. (2.00) Total Senior personnel	(b)(4) & (b)(6)			
B. Other Personnel				
1. (0.00) Post Doctoral associates				
2. (0.00) Other professionals				
3. (3.00) Graduate students				
4. (0.00) Secretarial-clerical				
5. (0.00) Undergraduate students				
6. (0.00) Other				
Total salaries and wages (A+B)				
C. Fringe benefits (If charged as direct c				
Total salaries wages and fringe				
D. Total permanent equipment				(b) (4)
E. Travel				
1. Domestic				
2. Foreign				
F. Total participant support costs				
G. Other direct costs				
1. Materials and supplies				
2. Publication costs/page charges				
3. Consultant services				
4. Computer (ADPE) services				
5. Subcontracts				
6. Other				
Total other direct costs				
H. Total direct costs (A through G)				
I. Total indirect costs				
J. Total direct and indirect costs (H+I)				
K. Residual funds / Small business fee				
1. Residual funds (If for further support of current projects GPM 252 and 253)				
2. Small business fee				
L. Amount of this request (J) or (J-K1+K2)				$249,814
M. Cost sharing				$0


Award Management and Award Letter System
Award Maintenance
9910853
2000
CGI pending DGA processing
249,814
249,814
Jay S. Fein
06020
2001
Pending FAS commitment
249,957
249,957
Jay S. Fein
06020
Cancel
History

SUMMARY
PROPOSAL BUDGET

Yr 2: 09/01/00 - 08/31/01

FOR NSF USE ONLY

ORGANIZATION	PROPOSAL NO.	DURATION (MONTHS) Proposed	Granted
GEORGE MASON UNIVERSITY			
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR	AWARD NO.		

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and other Senior Associates (List each separately with title, A. 7. show number in brackets)	NSF Funded Person-months CAL / ACA / SUMR	Funds Requested By Proposer	Funds Granted By NSF (If Different)
1. Jagadish Shukla PI	(b)(4) & (b)(6)		
2. TBD Research Scientist			
3.			
4.			
5.			
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)			
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)			
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)			
1. ( ) POST DOCTORAL ASSOCIATES			
2. ( ) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			
3. (3) GRADUATE STUDENTS Doctoral students			
4. ( ) UNDERGRADUATE STUDENTS			
5. ( ) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)			
6. ( ) OTHER			
TOTAL SALARIES AND WAGES (A + B)			
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)			
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)			
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000)			
TOTAL EQUIPMENT		(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND US POSSESSIONS)			
2. FOREIGN			
F. PARTICIPANT SUPPORT COSTS			
1. STIPENDS $			
2. TRAVEL			
3. SUBSISTENCE			
4. OTHER			
( ) TOTAL PARTICIPANT COSTS		(b)(4)	
G. OTHER DIRECT COSTS			
1. MATERIAL AND SUPPLIES			
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION			
3. CONSULTANT SERVICES			
4. COMPUTER SERVICES			
5. SUBAWARDS			
6. OTHER Tuition			
TOTAL OTHER DIRECT COSTS			
H. TOTAL DIRECT COSTS (A THROUGH G)			
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) (b)(4)			
TOTAL INDIRECT COSTS (F&A)			
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)			
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II. D. 7. j.)			
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)		$249,814	$
M. COST SHARING: PROPOSED LEVEL 5	AGREED LEVEL IF DIFFERENT $		

PI/PD TYPED NAME AND SIGNATURE*	DATE	FOR NSF USE ONLY INDIRECT COSTS RATE VERIFICATION		
ORG. REP. TYPED NAME AND SIGNATURE* Margaret E. Hanson, Proposal Manager Office of Sponsored Programs	DATE	Date Checked	Date Of Rate Sheet	Initials - ORG

NSF Form 1030 (10/98) Supersedes All Previous Editions

*SIGNATURE REQUIRED ONLY FOR REVISED BUDGET (GPG III. C)

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD • ARLINGTON, VIRGINIA 22230

Award Date September 24, 1999
Grant No. ATM-9910853
Proposal No. ATM-9910853

Ms. Margaret E. Hanson
Assistant Director for Preaward and
Development
George Mason University
4400 University Drive
Fairfax, VA 22030-4443

Dear Ms. Hanson:

The National Science Foundation hereby awards a grant of $249,920 to George Mason University for support of the project described in the proposal referenced above.

This project, under the direction of Jagadish Shukla, Institute for Computational Sciences and Informatics, is entitled:

"Predictability and Variability of the Present Climate."

This award is effective October 1, 1999 and expires September 30, 2000.

This is a continuing grant which has been approved on scientific / technical merit for approximately 5 years. Contingent on the availability of funds and the scientific progress of the project, NSF expects to continue support at approximately the following levels:

FY2000 $249,814	FY2001 $249,957
FY2002 $249,989	FY2003 $249,961

This grant is awarded pursuant to the authority of the National Science Foundation Act of 1950 (42 U.S.C. 1861 et seq.) and is subject to GC-1 Grant General Conditions (10/98).

The attached budget indicates the amounts, by categories, on which NSF has based its support.

The cognizant NSF program official for this grant is Jay S. Fein (703) 306-1527. The cognizant NSF grants official is Susan K. McDonnell (703) 306-1218.

Sincerely,

Brian J. Mannion
Grants Officer

Email address
mhanson@gmu.edu

SUMMARY PROPOSAL BUDGET

	PERSON MOS cal	acad	sumr	Funds granted By NSF
A. (2.00) Total Senior personnel	[redacted]			[redacted]
B. Other Personnel				
1. (0.00) Post doctoral associates				
2. (0.00) Other professionals				
3. (3.00) Graduate students				
4. (0.00) Secretarial-clerical				
5. (0.00) Undergraduate students				
6. (0.00) Other				
Total salaries and wages (A+B)				
C. Fringe benefits (if charged as dire				
Total salaries wages and fringes				
D. Total permanent equipment				[redacted]
E. Travel 1. Domestic				
2. Foreign				
F. Total participant support costs				
G. Other direct costs				
1. Materials and supplies				
2. Publication costs/page charges				
3. Consultant services				
4. Computer (ADPE) services				
5. Subcontracts				
6. Other				
Total other direct costs				
H. Total direct costs (A through G)				
I. Total indirect costs				
J. Total direct and indirect costs (H+I)				
K. Residual funds / Small business fee				
1. Residual funds (if for further support of current projects GPM 252 and 253)				
2. Small business fee				
L. Amount of this request (J) or (J - K1 + K2)				$249,920
M. Cost sharing				

ACTION PROCESSING FORM

I. RECOMMENDED AWARD DATA

30. Proposal No.	31. Prev. Award No.	32. and 33. Submitting Inst. and Inst. Code		34. Rec. Award Istr.
ATM-9910853	9526183	George Mason University	0037499000	CONT

35. Rec. Eff. Date	36. Award Dur.	37. Name of PI(s)/PD(s)	38. Rec. Natr of Award
08/30/1999 9/15/99	12	Shukla, Jagadish	NEW- Renewal

39. Title Predictability and Variability of the Present Climate

FINANCIAL CODES

40.	Organization	Pgm. Element	Appr.	Obj. Class	Funded Amount	PO or Recommending Official	DD or Approving Official
	06020106	5740	0199	4110	$249,920		
1.	Pgm. Refs: 1324 EGCH						
2.	Pgm. Refs:						
3.	Pgm. Refs:						
4.	Pgm. Refs:						
5.	Pgm. Refs:						
6.	Pgm. Refs:						
7.	Pgm. Refs:						
8.	Pgm. Refs:						

TOTAL RECOMMENDED AMOUNT * $249,920.00

41. Future Commitments

FY 2000	FY 2001	FY 2002	FY 2003
$249,814.00	$249,957.00	$249,989.00	$249,961.00

42. Special Certifications: ☐ Human Subjects ☐ I.R.B. ☐ Exempt ☐ Vert. Animals ☐ IACUC

43. Foreign or International Implications

Name of Country or World Region	Code	01	02	03	04	05	06
India	IN	x					
Europe	XG	x					

Type(s) of Implications (Check one or more for each entry)
01.Foreign Travel
02.Foreign Citizen(s) Supported
03.Activity at Frgn. Locale; Frgn. Procurement or Expenditure for at least one month
04.Cooperative Project with Frgn. Inst. or Org.
05.Activity Related to Int'l Program, Agreement, or Org.(Inter-or- non-gov; include bilateral and multilateral activities)
06.Other than above (e.g. Studies, Pubs.)

44. Signature of Managing Program Officer and Section Head (if Required) and Date
Jay S. Fein Jay S. Fein 8/7/99
Managing Org 06020106

45. Signature of Managing Division Director and Assistant Director (if Required) and Date
Richard S. Greenfield [signature] 8/12/99

46. Division Funds Certification Signature (if Required) and Date
Phyllis J. Hunley 8-12-99

II. AWARD DATA (DGA USE ONLY)

47. Date of Award	48. Award No. (if different)	49. Award Amount (if different)	50. Cumulative Award

51. Award Duration (if different)	52. Effective Date (if different)	53. Expiration Date	54. Submitting Inst. Code (if different)

55. Award Instrument	56. Natr of Awd (if different)	57. Type of Contract	58. DGA Initials and Date
CONT			

59. Remarks

☐ _____ Month(s) No-Cost Extension From _____ To: _____ Mode of Support: RSRH
☐ Original NSF Abstract Still Valid (1st-year-of-a-5-year-continuing grant)
☐ P.I. Transfer This is the first year/year of a five-year continuing grant.
☐ Pre-College Curriculum

ACTION PROCESSING FORM

1. Proposal No.	2. Award	3. NSF Organization	4. Document Date
ATM-9810853		CLIMATE DYNAMICS PROGRAM	08/06/1999

5. Award Istr	5A. Code	5. Award Istr	5A. Code	5B. Natr of Rqst	5C. Code	5B. Natr of Rqst	5C. Code	6. Req. Eff Date
CONT	2			NEW	1			09/01/1999

7. Date Received	7. Date Received	8. Req. Dur.	8. Req. Dur.	9. Requested Amount	9. Requested Amount
07/26/1999		36		$1,249,641.00	

SUBMITTING INSTITUTION DATA		10 Digit Code
10. Submitting Inst. Code	0037499000	10.
10A. Name	George Mason University	10A.
10B. Address 1	4400 University Drive	10B.
10C. Address 2		10C.
10D. City-State-Zip	Fairfax VA 220304443	10D.

NAME	PI/PD DATA	10 Digit Code
11. Shukla, Jagadish		11.
11A. Inst. Code	6300002833 Prior Support Y	11A.
11B. Address 1	Inst of Global Environ Soc	11B.
11C. Address 2	4041 Powder Mill Road, Suite 302	11C.
11D. Dept.	Center for Ocean-Land-Atmosphere Studies	11D.
11E. City-State-Zip	Calverton MD 20705	11E.

NAME	CO-PI/PD DATA	
12.		12.
12A.		12A.
12B.		12B.
12C.		12C.

13. Title: Predictability and Variability of the Present Climate — Pgm Annc: NSF 99-2

13. Title:

14. Managing Organization	CLIMATE DYNAMICS PROGRAM	Code 06020106	Code
15. Program Element	CLIMATE DYNAMICS PROGRAM	5740	
16. Object Class	RESEARCH GRANTS-NOT ELSEWH CLA	4110	

17. Program Reference Codes	1324	EGCH								

18. *(Not currently in use)*	19. Fields of Application	Code	Code
	Climate Related Activities	0319000	

20. % Basic Research	% Applied Research	21. SBIR Topic ID	Instrumentation
100	0		0

22. Special Program Data Elements (10 Chars. max. In A-M, 8 chars. max. In N-Z; N-Z reserved for whole numbers only)

A:	B:	C:	D: 76	E:	F:	G:
H:	I:	J:	K:	L:	M:	N:
O:	P:	Q:	R:	S:	T:	U:
V:	W:	X:	Y:	Z:		

NON-AWARD ACTION

23. Withdrawal	24.	25.
☐ P.I./INSTITUTION INITIATED (20) ☐ PROJECT FUNDED ELSEWHERE (21)	☐ DECLINATION (10)	☐ INAPPROPRIATE FOR NSF (30)

26. Signature, Program Officer	27. Date	28. Signature, Division Director	30. Date
Jay S. Fein		Richard S. Greenfield	

NSF FORM 1036

SUMMARY
PROPOSAL BUDGET

Yr 1: 09/01/99 - 08/31/00

ORGANIZATION	FOR NSF USE ONLY		
GEORGE MASON UNIVERSITY	PROPOSAL NO. 9910863	DURATION (MONTHS) Proposed: 12	Granted
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR	AWARD NO.		

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and other Senior Associates (List each separately with title, A. 7. show number in brackets)	NSF Funded Person-months CAL	ACA	SUMR	Funds Requested By Proposer	Funds Granted By NSF (If Different)
1. Jagadish Shukla PI	(b)(4), (b)(6)				
2. TBD Research Scientist					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. ( ) POST DOCTORAL ASSOCIATES					
2. ( ) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (3) GRADUATE STUDENTS Doctoral students					
4. ( ) UNDERGRADUATE STUDENTS					
5. ( ) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. ( ) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000)					
3 Computers and Printer					
TOTAL EQUIPMENT				(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND US POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
( ) TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS				(b)(4)	
1. MATERIAL AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER Tuition					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II. D. 7. j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$249,820	$

M. COST SHARING: PROPOSED LEVEL $ AGREED LEVEL IF DIFFERENT $

PI/PD TYPED NAME AND SIGNATURE*	DATE	FOR NSF USE ONLY
		INDIRECT COSTS RATE VERIFICATION

ORG. REP. TYPED NAME AND SIGNATURE*	DATE	Date Checked	Date Of Rate Sheet	Initials - ORG
Margaret E. Hanson, Proposal Manager Office of Sponsored Programs		9/21/99	10/10/96	

NSF Form 1030 (10/98) Supersedes All Previous Editions

*SIGNATURES REQUIRED ONLY FOR REVISED BUDGET (GPG III. C)

Indirect Cost Rates for Institution [illegible]

07/14/1996	01	Predetermined	07/01/1996	06/30/2001	10/10/1996	Dept of HHS
08/27/1995	01	Predetermined	07/01/1993	06/30/1996	07/27/1993	Dept of HHS
07/01/1988	01	Predetermined	07/01/1988	06/30/1993	05/24/1990	Dept of HHS
07/01/1986	01	Predetermined	07/01/1986	06/30/1988	02/14/1986	Dept of HHS
07/01/1985	01	Predetermined	07/01/1985	06/30/1986	02/06/1985	Dept of HHS
07/01/1984	01	Predetermined	07/01/1984	06/30/1985	03/20/1984	Dept of HHS

Research (on campus)	(b) (4) [redacted]
Research (off-campus)	

OFF-CAMPUS DEFINITION: For all activities performed in facilities not owned by the institution and to which rent is directly allocated to the project(s), the off-campus rate will apply. Actual costs will be apportioned between on-campus and off-campus components. Each portion will bear the appropriate rate.

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE/if not in response to a program announcement/solicitation enter NSF 99-2

NSF 99-2

99-10853

FOR CONSIDERATION BY NSF ORGANIZATIONAL UNIT(S) (Indicate the most specific unit known, i.e., program, division, etc.)

GEO/ATM/Climate Dynamics Program

DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS # (Data Universal Numbering System)	FILE LOCATION
JAN 26 1999	1	ATM	0602	07-781-7450	

EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)	SHOW PREVIOUS AWARD NO. IF THIS IS	IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY?
(b)(4) [redacted]	[x] A RENEWAL [ ] AN ACCOMPLISHMENT-BASED RENEWAL ATM-9528153	YES [ ] NO [x] IF YES, LIST ACRONYM(S)

NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE	ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE
George Mason University	4400 University Drive Fairfax, VA 22030-4444
AWARDEE ORGANIZATION CODE (IF KNOWN) 0037 49 9000	
NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE	ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE
PERFORMING ORGANIZATION CODE (IF KNOWN)	

IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.D.1 For Definitions) [ ] FOR-PROFIT ORGANIZATION [ ] SMALL BUSINESS [ ] MINORITY BUSINESS [ ] WOMAN-OWNED BUSINESS

TITLE OF PROPOSED PROJECT *Predictability and Variability of the Present Climate*

REQUESTED AMOUNT	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PREPROPOSAL NO., IF APPLICABLE
$1,249,641	36 months	September 1, 1999	

CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW

- [ ] BEGINNING INVESTIGATOR (GPG I.A.3)
- [ ] DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.D.1)
- [ ] PROPRIETARY & PRIVILEGED INFORMATION (GPG I.B, II.D.7)
- [ ] NATIONAL ENVIRONMENTAL POLICY ACT (GPG II.D.10)
- [ ] HISTORIC PLACES (GPG II.D.10)
- [ ] SMALL GRANT FOR EXPLOR. RESEARCH (SGER) (GPG II.D.12)
- [ ] GROUP PROPOSAL (GPG II.D.12)
- [ ] VERTEBRATE ANIMALS (GPG II.D.12) IACUC App. Date ______
- [ ] HUMAN SUBJECTS (GPG II.D.12) Exemption Subsection ___ or IRB App. Date ______
- [ ] INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES ______
- [ ] FACILITATION FOR SCIENTISTS/ENGINEERS WITH DISABILITIES (GPG V.G.)
- [ ] RESEARCH OPPORTUNITY AWARD (GPG V.H)

PI/PD DEPARTMENT	PI/PD POSTAL ADDRESS
Computational Sciences & Informatics Inst.	George Mason University 4400 University Drive Fairfax, VA 22030-4444
PI/PD FAX NUMBER 703/993-1980	

NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address
PI/PD NAME Jagadish Shukla	Ph.D.	(b)(6) [redacted]	703/993-1990	Shukla@cola.iges.org
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				

CERTIFICATION PAGE

Certification for Principal Investigators and Co-Principal Investigators

I certify to the best of my knowledge that:

(1) the statements herein (excluding scientific hypotheses and scientific opinions) are true and complete, and
(2) the text and graphics herein as well as any accompanying publications or other documents, unless otherwise indicated, are the original work of the signatories or individuals working under their supervision. I agree to accept responsibility for the scientific conduct of the project and to provide the required project reports if an award is made as a result of this proposal.

I understand that the willful provision of false information or concealing a material fact in this proposal or any other communication submitted to NSF is a criminal offense (U.S.Code, Title 18, Section 1001).

Name (Typed)	Signature	Social Security No.*	Date
PI/PD Jagadish Shukla	J Shukla	(b) (6)	7/6/99
Co-PI/PD			
Co-PI/PD			
Co-PI/PD			
Co-PI/PD			

Certification for Authorized Organizational Representative or Individual Applicant

By signing and submitting this proposal, the individual applicant or the authorized official of the applicant institution is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding Federal debt status, debarment and suspension, drug-free workplace, and lobbying activities (see below), as set forth in the *Grant Proposal Guide (GPG)*, NSF 99-2. Willful provision of false information in this and its supporting documents or in reports required under an ensuing award is a criminal offense (U.S. Code, Title 18, Section 1001).

In addition, if the applicant institution employs more than fifty persons, the authorized official of the applicant institution is certifying that the institution has implemented a written and enforced conflict of interest policy that is consistent with the provisions of *Grant Policy Manual* Section 510; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the institution's expenditure of any funds under the award, in accordance with the institution's conflict of interest policy. Conflicts that cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

Debt and Debarment Certifications (If answer "yes" to either, please provide explanation.)

Is the organization delinquent on any Federal debt? Yes (b) (4)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal Department or agency? Yes

Certification Regarding Lobbying

This certification is required for an award of a Federal contract, grant or cooperative agreement exceeding $100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding $150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE	SIGNATURE	DATE
NAME/TITLE (TYPED) Margaret E. Hanson, Proposal Manager	Margaret E. Hanson	7/7/99
TELEPHONE NUMBER 703/993-2292	ELECTRONIC MAIL ADDRESS Mhanson@gmu.edu	FAX NUMBER 703/993-2296

*SUBMISSION OF SOCIAL SECURITY NUMBERS IS VOLUNTARY AND WILL NOT AFFECT THE ORGANIZATION'S ELIGIBILITY FOR AN AWARD. HOWEVER, THEY ARE AN INTEGRAL PART OF THE NSF INFORMATION SYSTEM AND ASSIST IN PROCESSING THE PROPOSAL. SSN SOLICITED UNDER NSF ACT OF 1950, AS AMENDED.

SUMMARY
PROPOSAL BUDGET

mulative: 09/01/09 - 08/31/04

ORGANIZATION	FOR NSF USE ONLY		
GEORGE MASON UNIVERSITY	PROPOSAL NO.	DURATION (MONTHS) Proposed	Granted
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR	AWARD NO.		

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and other Senior Associates (List each separately with title, A. 7. show number in brackets)	NSF Funded Person-months CAL	ACA	SUMR	Funds Requested By Proposer	Funds Granted By NSF (If Different)
1. Jagadish Shukla PI				(b)(4). (b)(6)	
2. TBD Research Scientist					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. ( ) POST DOCTORAL ASSOCIATES					
2. ( ) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. (3) GRADUATE STUDENTS Doctoral students					
4. ( ) UNDERGRADUATE STUDENTS					
5. ( ) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. ( ) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000) 3 Computers and Printer					
TOTAL EQUIPMENT				(b)(4)	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND US POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
( ) TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS					
1. MATERIAL AND SUPPLIES				(b)(4)	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER Tuition					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) (b)(4)					
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II. D. 7. j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$1,249,641	$

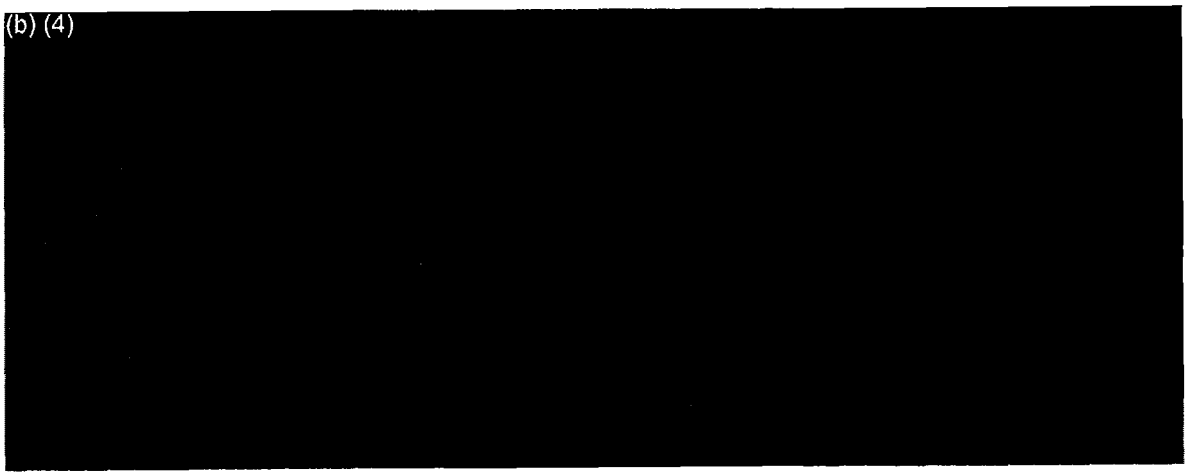
M. COST SHARING: PROPOSED LEVEL $	AGREED LEVEL IF DIFFERENT $	
PI/PD TYPED NAME AND SIGNATURE*	DATE	FOR NSF USE ONLY INDIRECT COSTS RATE VERIFICATION
ORG. REP. TYPED NAME AND SIGNATURE* Margaret E. Hanson, Proposal Manager Office of Sponsored Programs	DATE	Date Checked / Date Of Rate Sheet / Initials - ORG

NSF Form 1030 (10/98) Supersedes All Previous Editions

*SIGNATURES REQUIRED ONLY FOR REVISED BUDGET (GPG III. C)

Budget Explanation

(b) (4)



Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Jagadish Shukla	Other agencies (including NSF) to which this proposal has been/will be submitted. No

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Predictability and Variability of the Present Climate

Source of Support: NSF

Total Award Amount: $1,249,641.00 Total Award Period Covered: 09/01/99-08/31/04

Location of Project: George Mason University

Person-Months Per Year Committed to the Project. (b)(4) & (b)(6)

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Predictability of Short Term Climate Variations

Source of Support: NSF

Total Award Amount: $1,088,378.00 Total Award Period Covered: 09/01/95-08/31/00

Location of Project: George Mason University

Person-Months Per Year Committed to the Project. (b)(4) & (b)(6)

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

(b)(4) & (b)(6)

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

NSF Form 1239 (10/98) USE ADDITIONAL SHEETS AS NECESSARY

12191

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
2321 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515-6301
(202) 225-6371
www.science.house.gov

October 30, 2015

The Honorable France A. Córdova
Director
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Dear. Dr. Córdova,

I am writing in response to your letter of October 23, 2015, regarding the House Science, Space, and Technology Committee's request for records related to three National Science Foundation (NSF) grant awards. Your letter indicated that after initially denying the Committee's request for documents in an October 16, 2015 letter and referring the matter to the Office of Inspector General, that you would provide limited access to the documents.

I appreciate that your staff has delivered copies of the financial documents and records contained in the three award jackets requested. However, I regret that as in previous responses to requests made the Committee, you are providing only *in camera* access for review of approximately 1,000 pages of material related to the awards. While the Committee will again avail itself of the limited access you are providing to review the documents at NSF headquarters by appointment, as in previous correspondence I must assert that the Committee has a legal right to copies of all requested documents.

In your letter, you continue to maintain that NSF is bound by self-regulated standards regarding potential sensitive information and is not bound by the U.S. Constitution. Congress's authority to obtain federal information, including but not limited to, confidential information is extremely broad. The U.S. Supreme Court has unequivocally established that Congress's power to conduct investigations and oversight is so essential to the legislative function that it may be implied from the general vesting of all legislative power in Congress.

In this case, the Committee is investigating serious allegations of fraud and abuse of taxpayer dollars related to several federal grants awarded to the Institute for Global Environment and Society. It is a critical function of Congress to conduct oversight of federal taxpayer dollars, and for the Committee to conduct oversight of the federal agencies under its jurisdiction. Such oversight is impossible if an agency of the federal government unilaterally determines to limit the information that it furnishes to Congress, and permits review of official documents only at its offices and under NSF staff supervision.

In spite of your improper withholding of information, the Committee will move forward with reviewing documents *in camera*. My expectation is that if the Committee's staff determines that any or all of the documents reviewed are required as part of the investigation, that you will produce copies to the Committee.

If your staff has any questions about this request, please contact Cliff Shannon, Staff Director of the Research and Technology Subcommittee or Tim Doyle, Staff Director of the Oversight Subcommittee, at 202-225-6371.

Sincerely,

Lamar Smith

Lamar Smith
Chairman

cc: The Honorable Eddie Bernice Johnson, Ranking Minority Member

12193

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

2321 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515-6301
(202) 225-6371
www.science.house.gov

November 4, 2015

The Honorable France Córdova
Director
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Dear Dr. Córdova,

I am writing as a follow-up to the hearing the House Science, Space, and Technology Committee held on September 18, 2015, "NEON Warning Signs: Examining the Management of the National Ecological Observatory Network." The hearing examined the National Science Foundation (NSF) announcement that the NEON project would be $80 million over budget and 18 months behind its construction schedule on its current trajectory, as well as de-scoping plans and corrective actions to keep the project on budget.

As part of the questions submitted to the NSF for the hearing record, the committee inquired about what communications took place between NSF and NEON, Inc. from January 1, 2013-September 18, 2015 regarding the construction schedule and budget, as witnesses from NSF and NEON, Inc. provided conflicting information on those communications. NSF provided a summary of the communications for the hearing record.

As the Committee continues its oversight of the management of NEON, I now write to request copies of the following public records: every e-mail, letter, memorandum, record, note, text message, or document of any kind that pertains to the budget, costs, schedule or management of the National Ecological Observatory Network from January 1, 2013-November 4, 2015.

Pursuant to Rule X of the U.S. House of Representatives, I request that you provide all requested information to the Committee by **November 18, 2015**.

When producing documents to the Committee, please deliver production sets to the Majority Staff in Room 2321 of the Rayburn House Office Building and the Minority Staff in Room 394 of the Ford House Office Building. The Committee prefers, if possible, to receive all documents in electronic format.

If your staff has any questions, please contact Jennifer Wickre, Professional Staff, Research and Technology Subcommittee, at Jennifer.Wickre@mail.house.gov or 202-225-6371.

Sincerely,

Lamar Smith

Lamar Smith
Chairman

cc: The Honorable Eddie Bernice Johnson, Ranking Minority Member, House Committee on Science, Space, and Technology

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD, SUITE 1245
ARLINGTON, VIRGINIA 22230

OFFICE OF LEGISLATIVE
& PUBLIC AFFAIRS

November 18, 2015

The Honorable Lamar Smith
Chairman
Committee on Science, Space, and Technology
U.S. House of Representative
Washington, DC 20515

Dear Chairman Smith:

This letter responds to your letter dated Nov. 4, 2015, following up on the National Ecological Observatory Network (NEON) hearing before the House, Science, Space and Technology Committee on September 18 requesting copies of public records related to NEON. We appreciate the support of the Committee in our efforts to address the management of this scientifically important project, and we understand you have a particular interest in communication between the National Science Foundation (NSF) and NEON, Inc. regarding the construction schedule and budget.

We have enclosed official correspondence between cognizant NSF program officials and NEON, Inc. authorities that concern construction budgets and schedules. We are also attaching a detailed breakdown of contingency funding and approvals that we believe will be useful to you. These materials may contain sensitive information, and we ask that you treat them accordingly.

As Dr. James Olds, assistant director for NSF's Directorate for Biological Sciences, testified at the September 18 hearing, NSF is undertaking a series of contemporaneous actions to immediately strengthen its oversight of NEON Inc. Specifically, NSF has instituted a compliance schedule for NEON Inc., with concrete deadlines, benchmarks and deliverables. The purpose of these benchmarks and deliverables, which we are monitoring closely, is to discern, promptly and with rigor, whether NEON Inc. is capable of continuing to manage this project. NSF has all expert hands on deck in order to make this determination in a timely fashion.

The amount of information the Committee has requested reflects an enormous undertaking at the very time NSF employees are currently attempting to rectify the challenges faced by this project. We harbor serious concerns about the added workload this request would impose upon the staff who are needed to assess and correct the issues discussed during the two committee hearings on the issue.

Mr. Chairman, as this is a highly sensitive time as we address the NEON challenges at all levels of NSF, we respectfully ask that you further limit the scope of any remaining request for documents. This would greatly assist the Foundation's ability to ensure the NEON project remains scientifically sound and on track for U.S. taxpayers.

We would be happy to brief you and the Committee following our review and assessment of the benchmarks and deliverables that NSF has required of NEON, Inc. As we indicated at the September 18 hearing, we respect and share your concerns about the future of the NEON project, and we are making unprecedented efforts to address those concerns on behalf of the U.S. taxpayer and in the interest of science.

If you have any questions, please do not hesitate to contact me at (703) 292-8070.

Sincerely,

Amanda Hallberg Greenwell
Head, Office of Legislative and Public Affairs

Enclosures

Copy to:

Ranking Member Eddie Bernice Johnson

JASON CHAFFETZ, UTAH
CHAIRMAN

ONE HUNDRED FOURTEENTH CONGRESS

ELIJAH E. CUMMINGS, MARYLAND
RANKING MINORITY MEMBER

Congress of the United States

House of Representatives

COMMITTEE ON OVERSIGHT AND GOVERNMENT REFORM
2157 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515-6143
MAJORITY (202) 225-5074
MINORITY (202) 225-5051
http://oversight.house.gov

November 9, 2015

The Honorable France A. Córdova
Director
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Dear Director Córdova:

Cell-site simulation technology, commonly referred to as "Stingrays" or "dirtboxes,"[1] allows law enforcement agents to simulate a cell phone tower, which results in nearby mobile phones and other wireless communication devices connecting to the simulated tower instead of the phone carrier's legitimate tower. When the mobile device connects, the simulation device can see and record the mobile device's unique ID number and approximate location.

The Department of Justice (DOJ) and Department of Homeland Security (DHS) recently released enhanced policies governing those departments' use of cell-site simulation devices for domestic law enforcement activities.[2] Those policies require that, with limited exceptions, officers obtain a search warrant before using the devices. The policies also govern officer training, data retention policies, and statistics the departments are required to keep about the use of the devices.

Recent press reports indicate that federal law enforcement agencies other than DOJ and DHS may be using cell-site simulation devices, including the Internal Revenue Service (IRS).[3] In addition, the American Civil Liberties Union identified 12 other federal agencies with cell-site simulation devices.[4]

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[1] *Examining Law Enforcement Use of Cell Phone Tracking Devices, Hearing before the Subcomm. for Info. Tech. of the H. Comm. on Oversight and Gov't Reform*, 114th Cong. (Oct. 21, 2015); *see also* Letter from Hon. Jason Chaffetz, et al., Chairman, H. Comm. on Oversight and Gov. Reform, to Hon. Eric Holder, Att'y Gen., U.S. Dep't of Justice (Apr. 24, 2015), https://oversight.house.gov/wp-content/uploads/2015/05/2015-04-24-JEC-EEC-WH-RK-to-Holder-DOJ-stingrays-due-5-8.pdf.

[2] U.S. Dep't of Justice, *Department of Justice Policy Guidance: Use of Cell-Site Stimulator Technology* (Sept. 2014), http://www.justice.gov/opa/file/767321/download; U.S. Dep't of Homeland Security, *Department Policy Regarding the Use of Cell-Site Simulator Technology*, Policy Directive 047-02 (Oct. 2015), https://www.dhs.gov/sites/default/files/publications/Department%20Policy%20Regarding%20the%20Use%20of%20Cell-Site%20Simulator%20Technology.pdf.

[3] Nicky Woolf & William Green, *IRS possessed Stingray cellphone surveillance gear, documents reveal*, THE GUARDIAN (Oct. 26, 2015, 8:25 AM), http://www.theguardian.com/world/2015/oct/26/stingray-surveillance-technology-irs-cellphone-tower.

[4] American Civil Liberties Union, *Stingray Tracking Devices: Who's Got Them?*, https://www.aclu.org/map/stingray-tracking-devices-whos-got-them#agencies (accessed on Oct. 29, 2015).

As it was with DOJ and DHS before those agencies issued department-wide policies governing use of the devices, the Committee is concerned that other federal agencies may be governed by a patchwork of policies. Those policies may permit the use of cell-site simulator devices through a lower standard than a search warrant obtained after a showing of probable cause.

So that the Committee can better understand National Science Foundation's use, if any, of cell-site simulation technology, please provide the following documents as soon as possible, but no later than 5:00 p.m. on November 23, 2015:

1. All Agency-wide and component agency policies, guidance, or memoranda on the use of cell-site simulation technology.

2. All Agency-wide and component agency policies, guidance, or memoranda on the use and retention of information collected by cell-site simulation technology.

3. All Agency-wide and component agency policies, guidance, or memoranda on the use of cell-site simulation technology by any component agency of National Science Foundation (NSF) in conjunction with joint law enforcement operations conducted at the State and local level.

4. All Agency-wide or component agency policies, memoranda of understanding, or non-disclosure agreements entered into by any component agency of NSF with State and local law enforcement agencies regarding the use of cell-site simulation technology.

5. All policies, guidance, or memoranda on the use of NSF grants and the total amount of money disbursed by NSF to State or local law enforcement agencies to obtain cell-site simulation technology.

6. All documents referring or relating to any allegation of misuse of cell-site simulation technology by any component agency of NSF regarding any misuse.

7. All documents related to the cost and possession of cell-site simulators in the possession of the component agencies of NSF. In lieu of documents, NSF can provide an inventory of the cell-site simulators in the possession of the component agencies of NSF. The inventory is to show for each agency:

   a. the total number of such devices in possession of the agency;

   b. the name, make, and model of the devices used by or in possession of the agency;

   c. the total number of devices in possession of the agency for each make and model of device; and,

   d. the cost of each individual device and the total amount each agency spent in fiscal years 2010-2015 on acquiring and using cell-site simulation technology.

In addition, please contact the Committee as soon as possible to arrange a briefing on this matter by November 20, 2015.

The Committee on Oversight and Government Reform is the principal oversight committee of the House of Representatives and may at "any time" investigate "any matter" as set forth in House Rule X.

When producing documents to the Committee, please deliver production sets to the Majority staff in room 2157 of the Rayburn House Office Building and the Minority staff in room 2471 of the Rayburn House Office Building. The Committee prefers, if possible, to receive all documents in electronic format. An attachment to this letter provides additional information about responding to the Committee's request.

Please contact Troy Stock of the Majority staff at (202) 225-5074 or Brian Quinn of Ranking Member Cummings' staff at (202) 225-5051 with any questions about this request. Thank you for your attention to this matter.

Sincerely,

Jason Chaffetz
Chairman

Elijah E. Cummings
Ranking Member

Will Hurd
Chairman
Subcommittee on
Information Technology

Robin Kelly
Ranking Member
Subcommittee on
Information Technology

Enclosure

Responding to Committee Document Requests

1. In complying with this request, you are required to produce all responsive documents that are in your possession, custody, or control, whether held by you or your past or present agents, employees, and representatives acting on your behalf. You should also produce documents that you have a legal right to obtain, that you have a right to copy or to which you have access, as well as documents that you have placed in the temporary possession, custody, or control of any third party. Requested records, documents, data or information should not be destroyed, modified, removed, transferred or otherwise made inaccessible to the Committee.

2. In the event that any entity, organization or individual denoted in this request has been, or is also known by any other name than that herein denoted, the request shall be read also to include that alternative identification.

3. The Committee's preference is to receive documents in electronic form (i.e., CD, memory stick, or thumb drive) in lieu of paper productions.

4. Documents produced in electronic format should also be organized, identified, and indexed electronically.

5. Electronic document productions should be prepared according to the following standards:

   (a) The production should consist of single page Tagged Image File ("TIF"), files accompanied by a Concordance-format load file, an Opticon reference file, and a file defining the fields and character lengths of the load file.

   (b) Document numbers in the load file should match document Bates numbers and TIF file names.

   (c) If the production is completed through a series of multiple partial productions, field names and file order in all load files should match.

   (d) All electronic documents produced to the Committee should include the following fields of metadata specific to each document;

   BEGDOC, ENDDOC, TEXT, BEGATTACH, ENDATTACH, PAGECOUNT,CUSTODIAN, RECORDTYPE, DATE, TIME, SENTDATE, SENTTIME, BEGINDATE, BEGINTIME, ENDDATE, ENDTIME, AUTHOR, FROM, CC, TO, BCC, SUBJECT, TITLE, FILENAME, FILEEXT, FILESIZE, DATECREATED, TIMECREATED, DATELASTMOD, TIMELASTMOD, INTMSGID, INTMSGHEADER, NATIVELINK, INTFILPATH, EXCEPTION, BEGATTACH.

6. Documents produced to the Committee should include an index describing the contents of the production. To the extent more than one CD, hard drive, memory stick, thumb drive, box or folder is produced, each CD, hard drive, memory stick, thumb drive, box or folder should contain an index describing its contents.

7. Documents produced in response to this request shall be produced together with copies of file labels, dividers or identifying markers with which they were associated when the request was served.

8. When you produce documents, you should identify the paragraph in the Committee's schedule to which the documents respond.

9. It shall not be a basis for refusal to produce documents that any other person or entity also possesses non-identical or identical copies of the same documents.

10. If any of the requested information is only reasonably available in machine-readable form (such as on a computer server, hard drive, or computer backup tape), you should consult with the Committee staff to determine the appropriate format in which to produce the information.

11. If compliance with the request cannot be made in full by the specified return date, compliance shall be made to the extent possible by that date. An explanation of why full compliance is not possible shall be provided along with any partial production.

12. In the event that a document is withheld on the basis of privilege, provide a privilege log containing the following information concerning any such document: (a) the privilege asserted; (b) the type of document; (c) the general subject matter; (d) the date, author and addressee; and (e) the relationship of the author and addressee to each other.

13. If any document responsive to this request was, but no longer is, in your possession, custody, or control, identify the document (stating its date, author, subject and recipients) and explain the circumstances under which the document ceased to be in your possession, custody, or control.

14. If a date or other descriptive detail set forth in this request referring to a document is inaccurate, but the actual date or other descriptive detail is known to you or is otherwise apparent from the context of the request, you are required to produce all documents which would be responsive as if the date or other descriptive detail were correct.

15. Unless otherwise specified, the time period covered by this request is from January 1, 2009 to the present.

16. This request is continuing in nature and applies to any newly-discovered information. Any record, document, compilation of data or information, not produced because it has not been located or discovered by the return date, shall be produced immediately upon subsequent location or discovery.

17. All documents shall be Bates-stamped sequentially and produced sequentially.

18. Two sets of documents shall be delivered, one set to the Majority Staff and one set to the Minority Staff. When documents are produced to the Committee, production sets shall be delivered to the Majority Staff in Room 2157 of the Rayburn House Office Building and the Minority Staff in Room 2471 of the Rayburn House Office Building.

19. Upon completion of the document production, you should submit a written certification, signed by you or your counsel, stating that: (1) a diligent search has been completed of all documents in your possession, custody, or control which reasonably could contain responsive documents; and (2) all documents located during the search that are responsive have been produced to the Committee.

Definitions

1. The term "document" means any written, recorded, or graphic matter of any nature whatsoever, regardless of how recorded, and whether original or copy, including, but not limited to, the following: memoranda, reports, expense reports, books, manuals, instructions, financial reports, working papers, records, notes, letters, notices, confirmations, telegrams, receipts, appraisals, pamphlets, magazines, newspapers, prospectuses, inter-office and intra-office communications, electronic mail (e-mail), contracts, cables, notations of any type of conversation, telephone call, meeting or other communication, bulletins, printed matter, computer printouts, teletypes, invoices, transcripts, diaries, analyses, returns, summaries, minutes, bills, accounts, estimates, projections, comparisons, messages, correspondence, press releases, circulars, financial statements, reviews, opinions, offers, studies and investigations, questionnaires and surveys, and work sheets (and all drafts, preliminary versions, alterations, modifications, revisions, changes, and amendments of any of the foregoing, as well as any attachments or appendices thereto), and graphic or oral records or representations of any kind (including without limitation, photographs, charts, graphs, microfiche, microfilm, videotape, recordings and motion pictures), and electronic, mechanical, and electric records or representations of any kind (including, without limitation, tapes, cassettes, disks, and recordings) and other written, printed, typed, or other graphic or recorded matter of any kind or nature, however produced or reproduced, and whether preserved in writing, film, tape, disk, videotape or otherwise. A document bearing any notation not a part of the original text is to be considered a separate document. A draft or non-identical copy is a separate document within the meaning of this term.

2. The term "communication" means each manner or means of disclosure or exchange of information, regardless of means utilized, whether oral, electronic, by document or otherwise, and whether in a meeting, by telephone, facsimile, email (desktop or mobile device), text message, instant message, MMS or SMS message, regular mail, telexes, releases, or otherwise.

3. The terms "and" and "or" shall be construed broadly and either conjunctively or disjunctively to bring within the scope of this request any information which might otherwise be construed to be outside its scope. The singular includes plural number, and vice versa. The masculine includes the feminine and neuter genders.

4. The terms "person" or "persons" mean natural persons, firms, partnerships, associations, corporations, subsidiaries, divisions, departments, joint ventures, proprietorships, syndicates, or other legal, business or government entities, and all subsidiaries, affiliates, divisions, departments, branches, or other units thereof.

5. The term "identify," when used in a question about individuals, means to provide the following information: (a) the individual's complete name and title; and (b) the individual's business address and phone number.

6. The term "referring or relating," with respect to any given subject, means anything that constitutes, contains, embodies, reflects, identifies, states, refers to, deals with or is pertinent to that subject in any manner whatsoever.

7. The term "employee" means agent, borrowed employee, casual employee, consultant, contractor, de facto employee, independent contractor, joint adventurer, loaned employee, part-time employee, permanent employee, provisional employee, subcontractor, or any other type of service provider.

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD, SUITE 1245
ARLINGTON, VIRGINIA 22230

OFFICE OF LEGISLATIVE
& PUBLIC AFFAIRS

November 30, 2015

The Honorable Robin Kelly
Ranking Member
Subcommittee on Information Technology
Committee on Oversight and
Government Reform
United States House of Representatives
Washington, DC 20515

Dear Representative Kelly:

Thank you for your letter of November 9, 2015, requesting documents related to the use of cell-site simulation technologies by the National Science Foundation.

The National Science Foundation does not have any documents responsive to your request. The Foundation does not use cell-site simulation devices, and we do not have any policies regarding their use.

As requested, we will be in contact with you regarding a briefing on this matter. If you have any questions about this response, please feel free to contact me at (703) 292-8070.

Sincerely,

Amanda Hallberg Greenwell
Head, Office of Legislative and Public Affairs

Identical letter to:
The Honorable Jason Chaffetz
The Honorable Elijah E. Cummings
The Honorable Will Hurd

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD, SUITE 1245
ARLINGTON, VIRGINIA 22230

OFFICE OF LEGISLATIVE
& PUBLIC AFFAIRS

November 30, 2015

The Honorable Jason Chaffetz
Chairman
Committee on Oversight and
Government Reform
United States House of Representatives
Washington, DC 20515-6143

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Head, Office of Legislative and Public Affairs

Identical letter to:
The Honorable Elijah E. Cummings
The Honorable Will Hurd
The Honorable Robin Kelly

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD, SUITE 1245
ARLINGTON, VIRGINIA 22230

OFFICE OF LEGISLATIVE
& PUBLIC AFFAIRS

November 30, 2015

The Honorable Elijah E. Cummings
Ranking Member
Committee on Oversight and
Government Reform
United States House of Representatives
Washington, DC 20515-6143

Dear Representative Cummings:

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Sincerely,

Amanda Hallberg Greenwell
Head, Office of Legislative and Public Affairs

Identical letter to:
The Honorable Jason Chaffetz
The Honorable Will Hurd
The Honorable Robin Kelly

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD, SUITE 1245
ARLINGTON, VIRGINIA 22230

OFFICE OF LEGISLATIVE
& PUBLIC AFFAIRS

November 30, 2015

The Honorable Will Hurd
Chairman
Subcommittee on Information Technology
Committee on Oversight and
Government Reform
United States House of Representatives
Washington, DC 20515

Dear Chairman Hurd:

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Sincerely,

Amanda Hallberg Greenwell
Head, Office of Legislative and Public Affairs

Identical letter to:
The Honorable Jason Chaffetz
The Honorable Elijah E. Cummings
The Honorable Robin Kelly

12209

United States Senate
COMMITTEE ON COMMERCE, SCIENCE,
AND TRANSPORTATION
WASHINGTON, DC 20510-6125
WEB SITE: http://commerce.senate.gov

December 9, 2015

The Honorable France A. Córdova
Director, National Science Foundation
4201 Wilson Boulevard
Arlington, Virginia 22230

The Honorable Daniel E. Arvizu
Chairman, National Science Board
4201 Wilson Boulevard
Arlington, Virginia 22230

Dear Drs. Córdova and Arvizu:

On February 11, 2015, Ranking Member Nelson and I wrote to you regarding the National Science Foundation's (NSF) fiscal management of large facility cooperative agreements for facility construction and operation. The NSF Office of Inspector General (OIG) recently identified establishing accountability over large cooperative agreements as an ongoing top management challenge for NSF in fiscal year 2016.[1] I am writing today to request an update on progress to address the management and cost control challenges of one such project, the National Ecological Observatory Network (NEON). Both NSF and the NSF OIG have reported that, several years into the project, NEON faced a significant potential cost overrun of approximately $80 million. This potential cost overrun required NEON management to de-scope the project. While I appreciate NSF's cooperation with the Committee's inquiry thus far, these reports raise further questions about NSF's ability to manage cooperative agreements effectively in order to maximize federal research investments and protect taxpayers from costly or uncontrolled spending.

NEON is a $433.8 million construction project intended to build a geographically distributed infrastructure of sensor networks across the United States to measure a wide variety of ecological data. In June 2015, NEON informed NSF that the program was projected to face a schedule slip of as much as 18 months[2] and a potential cost overrun of approximately $80 million,[3] in addition to the $60 million included as contingency funds in the original budget.[4]

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[1] Nat'l Sci. Found., Office of Inspector Gen., Semiannual Report to Congress, at 39 (Sept. 2015), http://www.nsf.gov/pubs/2016/oig16001/oig16001.pdf.

[2] *NEON Warning Signs: Examining the Management of the National Ecological Observatory Network: Hearing Before the Subcomm. on Research & Tech. and the Subcomm. on Oversight of the H. Comm. on Sci., Space, & Tech.*, 114th Cong. (Sept. 18, 2015) (statement of Dr. James L. Olds, Assistant Director, Directorate for Biological Sciences, Nat'l Sci. Found.).

[3] NSF, Office of Inspector General, *NSF's Management of Potential $80 Million Cost Overrun for NEON*, Report No. 15-3-001 (Sept. 15, 2015), https://www.nsf.gov/oig/_pdf/15-3-001-NEONOverrun.pdf [hereinafter NSF OIG Report].

[4] H. Comm. on Sci., Space, & Tech., *Hearing Charter: NEON Warning Signs: Examining the Management of the National Ecological Observatory Network,*

NSF responded to this potential cost overrun by convening community representatives to redefine the project, promoting greater agency involvement, and requiring revised project documentation.[5] As a result, I am aware that a number of changes were made by NSF to de-scope the project, including reducing the number of sites from 106 to 82, removing an experimental component, and making other changes to control costs.[6] Additionally, on September 8, 2015, NEON announced that Dr. Russ Lea, CEO since February 2012, would be stepping down, and that its board of directors had started a search for his replacement.[7]

While I understand and appreciate that NSF has made several recent improvements in its oversight of cooperative agreements, the NSF Office of Inspector General (OIG) remains concerned about the level of scrutiny NSF applies in overseeing NEON in particular. In a September 2015 report, the OIG observed that while some factors may have been out of the NSF's control, "serious accountability concerns associated with NEON" contributed to NEON's potential cost overrun.[8] In fact, the OIG noted that it has been recommending that NSF address "serious financial risks in the NEON project" since 2011.[9]

According to the report, the OIG identified numerous warning signs including inadequacies in NEON's cost estimates and other financial reporting. The OIG concluded that, if "NSF had strong cost surveillance practices in place from the start of the project, it would have had the information it needed to identify the potential cost overruns early on. . . ."[10] The OIG report recommended that NSF conduct an independent evaluation of NEON's new cost estimate to complete construction, due this month, and that NSF take prompt action to address its findings.[11] In addition, the OIG recommended that NSF require special payment treatment of the project and that NEON include sufficient, quality information in its project reports to ensure that NSF can manage the program effectively.[12]

In its response to the OIG report, however, NSF appeared to disagree with the OIG's conclusion that improved cost controls would have allowed NSF to catch NEON's problems earlier and prevent the project's potential overrun. NSF also did not agree to implement all of the OIG recommendations fully. Although NSF proposed several actions of its own to monitor NEON going forward, including placing NEON as the inaugural project on a newly created

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https://science.house.gov/sites/republicans.science.house.gov/files/documents/HHRG-114-SY15-20150918-SD001.pdf (last visited Dec. 9, 2015).

[5] *See* Letter from Grants & Agreements Officer, Division of Acquisition & Cooperative Support, NSF, to Dr. Russ Lea, CEO, NEON (July 30, 2015).

[6] NSF OIG Report, *supra,* note 3.

[7] NEON, Inc., *Leadership transition announced at NEON, Inc.*, http://www.neoninc.org/updates-events/update/leadership-transition-announced-neon-inc (last visited Dec. 9, 2015).

[8] NSF OIG Report, *supra* note 3, at 2.

[9] *Id.* at 1.

[10] *Id.* at 6.

[11] *Id.*

[12] *Id.*

"Watch List,"[13] the OIG report expressed "concerns with the sufficiency of NSF's proposed actions in response to all of our recommendations."[14] Given the scale of the NEON project and its history of financial management issues, I am particularly concerned that NSF is not fully heeding OIG recommendations. Taxpayers will not receive all the scientific benefits originally promised through NEON now that the project has been de-scoped. Therefore, NSF must work even harder to ensure the project construction is brought to completion efficiently and responsibly so that even the lesser return on investment may soon be realized.

I appreciate your willingness to work with the Committee to address current policy challenges, specifically with regard to the Committee's effort to reauthorize science and technology research and development policies. I seek to ensure that the NSF and the National Science Board are making every effort to continue to prioritize fiscal management of NEON. Therefore, to assist the Committee in its ongoing oversight of NSF cooperative agreements in general and its financial management of NEON in particular, please provide responses to the following:

1. If NSF has not addressed all of the OIG's recommendations to date regarding NEON, please specify any outstanding recommendations and provide a short description of NSF's current progress in addressing them. For each OIG recommendation regarding NEON that NSF has addressed, please describe how NSF implemented that recommendation and how such implementation differed, if at all, from the OIG's recommendation. What accounts for any differing characterizations by NSF and the OIG about NSF's acceptance of OIG recommendations?

2. By how much, if at all, have the de-scoping effort and improvements in management efficiencies reduced the potential cost overrun to date?

3. What is the current estimated completion date for the NEON project?

4. Did NEON meet recent September 15 and October 15 deadlines for the submission of revised project documentation, as well as the December 1 deadline for the submission of the comprehensive, revised cost proposal? If so, please provide copies of these documents to the Committee.

5. What is your confidence level in NEON's ability to complete construction on the project and oversee operations and maintenance once completed? Will it be necessary to re-compete the cooperative agreement?

6. If, during the initial review and investment decision-making phase, the NEON project had been proposed at its current de-scoped benefit level, would that

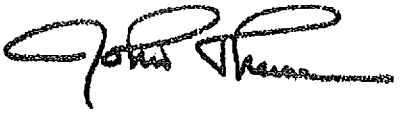
[13] Staff Memorandum from France A. Córdova, Dir., Nat'l Sci. Found. (Sept. 23, 2015).
[14] NSF OIG Report, *supra* note 3, at 6.

have changed the NSF's decision to proceed with the project? Would NEON have remained as high a priority among other projects competing for the same funding if the lesser return on investment had been expected?

In addition, please provide a briefing to update Committee staff on NEON regarding (1) any policy changes NSF and NEON have implemented to improve cost monitoring and accomplish the de-scoping plan since August 2015; (2) any actions NSF can take if a potential cost overrun recurs at NEON; (3) any future audits of NEON planned; (4) the status of the search for a new NEON CEO; and (5) the status of the National Academy of Public Administration's review of cooperative agreement procedures.

Please provide the requested information as soon as possible, but by no later than December 23, 2015. If you have any questions, please contact Ashok Pinto or Missye Brickell of the Committee staff at (202) 224-1251. Thank you again for your prompt attention to this important matter.

Sincerely,



JOHN THUNE
Chairman

cc: The Honorable Bill Nelson
Ranking Member

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

January 19, 2016

The Honorable John Thune
Chairman
Committee on Commerce, Science and Transportation
United States Senate
Washington, D.C. 20510

Dear Chairman Thune:

Thank you for your letter of December 9, 2015, regarding the National Science Foundation's (NSF) management of the National Ecological Observatory Network (NEON). We welcome the opportunity to respond to your questions and provide an update on the recent steps we have taken to address the future management of NEON, as well as respond to concerns raised by the Office of Inspector General (OIG).

Over the past several years, NSF management and the National Science Board (NSB) have worked in concert to enhance oversight of large facility cooperative agreements. Financial management of large facility cooperative agreements is a top priority at NSF. We are focused on ensuring that NEON completes construction efficiently and delivers the promised science.

We appreciate the Committee's attention to these important matters, as we share your goals of ensuring efficient use of taxpayer dollars and maximizing the Federal research investment. We look forward to answering any questions you may have related to the enclosed responses and to a continuing dialog toward the progress of science in the service of the nation.

Sincerely,

France A. Córdova
NSF Director

Dan E. Arvizu
NSB Chairman

Enclosures:

- Responses
- Correspondence between Dr. James Olds and Drs. Collins and Kelly, 12/11/15

cc: The Honorable Bill Nelson

Ms. Allison Lerner
Inspector General
National Science Foundation

In response to your letter dated December 9, 2015 NSF provides the following:

1. NSF agrees with the spirit of the latest OIG recommendations given in its Alert memo dated September 15, 2015 (15-3-001) and had already implemented all necessary and relevant actions prior to receiving the final memo. The agency actions underway that address the OIG recommendations, and as further stated in NSF's Corrective Action Plan (CAP) to the OIG dated November 23, 2015, are as follows:

- **Special payments treatment in which NSF requires NEON to provide detailed invoices before payment is made.**

  Initial NSF Response as part of CAP: NSF is conducting monthly expenditure reviews, and has strictly limited the funding made available to NEON Inc. In addition, we will take into consideration NSF's special payment policies and procedures and modify our existing activities as warranted.

  Update: None

- **More substantial NSF involvement in NEON management.**

  Initial NSF Response as part of CAP: NSF has increased its involvement in the management of the NEON project as evidenced by increasing technical oversight, cost monitoring, assistive visits, and review of project documentation. As issues have arisen there has been a corresponding escalation of management involvement and NSB oversight.

  Update: See below on NSF's decision to replace NEON, Inc. as the managing organization.

- **Independent assessment of the December 2015 cost estimate to complete.**

  Initial NSF Response as part of CAP: NSF plans to contract for an independent assessment of the December 2015 cost estimate to complete construction of the NEON project, subject to NEON's submission of revised project documentation.

  Update: In accordance with recently strengthened policies, NSF has contracted for an Independent Cost Estimate (ICE) of the remaining technical scope. The ICE commenced on December 18, 2015, is scheduled to be received in mid-March 2016 and will inform NSF's cost analysis for a future award to the new managing organization.

- **Obtain EVM reports with sufficient quality and with sufficient detail to manage the project's progress and cost.**

  Initial NSF Response as part of CAP: NEON Inc.'s Earned Value Management System has been problematic with regard to the efficiency and reliability of showing trends in

performance. Insisting on compliance with the new standardized monthly reporting requirements has helped to illustrate this weakness compared to other projects. This is one of the many components covered by our review of project documentation that was required to meet NSF's standards by December 1, 2015. As described in NSF's Scope Management Letter to NEON Inc. dated July 31, 2015, NEON Inc.'s ability to provide these deliverables and effectively evaluate and respond to trends in performance within the timeframe required and at a level of clarity and detail acceptable to NSF will have a direct impact on future decisions concerning continued funding of the NEON project. Improved EVM data from NEON will feed into the trend analysis done by NSF.

Update: Continued insufficient reporting helped inform NSF's decision to seek a new managing organization. NSF expects the new managing organization to undertake EVM reporting in compliance with NSF and industry standards. This will be a condition of the new award.

2. The de-scoping effort and management efficiencies had the desired effect of reducing the projected cost overrun and re-focusing NEON, Inc.'s efforts toward project completion within budget. However, the December 1, 2015 revised cost proposal from NEON, Inc. still showed a potential cost overrun of $19M. This, combined with a schedule extension of two additional years, led NSF to make its final decision to seek a new management organization to complete construction and initial operations.

3. NEON, Inc.'s latest estimated completion date for the NEON project as stated in its December 1st deliverables package is mid-2019; or two additional years from the current completion date. NSF expects the potential new managing organization to propose ways to move the completion date sooner. NSF is working closely with NEON, Inc. to identify and implement ways to improve schedule while the transition between managing organizations is taking place.

4. Yes; NEON, Inc. met the September 15th, October 15th and December 1st deliverables requirements, including the revised cost proposal submission. However, in each case, NSF deemed significant elements of the documentation to be insufficient. This informed NSF's final decision to seek a new managing organization for the NEON Project. These insufficiencies included but were not limited to improper incorporation of risk management and a severe lack of schedule discipline. Please see enclosed correspondence between NSF and NEON management on December 11, 2015 for further information.

5. Based on a detailed assessment of the required deliverables described above, NSF's confidence in NEON, Inc.'s ability to complete construction and manage initial operations is low. As a result, NSF decided to replace NEON, Inc. as the managing organization as documented in NSF's letter to NEON, Inc. dated December 11, 2015.

   NSF needed to act expeditiously in order to stabilize the Project and bring new and experienced project management on board to complete construction and commissioning. Although the approach of conducting a formal, full and open competitive process for

such an award was explored, NSF recognized that a standard competitive process would require an unacceptable amount of time to implement under the circumstances, causing further schedule delays and increased costs. Consequently, NSF decided to engage in an alternative approach using the general authority and flexibility available under the NSF Act, as amended, provided by 42 U.S.C. §1870(c), to expedite the selection of a successor organization which will be subject to NSB action.

6. On December 18th, NSF's Directorate for Biological Sciences (BIO) accepted a final report from the science community re-affirming the scientific value and transformational aspects of the de-scoped NEON facility. The report states, in part:

   "Perhaps the best way to examine the impact of the totality of the cuts is to re-examine NEON's ability to answer the five grand challenge questions that framed the Observatory's initial design. In the view of this Subcommittee, NEON after the scope changes is still capable of delivering important data to advance each of the five questions."

   And...

   "In short, given robust NSF commitment to NEON operations and data production, future investigator-led research on the NEON platform, and sufficient investment in education of the scientific community, NEON's potential to enable transformative research will remain strong."

   The NEON facility remains a high priority to the U.S. biological sciences community and, as a result, to NSF, which was the basis behind NSF's decision to continue the project by seeking a new, qualified management organization.

NSF would be pleased to provide an additional briefing to Senate Commerce Committee staff in the near future. With regard to the Committee's additional questions in preparation for that briefing:

1. NSF has already implemented its plans to strengthen cost monitoring on all of its large facilities project including NEON as described above. No additional policies or plans have been implemented since August 2015.
2. NSF actions regarding the latest projected $19M cost overrun presented by NEON, Inc. on December 1st are described above with the transition to a new managing organization.
3. Under its new policy, NSF is planning an incurred cost audit of the NEON Project in FY 2016.
4. NEON, Inc. has appointed an interim CEO who is actively engaged in stabilizing the project and supporting the management transition period.
5. The National Academy of Public Administration's report was received on December 18, 2015 which was supportive of NSF's use of cooperative agreements for large facility construction projects. NSF is in the process of reviewing the recommendations for implementation.

12213

Congress of the United States
House of Representatives
Committee on Appropriations
Washington, DC 20515–6015

December 17, 2015

Dr. France Cordova
Director of the National Science Foundation
The National Science Foundation
Arlington, VA 22230

Dear Dr. Cordova:

The National Science Foundation (NSF) has implemented a series of actions to increase transparency and accountability to ensure that awards for basic research and education be in the national interest. We appreciate NSF's commitment to ensuring that limited appropriated dollars are spent wisely. We expect this commitment to continue.

The Committee understands that the "national interest" determination is based on a written justification of why the award is worthy of Federal funding and that this determination is made after the award proposal has satisfied the Foundation's review for merit and broader impacts. In addition, we understand that this determination shows that the award will be in the national interest by having the potential to achieve at least one of the following:

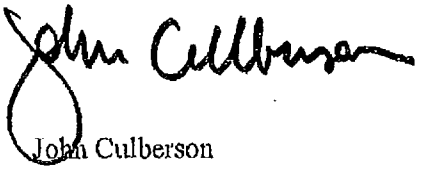
- increased economic competitiveness in the United States;
- advancement of the health and welfare of the American public;
- development of an American STEM workforce that is globally competitive;
- increased public scientific literacy and public engagement with science and technology in the United States;
- increased partnerships between academia and industry in the United States;
- support for the national defense of the United States; or
- promotion of the progress of science.

The Fiscal Year 2016 Consolidated Appropriations Act includes report language directing the NSF to continue efforts to implement transparency processes, which include requiring that public award abstracts articulate how the project serves the national interest, and provide periodic updates to the Committee on these activities.

On behalf of myself and Chairman Smith of the Committee on Science, Space, and Technology, we ask you to commit to maintaining current practices requiring that research and education activities be in the national interest, as required by the Fiscal Year 2016 Consolidated Appropriations Act.

We appreciate your commitment to preserving American leadership in scientific research and discovery. We look forward to your response to this letter.

Sincerely,



John Culberson
Chairman
Subcommittee on Commerce, Justice, Science, and Related Agencies

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

OFFICE OF THE
DIRECTOR

December 17, 2015

The Honorable John Culberson
Chairman
Subcommittee on Commerce, Justice,
Science and Related Agencies
Committee on Appropriations
United States House of Representatives
Washington, DC 20515

Dear Chairman Culberson:

Thank you very much for your letter to me this morning about articulating to the public how the National Science Foundation (NSF) projects serve the national interest. I greatly appreciate the confidence that you have placed in the NSF and its mission.

NSF takes very seriously its stewardship of taxpayer dollars, and its accountability for those resources. Wise stewardship of taxpayer dollars is necessary to maintain and ensure the public's trust for NSF's funding of fundamental scientific and engineering research, especially in an era of competing priorities for limited discretionary funds.

For more than a year, NSF has required NSF staff to ensure that every award abstract includes a "...nontechnical description of the project, which explains the project's significance and importance. This description also serves as a public justification for NSF funding by articulating how the project serves the national interest, as stated by NSF's mission: to promote the progress of science; to advance the national health, prosperity and welfare; or to secure the national defense...".

Furthermore, effective January 25, 2016, our public guidance will also conform to the established policy, by requiring that, "An NSF award abstract, with its title, is an NSF document that describes the project and justifies the expenditure of Federal funds by articulating how the project serves the national interest...".

Mr. Chairman, NSF, in strong partnership with the legislative branch and the nation's scientific community, has created arguably the world's most successful merit-based model for allocating funding for fundamental research. The results of this research have expanded the frontiers of knowledge and yielded significant returns to the U.S. economy and society. I am personally committed to improving our transparency and accountability to the Congress and public, and to maintaining our current practices which require each award to provide a clear justification of its potential to achieve advancements of importance to our nation.

I greatly appreciate your continued strong support of the National Science Foundation, and I look forward to continuing working with you to advance science and engineering in the national interest.

Sincerely,

France Córdova
Director

12214

STEVE CHABOT, OHIO
CHAIRMAN

NYDIA M. VELAZQUEZ, NEW YORK
RANKING MEMBER

Congress of the United States

U.S. House of Representatives

Committee on Small Business

2361 Rayburn House Office Building
Washington, DC 20515-0315

December 18, 2015

Mr. Richard Buckius
Chief Operating Officer
National Science Foundation
4201 Wilson Blvd.
Arlington, VA 22230

Dear Mr. Buckius:

As Chairman of the Subcommittee on Investigations, Oversight and Regulations of the Committee on Small Business, I am writing to request information related to the suspension and debarment activity of the National Science Foundation. The Interagency Suspension and Debarment Council (ISDC) annually reports the government-wide gross number of suspensions and debarments to Congress. For example, in fiscal year 2014, it reported that within the National Science Foundation, there were 9 suspensions, 33 proposed debarments, and 25 debarments. However, the data presented does not provide more detailed information about the businesses that were referred for suspension, proposed debarment, or debarment.

Therefore, I am writing to request the following information from the National Science Foundation.

1. Of the reported suspensions, proposed debarments, or debarments reported by the National Science Foundation to ISDC, what number or percentage of these actions were for small businesses? Please provide this information for fiscal years 2012, 2013, and 2014.

2. The number of small businesses and other-than-small businesses suspended for each of the reasons enumerated in Federal Acquisition Regulation (F.A.R.) 9.407-2. Please provide this information for fiscal years 2012, 2013, and 2014.

3. The number of small businesses and other-than-small businesses proposed for debarment for each of the reasons enumerated in F.A.R. 9.406-2. Please provide this information for fiscal years 2012, 2013, and 2014.

4. The number of small businesses and other-than-small businesses debarred for each of the reasons enumerated in F.A.R. 9.406-2. Please provide this information for fiscal years 2012, 2013, and 2014.

Please provide the answers to these requests electronically to Emily Murphy (Emily.murphy@mail.house.gov) and Viktoria Ziebarth (Viktoria.ziebarth@mail.house.gov) of the Committee on Small Business staff no later than January 15, 2015. Should you have any questions regarding these requests, please contact the Committee staff at (202) 225-5821.

Sincerely,

Cresent Hardy

Cresent Hardy
Chairman
Subcommittee on Investigations, Oversight, and Regulations

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

January 13, 2016

VIA EMAIL TO:
Emily.murphy@mail.house.gov and Viktoria.ziebaith@mail.house.gov

The Honorable Cresent Hardy
Chairman, Subcommittee on Investigations, Oversight, and Regulations
Committee on Small Business
U.S. House of Representatives
2361 Rayburn House Office Building
Washington, DC 20515-6315

Dear Chairman Hardy:

Please find below the response to your letter dated December 18, 2015 requesting information related to the suspension and debarment activity of the National Science Foundation (NSF). As the information below indicates, because we are a grant making agency, most all of the suspension and debarment activities of NSF arise under OMB Guidelines to Agencies on Government-Wide Debarment and Suspension (Nonprocurement) found at 2 C.F.R. Part 180, as opposed to the Federal Acquisition Regulations. As such, I have included information for NSF's nonprocurement suspension and debarment activities and I have provided citations for the nonprocurement parallel provisions to the FAR provisions referenced in the letter.

1. Of the reported suspensions, proposed debarments, or debarments reported by the National Science Foundation to ISDC, what number or percentage of these actions were for small businesses? Please provide this information for fiscal years 2012, 2013, and 2014.

The suspensions, proposed debarments, and debarments for small businesses by NSF for 2012, 2013, and 2014 are as follows:

	2012 (total)	2013 (total)	2014 (total)
Suspensions	3 (7)	1 (6)	2 (9)
Proposed Debarments	2 (8)	1 (18)	6 (33)
Debarments	1 (8)	1 (7)	4 (25)

2. The number of small businesses and other-than-small businesses suspended for each of the reasons enumerated in Federal Acquisition Regulation (F.A.R.) 9.407-2. Please provide this information for fiscal years 2012, 2013, and 2014.

As explained above, NSF has no small businesses and other-than-small businesses suspended under the Federal Acquisition Regulation (F.A.R.) 9.407-2 for this period. Generally, NSF's suspensions occur under OMB Guidelines to Agencies on Government-Wide Debarment and Suspension (Nonprocurement) found at 2 C.F.R. Part 180. The number of small businesses and other-than-small businesses suspended for each of the reasons enumerated in 2 C.F.R. § 180.715 are: 2012 3 (small businesses), 7 (total); 2013 1 (small business), 6 (total); and 2014 2 (small businesses), 9 (total).

3. The number of small businesses and other-than-small businesses proposed for debarment for each of the reasons enumerated in F.A.R. 9.406-2. Please provide this information for fiscal years 2012, 2013, and 2014.

NSF has no small businesses and other-than-small businesses proposed for debarment under F.A.R. 9.406-2. The number of small businesses and other-than-small businesses proposed for debarment for each of the reasons enumerated in OMB Guidelines to Agencies on Government-Wide Debarment and Suspension (Nonprocurement) at 2 C.F.R. § 180.800 are: 2012 2 (small businesses), 8 (total); 2013 1 (small business), 18 (total); and 2014 6 (small businesses), 33 (total).

4. The number of small businesses and other-than-small businesses debarred for each of the reasons enumerated in F.A.R. 9.406-2. Please provide this information for fiscal years 2012, 2013, and 2014.

NSF has no small businesses and other-than-small businesses debarred under F.A.R. 9.406-2. The number of small businesses and other-than-small businesses debarred for each of the reasons enumerated in OMB Guidelines to Agencies on Government-Wide Debarment and Suspension (Nonprocurement) at 2 C.F.R. § 180.800 are: 2012 1 (small business), 8 (total); 2013 1 (small business), 7 (total); and 2014 4 (small businesses), 25 (total).

Should you have any questions about the foregoing, please contact me at (703) 292-8070.

Sincerely,

Anthony J. Gibson 1/4/16

Amanda Hallberg Greenwell
Head, Office of Legislative and Public Affairs

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States

House of Representatives

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

2321 RAYBURN HOUSE OFFICE BUILDING

WASHINGTON, DC 20515-6301

(202) 225-6371
www.science.house.gov

November 4, 2015

The Honorable France Córdova
Director
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Dear Dr. Córdova,

I am writing as a follow-up to the hearing the House Science, Space, and Technology Committee held on September 18, 2015, "NEON Warning Signs: Examining the Management of the National Ecological Observatory Network." The hearing examined the National Science Foundation (NSF) announcement that the NEON project would be $80 million over budget and 18 months behind its construction schedule on its current trajectory, as well as de-scoping plans and corrective actions to keep the project on budget.

As part of the questions submitted to the NSF for the hearing record, the committee inquired about what communications took place between NSF and NEON, Inc. from January 1, 2013-September 18, 2015 regarding the construction schedule and budget, as witnesses from NSF and NEON, Inc. provided conflicting information on those communications. NSF provided a summary of the communications for the hearing record.

As the Committee continues its oversight of the management of NEON, I now write to request copies of the following public records: every e-mail, letter, memorandum, record, note, text message, or document of any kind that pertains to the budget, costs, schedule or management of the National Ecological Observatory Network from January 1, 2013-November 4, 2015.

Pursuant to Rule X of the U.S. House of Representatives, I request that you provide all requested information to the Committee by **November 18, 2015**.

When producing documents to the Committee, please deliver production sets to the Majority Staff in Room 2321 of the Rayburn House Office Building and the Minority Staff in Room 394 of the Ford House Office Building. The Committee prefers, if possible, to receive all documents in electronic format.

If your staff has any questions, please contact Jennifer Wickre, Professional Staff, Research and Technology Subcommittee, at Jennifer.Wickre@mail.house.gov or 202-225-6371.

Sincerely,

Lamar Smith
Chairman

cc: The Honorable Eddie Bernice Johnson, Ranking Minority Member, House Committee on Science, Space, and Technology

IS NSF PROPERLY MANAGING ITS ROTATING STAFF?

Thursday, June 25, 2015

House of Representatives,

Subcommittee on Oversight,

joint with the

Subcommittee on Research and Technology,

Committee on Science, Space, and Technology,

Washington, D.C.

Committee Hearings

of the

U.S. HOUSE OF REPRESENTATIVES

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IS NSF PROPERLY MANAGING ITS ROTATING STAFF?

Thursday, June 25, 2015

House of Representatives,

Subcommittee on Oversight,

joint with the

Subcommittee on Research and Technology,

Committee on Science, Space, and Technology,

Washington, D.C.

The Subcommittees met, pursuant to call, at 9:34 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Barry Loudermilk [Chairman of the Subcommittee on Oversight] presiding.

Chairman LOUDERMILK. The Committee on Science, Space, and Technology joint hearing of the Subcommittee on Oversight and the Subcommittee on Research and Technology will come to order.

Without objection, the Chair is authorized to declare recess of the Committee at any time.

Good morning and welcome to today's hearing titled ''Is NSF Managing Its Rotating Staff?'' I recognize myself now for 5 minutes for an opening statement.

I would like to thank our witnesses for being here this morning, and I'm looking forward to hearing from both of you on this very important matter.

We're here today to discuss the National Science Foundation's use of the Rotator Program, specifically, the individuals who are assigned through the Intergovernmental Personnel Act, or IPAs. These IPAs are top scientists, engineers, and educators from universities and industry who help staff the NSF on a temporary basis. In addition, the NSF employs Visiting Scientists, Engineers, and Educators, which, together with the IPAs, form the NSF Rotator Program.

While the Rotator Program brings expertise, diverse skill sets, and fresh perspective to the NSF, IPAs come with a significant cost to the NSF, which is completely unacceptable. For example, these IPAs remain an employee of

their home institution and their salaries are matched by the NSF throughout their tenure as an IPA, typically ranging from 1 to 3 years. In addition to salary matching, the NSF pays IPAs lost consulting fees, individual research and development travel, fringe benefits, and temporary living expenses.

Considering that NSF employs 184 IPAs, which is 12 percent of the total NSF workforce, these costs add up very quickly. In fact, according to the 2013 NSF Inspector General report, IPAs cost the NSF $36,448 more per IPA on average than the average permanent federal employee, and in 2013, the NSF spent more than $6.7 million on IPA-related costs.

When an agency is spending millions on rotating staff--not permanent staff--one would hope that they are the best-suited individuals for the positions they are filling. However, that doesn't appear to be the case with the NSF. In 2010, an NSF IG report found that IPAs in management-level positions at the NSF lacked institutional knowledge about the federal employment protocol, training, and expectations, all key management issues and functions.

The NSF funds a variety of large research projects, including multiuser research facilities, tools for research and education, and distributed instrumentation networks. Taking into account that some of these IPAs come from

organizations and institutions that would be interested in some of these funds, there is also the chance that if not properly managed, an IPA could have a conflict of interest with certain proposals and awards. The NSF IG recently released a report detailing a situation that falls into this category, which I am looking forward to learning more about today.

As a small business owner, I unconditionally understand the need for accountability. The fact that these temporary staffers are being paid more money for jobs that they are not necessarily qualified for and have an inherent ability to take advantage of, is completely inexcusable. Without proper oversight, the NSF is wasting taxpayer dollars on individuals who make more money than they should for jobs they may not be qualified for in roles that are susceptible to conflicts of interest. This committee has warned the NSF about the irresponsible spending over the past few years, and this is just another unfortunate example. When will the NSF take adequate measures to implement proper oversight, management, and plain responsibility?

I look forward to today's hearing, which I anticipate will inform us more about IPAs at the NSF, the management of them, as well as the oversight and accountability of what they are being paid. We owe it to the American people to ensure that these assignments are not using hard-earned

taxpayer money to overpay for subpar work. How does that seem fair?

In the end, though, I hope that this hearing will bring to light the issue of rotating staff and inform us of--on how to provide better oversight and management of federally funded rotating staff to guarantee taxpayers that they can trust us with their money and know that it will be spent in the most efficient way.

[The statement of Chairman Loudermilk follows:]

********** INSERT 1 **********

Chairman LOUDERMILK. I now recognize the Ranking Member of the Subcommittee on Oversight, the gentleman from Virginia, Mr. Beyer, for an opening statement.

Mr. BEYER. Thank you, Mr. Chairman.

The National Science Foundation employs thousands of hardworking scientists and staff, many of whom live in my district, and I value the tremendous benefit that the agency has brought to America and Americans over the past 65 years by supporting a wide range of scientific discoveries that have improved our understanding of every facet of the world around us.

As with any organization, public or private, sometimes problems emerge. Management improvements can be made and administrative oversight enhanced. Today's hearing will focus on the management and oversight of the NSF's Rotator Program.

The NSF's Rotator Program, primarily Intergovernmental Personnel Act positions, allows nonfederal employees from academic institutions and research labs to work at NSF for a temporary period of up to 4 years. The advantage of this program is that it guarantees a continuous infusion of scholars at the forefronts of their fields.

This approach to staffing is similar to another program that has long been viewed as one of the most valuable in the U.S. Government, in fact, the most valuable in the world, the

Defense Advanced Research Projects Agency. DARPA also relies on rotators to come in and manage research portfolios focused on innovative emerging research.

While there are obvious benefits to this program, it's impossible to use such a system without running some risks. IPA staff are not necessarily trained managers but fill professional staff positions and as NSF relies on the IPA program to fill positions far in excess of other federal agencies. This can cause some problems among rank-and-file employees. IPAs have also not been brought up through the civil service ranks with an appreciation of the importance of avoiding conflicts of interest.

Each year, NSF provides around 7 billion in grant awards and cooperative agreements to academic institutions. It's widely praised for the efficiency of its grants management system and widely copied by foreign governments looking to spur creativity and innovation.

However, when employees of grant-receiving institutions come to NSF on temporary assignment, it's important that the Foundation routinely ensure that each rotator is properly trained and monitored to ensure they manage their portfolio wisely and in compliance with the law. The Foundation must take prompt steps to identify potential conflicts of interest and that the rotators have the proper training to understand their obligations to avoid violating conflict-of-interest

rules at the agency.

Today, we'll hear from the Inspector General about a single rotator who failed to meet obligations for disclosing conflicts and for taking ethics training. The IG found that the individual was involved in three grant decisions with inappropriate ties to the grant recipient, call into question the integrity of the award. It's hard to determine whether the degree of this one failing represents systemic issues with the way NSF manages IPAs or whether it's just an unfortunate one off failing, but I agree with the IG that this incident points to broader management issues regarding NSF's oversight of the Rotator Program, and the recommendations contained in their report seem reasonable and obviously overdue.

I know NSF has not had much time to evaluate the specific recommendations, but I believe that where management problems exist, they need to be quickly fixed. Where conflicts of interest emerge, they need to be removed and rectified, and the public has to have confidence that NSF is managing its funds with absolute integrity.

These new recommendations regarding conflict-of-interest policies join a standing list of other Inspector General recommendations on the program that were designed to control the costs of that program. While NSF has moved to put some of these changes in place, I'm disappointed to learn that

those reforms have been moving a very, very slow track.

Without endorsing any particular recommendation at this time, NSF should know that we, the members of this Oversight Committee, expect this leadership to do more and quickly in this area. I believe that the Rotator Program as a whole can bring great benefit to NSF and to the Federal Government. It helps to spark fresh and innovative ideas, it fosters collaboration between the Federal Government and America's intellectually rich academic community and improves the advancement of scientific discoveries and cutting-edge technological developments on a wide range of subjects.

As we strive to promote greater economic efficiencies on the NSF Rotator Program, I believe it's important to keep the benefits of the program in mind. One bad case does not a crisis make and the Committee would be well-served to keep this in mind. We read the sad story of the two-star Army General this week in trouble. We've watched how various Members of our Congress have been in trouble just this year, and we don't want to throw out the baby with the bathwater.

I look forward to hearing from our two witnesses about--both about the issues that have been identified but the acts that you've taken to correct them.

Thanks very much, Mr. Chairman. I yield back.

[The statement of Mr. Beyer follows:]

199 ********** INSERT 2 **********

Chairman LOUDERMILK. Thank you, Mr. Beyer.

If there are any Members who wish to submit additional opening statements, your statements will be added to the record at this point.

At this point I ask unanimous consent to enter documents into the record.

Without objection.

[The information follows:]

********** INSERT 4 **********

Chairman LOUDERMILK. At this time I'd like to introduce our witnesses. Our first witness is Ms. Allison Lerner. Ms. Lerner is the Inspector General for the National Science Foundation, or the NSF. Before joining the NSF in April 2009, Ms. Lerner served in many leadership positions at the Department of Commerce, including counsel to the Inspector General. She has received several national awards for excellence and was selected to be a member of the Government Accountability and Transparency Board by the President in June 2011. Ms. Lerner received her law and undergraduate degrees from the University of Texas.

The final witness today--on today's panel is Dr. Richard Buckius. Dr. Buckius is the Chief Operating Officer for the NSF. Mr. Buckius assumed his position of COO in October 2014, having previously been a Senior Policy Advisor for NSF. He is an author and coauthor of numerous publications on the topics of radiation, heat transfer, numerical fluid mechanics and combustion. Dr. Buckius received his bachelor's, master's and Ph.D. in mechanical engineering at the University of California Berkeley.

At this point the Chair would like to recognize the--I'd like to recognize the Ranking Member of the Subcommittee on Research and Technology, the gentlewoman from Illinois, Ms. Lipinski, for her opening statement.

Mr. LIPINSKI. Well, kind of close.

Chairman LOUDERMILK. Or his. I'm sorry, sir.

Mr. LIPINSKI. Thank you.

Chairman LOUDERMILK. You're--my apologies. Instead of--I thought I was--I had it right and then I read the script.

Mr. LIPINSKI. That's always a mistake.

Chairman LOUDERMILK. Yes.

Mr. LIPINSKI. Well, I--

Chairman LOUDERMILK. My apologies.

Mr. LIPINSKI. I apologize for being late. I understand we had to move this up because of votes.

I want to thank Chairman Loudermilk and Chairwoman Comstock for holding this hearing on NSF's management of the IPA Rotator Program. I want to thank Dr. Buckius and Ms. Lerner for being here. Good morning.

I--you know, we know what the issues are, reports issued by the NSF Inspector General over the last few years, including last Friday's report, make it clear that there are some management and oversight issues with the Rotator Program that are worthy of our concern and attention. However, as we pursue our oversight responsibilities, we should not lose sight of the tremendous value that the Rotator Program brings to NSF and to the scientific community.

NSF has a very talented workforce across the board. Long-term federal employees serving in program officer and

executive positions come to the agency with many years of experience and scientific research, as well as in managing program budgets in participating NSF grant review process. Those recruited to executive positions are also experienced managers. After several years at NSF, their institutional memory and knowledge of federal rules and regulations is invaluable.

But we also know that rotators also come to NSF with many years of experience and similar skills. And what makes the Rotator Program unique and essential is that rotators provide a constant influx of new ideas, new perspectives, and a frontline understanding of emerging trends in science and engineering. As such, they are particularly well placed to evaluate high-risk, high-reward research proposals and ensure that NSF continues to support a portfolio that includes transformative research, a topic which we discuss often in this committee.

While exploring options to strengthen management of the program and to implement cost controls, we should not even unintentionally take steps that compromise the benefits this program provides to the agency and to scientific progress.

Now, having said that, the Inspector General has raised several issues in the last few years that warrant our review. From the cost associated with the IPA program to the management benefits such as independent research and

development and the requirements such as ethics training, there is room for improvement. The Foundation received the most recent report on a conflict-of-interest case only last Friday giving them little time to review the specific recommendations. It might have been better, perhaps, to postpone this hearing by a couple months. However, we are here today.

This particular case dates back to 2013, so I expect Dr. Buckius will be able to share with us some of his thinking about what went wrong in terms of management controls and how procedures can be tightened up going forward. I also hope that Dr. Buckius will be able to share with us actions NSF has taken since the 2012 and 2013 IG reports to strengthen management and oversight of other aspects of the Rotator Program.

In no way do I want to diminish the issues that have been raised. We need to make sure that we are providing oversight and that NSF is responding appropriately to the findings.

I want to thank the witnesses for being here, look forward to your testimony. Thank you.

[The statement of Mr. Lipinski follows:]

********** INSERT 3 **********

Chairman LOUDERMILK. Again, thank you, Mr. Lipinski, and again, my sincere apologies.

Pursuant to the committee rules, all witnesses will be sworn in before they testify. If you'll please rise and raise your right hand.

Do you solemnly swear or affirm that the testimony you are about to give will be the truth, the whole truth, and nothing but the truth, so help you God?

Let the record reflect that the witnesses answered in the affirmative.

Before we begin, I will request that our witnesses please limit your testimony to 5 minutes. It seems there will be another series of votes called in about an hour and I want to make sure that we have time for discussion. Your entire written statement will be made part of the record.

I now recognize Ms. Lerner for 5 minutes to present her testimony.

TESTIMONY OF ALLISON LERNER, INSPECTOR GENERAL, NATIONAL SCIENCE FOUNDATION; AND RICHARD BUCKIUS, CHIEF OPERATING OFFICER, NATIONAL SCIENCE FOUNDATION

TESTIMONY OF ALLISON LERNER

Ms. LERNER. Mr. Chairman and members of the subcommittee, I appreciate this opportunity to discuss my office's oversight of NSF's management of its rotating staff, especially assignments under the Intergovernmental Personnel Act. I'll focus on finding some recommendations made in three audits completed by my office, one on cost associated with NSF's use of rotators, a second on personnel management issues related to rotators, and a third on NSF's management and oversight of the Independent Research and Development program, or IR/D.

Finally, since rotators often make funding decisions, I'll discuss a recent investigative report which identified ways for NSF to improve its controls to identify and mitigate rotators' conflicts of interest.

To advance its mission of supporting science and engineering research and education, NSF brings scientists, engineers, and educators from academia, industry, or other organizations to the Foundation for rotational assignments of up to 4 years. While there are definitely benefits that come

from having rotators at NSF, there are also challenges. For example, because of rotators' limited tenure, there's almost constant turnover in staff, especially in senior leadership positions. Other challenges include higher cost for rotators and rotators' lack of familiarity with government processes and culture.

The additional cost of using rotators instead of permanent federal employees is considerable. We found that NSF paid an added cost of approximately $6.7 million or an average of over $36,000 per IPA for the 184 IPAs we looked at in a 2013 audit. We recommended that NSF evaluate ways to reduce these costs such as increasing rotators' use of telework, increasing cost-sharing by home institutions, and limiting salary to the maximum federal pay rate for the position. NSF has developed a plan to accomplish--a plan to examine rotator cost but much work remains to be done to accomplish the actions included in that plan.

NSF's reliance on rotators also proposes personnel management challenges. For example, at the time of our 2010 audit, NSF did not require rotators to have annual performance evaluations even though they functioned in the same capacity as NSF's federal executives who are evaluated each year. As a result, NSF risks not holding IPAs accountable as it does federal employees for accomplishing NSF's missions and goals. In response to our

recommendations, NSF has put all IPAs under a performance management system and reports that it received 117 IPA appraisals in the most recent cycle.

We also examined controls over NSF's IR/D program, which is utilized primarily by rotators to maintain their professional competencies and remain actively involved with their research while at NSF. At the time of our 2012 audit, NSF policy allowed IR/D participants to spend up to 50 days a year, or 20 percent of their time, on IR/D activities. In 2010, IR/D travel costs were $1.8 million. Rotators and other visiting scientists took 90 percent of the IR/D trips during this period. Since our audit, the Foundation has strengthened oversight at the IR/D program and taken steps to reduce its costs.

In light of the Foundation's reliance on rotators to make funding decisions, it's critical that strong controls be in place to identify and mitigate conflicts of interest that occur as a result of rotators' research activities or their connections with their home institutions. Such controls protect rotators, many of whom have never worked in a federal environment, as well as the Foundation itself.

A recent investigative report documented problems with controls over COIs that we identified in the context of one rotator's tenure at NSF. We found that no concrete plan to manage the rotator's known conflict was developed and

communicated, that there were significant delays in the rotator's completion of a required ethics course and her submission of a required financial disclosure form, that actions taken to assess the impact of the rotator's conflicts of interest on an award she made were seriously flawed, that the names of the persons who wrote the justification for funding and who actually made the decision to fund the award with which the rotator had conflicts were not included in NSF's system of record, undermining the agency's ability to identify and mitigate conflicts of interest, and that a critical tool used to enforce the one-year cooling-off period following the rotator's tenure at NSF was circumvented.

We recommended that NSF take various actions to strengthen its controls over conflicts. Since we just issued our investigative report last week, the agency has not had an opportunity to formally respond.

Rotating staff are an important component of NSF's workforce and bring valuable experience to the Foundation. While we recognize the significant contributions made by rotators, it's essential for NSF to examine the cost associated with the rotator program to ensure that federal funds entrusted to the Foundation are being spent effectively and efficiently. It's also critical that funding justifications and recommendations made by rotators be free from conflicts of interest, as the integrity of those

decisions is essential to NSF's merit review process.

My office remains committed to providing rigorous and dependent oversight of NSF's management of its rotating staff and will continue to work with the Foundation and the Congress to this end.

I'd be happy to answer any questions.

[The statement of Ms. Lerner follows:]

********** INSERT A **********

Chairman LOUDERMILK. Thank you, Mrs. Lerner.

I now recognize Dr. Buckius for 5 minutes to present his testimony.

TESTIMONY OF RICHARD BUCKIUS

Mr. BUCKIUS. Thank you, Mr. Chairman. Thank you, Mr. Chairman. Members of the committee, thank you for the opportunity to discuss NSF's Rotator Programs, particularly as you've heard the IPA assignments.

NSF supports fundamental research at the frontier across all fields of science and engineering through an investment in more than 42,000 active awards. NSF seeks to create and exploit new concepts in science and engineering and provide global leadership in research and education. This requires NSF to create an ever-changing vision for the future innovations and provide the resources to make vision into a reality. The expertise needed to carry out this work is constantly changing. The challenge for NSF is to blend change with continuity in managing our merit review process and overseeing our awards.

A mix of federal employees and rotators, some of whom are IPAs, is essential to NSF. Experienced federal employees provide continuity of scientific expertise, management, oversight, while rotators come from across the country with

new perspectives in science, engineering, and education. Because NSF supports fundamental research at the frontier, NSF relies on a mix of federal employees and rotators for a constant infusion of new knowledge into the structure of the rigorous merit review and post-award oversight.

The scientific community sees serving as a rotator at NSF as a public service. The opportunity to serve, while expanding the rotator's scientific perspectives, can disrupt the rotator's personal life and lead to a loss in continuity at the home institution. The IPA's home institution benefits from the experience and expertise the IPA gains but it does not have access to the faculty members, contributions, and all the usual functions during the IPA assignment. Therefore, it is important for NSF to avoid negative impacts on these rotators who choose to engage in the public service.

NSF costs and the oversight of our staff are continually monitored. Reducing our overhead cost to fund discoverers and discoveries is always a goal, and this must be balanced with the impact on our programs and the community. In the case of IPAs, NSF requests cost-sharing from all potential rotators and scrutinizes all salaries above the maximum federal rate.

While rotators perform their responsibilities at NSF, they are not allowed to handle any matters related to their

home institution and are subject to NSF policies on conflict of interest, performance, training, and conduct. Like federal employees, rotators must follow conflict-of-interest statutes, as well as government-wide ethics regulations.

To bolster the awareness and compliance of these statutes and regulations, IPAs, like other federal colleagues, are subject to mandatory conflict-of-interest training. Also like federal--other federal employees, IPAs provide performance plans for their IPA service.

The Foundation has benefited from the Office of the Inspector General reports on opportunities to improve the NSF IPA programs. As she has referred, the 2010 OIG report noted importance in improving the IPAs in the agency's Formal Performance Management System. NSF responded by taking action to incorporate all IPAs, including those operating at and below the executive level into the agency's Formal Performance Management System, and the OIG recommended--recommendation was satisfied the very next year. The change ensures that IPAs are held accountable to the agency and to the taxpayers.

This approach to accountability is also applied to NSF's Independent Research and Development Program, IR/D. In response to the OIG management report that identified internal control issues on our IR/D program, NSF immediately formed a task group and proposed changes. In 2012 the OIG

auditors favorably reviewed the task force recommendations and suggested additional controls. NSF put those controls in place. The IR/D program, available to federal employees and rotators, has--now has much more accountability.

I recognize that the OIG released a new report last Friday focused on the management of conflict of interest of our rotators. It is important to note that this was one specific case. Well before the release of the OIG report, the agency worked to address the situation and hold individuals accountable.

My written testimony does not address the report's recommendations due to the timing of its release. I would like to thank the IG, though, for her support of NSF and for her concerns about the integrity of the IPA program.

Mr. Chairman, members of the committee, bringing scientists, engineers, and educators from the community to join NSF's permanent staff contributes to the NSF mission of advancing the progress of science and its strategic goals of transforming the frontiers and addressing national needs. The Rotator Programs at NSF include the--including the IPA assignments are essential elements of achieving NSF's mission. With the support of the OIG, Congress, the Foundation will continue to enhance these programs to best serve science and technology in the national interest.

Thank you again for the opportunity to testify and I

look forward to answering your questions.

[The statement of Mr. Buckius follows:]

********** INSERT B **********

Chairman LOUDERMILK. Thank you to both of our witnesses for being here today, and now we're going to begin our questioning. And the Chair recognizes himself for 5 minutes.

As I mentioned in my opening statement, the IG found that in 2013 the NSF spent more than 6.7 million on IPA-related costs, with the NSF spending on average $33,448 more on IPA assignments than average permanent federal employees. These costs include salary matching, lost consulting fees, individual research and development travel, fringe benefits, and temporary living expenses.

Dr. Buckius, of that 6.7 million spent in 2013, how much of it was spent on these varying costs that I just mentioned?

Mr. BUCKIUS. In--you want the--excuse me, you want the fractions on each one of those?

Chairman LOUDERMILK. Yes, sir.

Mr. BUCKIUS. So the biggest one is $3 million salaries of the 6.7. It's important to note, too, if you read her report carefully, on a footnote it only provides you the numbers for those that are above the federal rate. If you include those that are below the federal rate, the net gain is only half of that, 1.5 million. The other costs, lost consulting, travel--excuse me, location allowance and IR/D are accurate as far as we can tell.

It's also important to note, though, that the IR/D is available to all rotators and federal employees at NSF. Only

63 percent of those allocations are to IPAs. The rest goes to federal employees and visitors. So it's not only available to IPAs.

Chairman LOUDERMILK. Okay. Thank you.

Can you tell me, what did the National Science Foundation spend in 2014 on IPA-related costs?

Mr. BUCKIUS. I'm sorry. I can get you that number. I don't have that with me.

Chairman LOUDERMILK. Okay. You don't?

Mr. BUCKIUS. No, I do not.

Chairman LOUDERMILK. Mrs. Lerner, do you know what that number is?

Ms. LERNER. I do not.

Chairman LOUDERMILK. Okay. That'll be helpful if you could get back with us on that number.

Dr. Buckius, how do you justify the additional cost these IPA assignments--of these IPA assignments than what you pay the average permanent federal employee?

Mr. BUCKIUS. So as it's been discussed by Lerner, as well as Mr. Lipinski, this is a very different agency than a lot of the other agencies. The IPA, the Rotator Program, is an absolutely essential part of our program. We have very, very excellent federal employees that give us the continuity but we don't have the ability, unlike, say, DOE that has staff that does research at the forefront, has facilities at

the forefront. We don't do that. That's not in our mission. So by bringing these front--these forefront leaders into our agency, they're able to bring that new expertise, bring that new knowledge, bring the ability to change into our agency. This is essential to our agency.

So the costs that we have to pay, we want to make sure that we can recruit the best possible leaders and scholars to come and help this agency, and therefore, we really need to be able to pay market-force value for these folks in order to get them to come to the agency and serve.

Chairman LOUDERMILK. Can I ask you, is--what benefit do these scientists and other IPAs have leaving their permanent job to take a leave of absence or whatever to come to NSF?

Mr. BUCKIUS. Okay. So let me just preface this with I am an IPA and so--and I also was a department head and I also was an AD and so I've been on all sides of this issue. So the IPA is probably, as a rotator and when they first come, which I did in '88, you're trying to manage your program at the university, your students, and you're trying to also manage the portfolio that you're having to access at NSF. So it requires you to really--I would argue--most IPAs that are involved in this probably work, you know, more than 40 hours a week for sure just in order to make it all work. Your family sometimes stays at home. You then come and spend your time here, and in all fairness, it's a 24/7 kind of a job

then because, right, you don't have your family with you. And so you spend a lot of time doing it.

The home institution, though, gains, too, so I don't want to ever belittle that. By bringing the IPA back, the IPA then has a much broader perspective of what the country's about, what the research is about, and that will help--that will definitely help the home unit.

But, unfortunately, the home unit doesn't gain all the other attributes that the faculty member provides, committee work, general advising, issues that relate to the community aspects of a department. You lost all that. So the department gains and loses, the IPA gains and loses.

What happens, though, is when you're on the side of NSF and we want to recruit these top scholars and we want them to come, we don't want to have any impediments that'll make it more difficult for them to come. As a department head also, I often don't want them to go either because I need them as a department head. So it's this constant balance. And I think the way we've done it so far, I think everybody gains and everybody loses and I think that's probably the fairest way we can go.

Chairman LOUDERMILK. One last question. I see I'm running out of time and I'll be respectful of everyone's time. Is there a recruitment issue or do you have a backlog of those that want to be IPAs?

Mr. BUCKIUS. It is a recruitment issue. We often don't get the people we want for all the commitments that I've just said. Individuals, when they consider coming to NSF, they often--it really affects their long-term career programs, their research programs, and they have to balance that with the public service.

Chairman LOUDERMILK. Are you fully staffed now?

Mr. BUCKIUS. In IPAs, no. We can go up to 195 and I think we--I think you said we're at 180. We've been down to as low as 173.

Chairman LOUDERMILK. Okay. Thank you. I see my time is expired and I now recognize Mr. Beyer for 5 minutes.

Mr. BEYER. Thank you, Mr. Chairman.

Dr. Buckius, I was going to ask you a question about can full-time, long-term government employees provide the same kind of insight and creativity in science that these IPAs do? And I think you've done a great job answering that. I am concerned, though, that the same argument could be made for many other government agencies, for example, the Department of Justice where I see lots of sort of mid-career brilliant attorneys stolen out of private practice who come work for the same governmental maximum for 3, 4, 6 years in order to contribute their expertise on terrorism, on financing, and lots of interesting things.

And--but I'm also particularly aware of the balance

between outside people who come in and the long-term federal employees. I was a politically appointed ambassador, and so I'm very sensitive to how that affected the morale of the career foreign service officers who perhaps didn't get a chance to be ambassador because these political guys were there.

So I look at the numbers, the ones that I have at least, of the seven Assistant Directors, six are IPAs; of the 32 Division Directors, 24 are IPAs. If so many of these top-level positions are filled by IPAs, doesn't it give the rank-and-file federal service worker not much hope for career advancement? And what is the effect on morale?

Mr. BUCKIUS. So that's a very difficult question for me to answer. I have heard of a few complaints, really very few though, by the career federal employees regarding their interactions with the IPAs. So they also gain a lot, too, right? So if I'm a federal employee, a running a program, and I have an IPA that comes in and runs a similar program, I get to exchange creative ideas where the--that the IPA can bring at the forefront where I might not have that experience. So even individual, at the one-on-one kind of level, there's a lot to be gained.

Regarding the executive service, we--I think you're accurate. I think that the percentage of IPAs in our most senior leadership positions is larger than the overall

fraction of IPAs in the agency. We do, though, have a number of federal employees that end up having--being our Division Directors, as well as our office heads, and so it's not that it's closed out; it's just that it's not as probable.

Typically, though, I noted a couple of comments that they don't bring the federal experience to these leadership roles. That's a true statement but they bring a lot of leadership. We have folks that have led major departments, led major colleges, in the case of engineering, around this country. So they have a lot of leadership skills. They just might have to get a little more fine-tuned on the federal issues. But by and large I think they're really superb leaders.

Mr. BEYER. You jumped ahead to another question I had, which is what necessarily makes a great scientist a great manager because I don't see them as equivalent at all.

Mr. BUCKIUS. And I think you're right, okay, and I'll agree with that. There are some scientists, engineers who probably shouldn't be leaders, okay. They're much better doing the fundamental research and leading students. But then there are those that actually have a very strong research portfolio and they also are very good leaders. And so in the case I just referred to, you know, we have deans and department heads who are leading major, major units around this country who come to NSF and impart that

leadership ability into the agency, and I think it's really valuable.

Mr. BEYER. Doctor, let me get to what seems to me perhaps the most existential question here, and forgive me for misinterpreting this. How much of the dependence on IPAs with the associated problems and benefits is--or let's just say overdependence on IPAs is because we in Congress don't authorize enough money for long-term federal staff, and therefore, you have to take resources out of the research budget to fund the IPAs? And what if we had--if we committed more money to the full-time government service, you know, say, a 50/50 ratio or whatever it is, would we be able to have more money for the research that then does so much good things?

Mr. BUCKIUS. Well, so that--

Mr. BEYER. Is this--are IPAs a back way of avoiding what decisions we make in our Budget Committee?

Mr. BUCKIUS. So my answer to that would be no. Regardless of where you tell us to put the money for an IPA, we would still think that they're essential and we would still hire them and recruit them the way we do now, regardless of where the money comes from for the reasons I've just stated. Because of the nature of this agency, because of the fact that we don't have these large facilities doing fundamental research, we need this infusion of folks. So we

take it out of R and RA. If it was in AOAM, I have no role--input on that because we still would need those folks in the agency in order to be able to make us have the impact that we're having.

Mr. BEYER. Okay. Thank you, Doctor.

I yield back, Mr. Chairman.

Chairman LOUDERMILK. Thank you, Mr. Beyer.

The Chair now recognizes Mr. Posey for 5 minutes.

Mr. POSEY. Thank you, Mr. Chairman.

Dr. Buckius, can you describe in one sentence the rotators or the IPA employee--I mean would you call them like rental experts that you bring in, just the shortest possible description for me.

Mr. BUCKIUS. Of what they do or who they are?

Mr. POSEY. Both.

Mr. BUCKIUS. Okay. So they're typically leaders and scholars from around the country and they provide two things for us. They provide an infusion of new, creative, leading-edge thought, as well as function to perform some of the functions--

Mr. POSEY. Okay. But--so they're part-timers you bring on?

Mr. BUCKIUS. No, they're full-time employees for a short period of time.

Mr. POSEY. For a short period of time, okay. Can you

give me an example of one or two of them that you think are especially valuable in what they do?

Mr. BUCKIUS. Okay. Well--so let me be personal because I did them--I've done all--so I've been a program person--

Mr. POSEY. No, not you. Give me another one. Use another one.

Mr. BUCKIUS. Okay. Good, because I don't like to talk about myself. So in the case of, say, one of our leaders who comes from a major institution, was a dean, leads now one of our major directorates, has moved that directorate into different areas that weren't before, hasn't even taken employees--

Mr. POSEY. Okay. That's satiric platitudes. Anything really specific you can tell me?

Mr. BUCKIUS. I think we're looking for leadership and that's leadership.

Mr. POSEY. Well, you can say that about anybody. In March 2013 it was stated that the NSF paid 54 IPAs' salaries exceeding the federal executive pay limit of almost $180,000, which is about probably five times the average annual wage in my district, which is the highest salary earned by federal employees at NSF, including presidential appointees. Of these 54 IPAs, the NSF paid 34 a salary of over $200,000 in annual salary and over $300,000 to an Assistant Director. Do you believe that was appropriate compensation?

Mr. BUCKIUS. Yes, I do.

Mr. POSEY. Okay. What procedures does NSF have in place to properly assess the cost-to-benefit ratio of these high-dollar rental people or temporary people?

Mr. BUCKIUS. So NSF over the years has done a number of independent studies by various organizations. NAPA, OPM, GAO have all done assessments of our program and they have recommended changes, just like Lerner has recommended. At the same time, they've given very positive remarks about the program.

Mr. POSEY. Okay. Fifty-four IPAs earned a salary over the federal executive pay limit. Do you believe that's fair to the NSF's own employees who cannot receive compensation that exceeds a pay grade of almost $180,000?

Mr. BUCKIUS. So remember the reason why we bring them. We bring them to do function and we bring them to do leadership in forefront activities--

Mr. POSEY. I know. They have talent that your own people don't have presumably.

Mr. BUCKIUS. No, they have different talents.

Mr. POSEY. Oh, okay. I was surprised to find Mrs. Lerner's revelation that the temporary employees you bring in are responsible for making award funding decisions. Can you tell me if any of them had any hand in awarding these grants: 340,000 to study human-set fires in New Zealand in the 1980s;

227,000 to study pictures of animals in National Geographic magazine; $200,000 to study Turkey's failing fashion industry; 1.5 million to study pasture management in Mongolia; 50,000 to study civil lawsuits in Peru in 1600 to 1700; 200,000 to study gender bias in Wikipedia pages; 164,000 to study Chinese immigration in Italy; 170,000 for two studies of native people's basket weaving in Alaska; 487,000 to study textiles and gender in Iceland from 874 to 1800, the Viking Era; 136,000 to repatriate recordings of traditional Alaskan music from the 1940s; $50,000 for stem cell education in Sri Lanka; 15,000 to study gender and fishing practices at Lake Victoria, Africa; 147,000 to study international marriages between France and Madagascar? And, you know, I have pages here, but can you tell me if any of these temporary employees were responsible for funding any of those projects absolutely unequivocally yes or no?

Mr. BUCKIUS. I cannot tell you who has funded those but we surely can get you that information, whether they're federal employees or rotators.

Mr. POSEY. But they would have--rotators would have responsibility to fund crap like this, right? I mean--

Mr. BUCKIUS. Rotators--

Mr. POSEY. --projects like this, excuse me. I'm sorry.

Mr. BUCKIUS. --could fund projects like that, yes.

Mr. POSEY. Thank you. I see my time is up, Mr.

Chairman. I yield back.

Chairman LOUDERMILK. Thank you, Mr. Posey.

The Chair now recognizes Mr. Lipinski.

Mr. LIPINSKI. Thank you, Mr. Chairman.

Yeah, I certainly agree, Dr. Buckius, that the rotator program is an essential element of the NSF mission, as you stated, and I have to say it's a little surprising to me to hear such strong Republican support for federal employees, as we've heard here, but welcome that.

But I think the Rotator Program is very important. But--and I've been a defender of it, and when there have been issues that have come up, I've defended it. But there are issues that need to be dealt with here. And I wanted to ask about a couple of the IG recommendations that have not been--my understanding is that NSF has not followed through on the recommendations. And these two are, first of all, that the IG recommended the NSF appoint a single individual to help champion NSF Rotator Program, would also help improve NSF oversight of the program. The second one is the IG recommended that the NSF produce formal guidelines on travel and possible telework for those engaged in the IR/D program. Could you address why NSF has not followed through on either of those recommendations?

Mr. BUCKIUS. So the first one regarding an individual, I cannot really answer that question. As I said, I came in

October and I don't know what the practices were before then. I think it's a very good recommendation. I see no reason why we shouldn't do that.

On the telework issue, we are starting to implement that. I'm not confident it's going to see the significant cost-savings that it's been purported to. So I think we have to run the experiment and see if this actually plays out.

The other two issues that--or the main issue that was brought up was regarding cost-share. We ask every IPA when they are working on their contract if they will cost-share, and some can and some do not. Part of the problem I think is with, you know, a lot of the public institutions around the country now are not seeing the budgets that they saw before, and therefore, providing cost-share for these kinds of activities is becoming harder and harder. And so that's a worry from the point of view of cost savings.

Mr. LIPINSKI. Okay. And I was going to ask this the other--two questions the other way around. I wanted to make sure you had an opportunity to answer those two.

Ms. Lerner, can you just mention some of the things very briefly--now, you had discussed some of these. What has the NSF recommendations--have they implemented in a way that you think has been very responsive and helpful to the Rotator Program?

Ms. LERNER. I think NSF has done a fantastic job of

implementing the recommendations that we made with respect to the IR/D program. And we made recommendations initially out of a Management Implication Report and NSF set up an IR/D task group. We also did a further audit, made additional recommendations, and NSF has been tremendously responsive. They have--let me see. They've--when we did our audit, they had no idea how much money they were spending on the IR/D program and they didn't know how much time people were charging. They now have codes to track both of those things. There's an annual report on costs associated with the IR/D program that they've provided in 2013/2014, and I'm sure they will in 2015, so there's much more oversight of the program that's taking place.

They have provided more training for people who are using the program and who are approving the proposals for people who want to participate in the programs so there's a better understanding of how that's working. So I think what--in that area in particular you've seen a great way that the agency can respond to concerns that the IG has raised and take them to the next level so--

Mr. LIPINSKI. And not to diminish any of your recommendations, but what do you think are the most important ones that NSF still needs to follow up on?

Ms. LERNER. I think certainly taking more concrete actions with respect to the recommendations that we made

about the cost of rotators would be quite important.

I know there--what we recognized is that there are a large number of rotators who are not the senior managers and so it seems like there are--you know, after an initial period for them to get used to the Foundation, there are real opportunities to use telework there more robustly, especially with all of the technical tools that we have and the ability to run virtual panels as well. So I would--I really would like to see more action on that--with respect to that recommendation.

And on the cost-sharing, I mean certainly we recommend--as people are asked about whether they want to cost-share but there hasn't been--we did not see, when we did our audit work--much in the way of negotiation. So it would be helpful if the document that they had wanted to prepare that outlined the benefits and that made it easier for them to have--to really negotiate that was finalized.

Mr. LIPINSKI. Thank you. I yield back.

Chairman LOUDERMILK. All right. Here's the posture we're in right now. Votes obviously have been called. We only have two other Members who are here to ask questions. And what I propose is if each Member would keep their questions to less than 5 minutes and if the witnesses would be succinct and concise with their answers, we could go ahead and finish out. Otherwise--that way we wouldn't have to hold

you over until after votes if that works with everyone.

All right. So at this point the Chair recognizes Mr. Westerman.

Mr. WESTERMAN. Thank you, Mr. Chair, and I'll talk fast for a guy from Arkansas.

Ms. Lerner, your most recent report focused on an IPA conflict of interest at the NSF and found that NSF failed to develop a clear plan to manage and mitigate the IPA's known conflict of interest from the outset. Is it true that it took months for the IPA to meet with their division conflicts official to discuss how to handle the conflict of interest?

Ms. LERNER. That's what we were informed.

Mr. WESTERMAN. So given the seriousness of conflict of interest and those type of issues, have you found that this kind of delay is commonplace at NSF based on your work?

Ms. LERNER. I can't speak to--we haven't looked broadly to see if this is--this issue is recurring. That's certainly something that, you know, I think we want to talk with the agency about, you know, what we do moving forward to access--to determine the breadth of these issues.

Mr. WESTERMAN. Do you believe proper procedures are in place to mitigate this kind of issue in the future?

Ms. LERNER. If I did, we would not have made the recommendations that we did. I think what we identified are real opportunities to tighten controls so that it's clearer

to everybody that when these people come on, they need--there needs to be prompt action to train them, to identify the conflicts, and to make sure that there's a plan in place to manage them.

Mr. WESTERMAN. Okay. So from your work when you investigated an IPA at the NSF you found that it had clear conflicts of interest present and they ultimately contributed to the awarding of three grants that you found did not meet the merits consistent with standard NSF practices. That is correct?

Ms. LERNER. That's--it wasn't our determination. It was the determination of--the reviewers raised questions about that process, yes.

Mr. WESTERMAN. So what were the total dollar figures of those grants?

Ms. LERNER. I believe total they came to about $2 million but I'd have to get back to you with the precise number.

Mr. WESTERMAN. Are they still open?

Ms. LERNER. They are still open and there's about--at least at the--as of the end of May there was about $400,000 remaining on those three awards.

Mr. WESTERMAN. Okay. So one of the more startling observations made in your testimony is about how a rotator violated a one-year ban when applying for $14 million in NSF

funding and how it appears that someone within the agency tried to cover that person's tracks by creating a different ID number for that person. Do you think that this is an isolated incident with one person knowingly and willfully ignoring government ethics rules or do you have concerns that ethics violations are more widespread?

Ms. LERNER. I certainly hope that this particular creation of a second PI ID is isolated, and I don't have evidence to show that that is a widespread problem, but what we also found is, you know, it would be very difficult for us to tell if that--if--you know, who was doing that. So that is--certainly is a matter of concern for us.

Mr. WESTERMAN. So do you think that a single person overseeing all of NSF's rotating personnel might do a better job in ensuring compliance with government ethics laws?

Ms. LERNER. A single person overseeing? I think, you know, that would certainly--having one person with broad responsibility to look at, you know, the use of rotators and to ensure that they are being appropriately trained and sensitive to the issues of conflicts would help. Right now, the management is very diffuse and that makes it difficult to ensure accountability.

Chairman LOUDERMILK. In the interest of time so we have one more Member, is it all right if we--

Mr. WESTERMAN. I'll yield back, Mr. Chairman.

Chairman LOUDERMILK. Okay.

Mr. WESTERMAN. Thank you.

Chairman LOUDERMILK. Thank you, Mr. Westerman.

The Chair recognizes Mr. Tonko.

Mr. TONKO. Thank you, Mr. Chair.

While NSF's system is by no means perfect, I'm concerned by the majority's continued fixation with NSF's peer-review process, which in large part relies on IPAs. Like any organization, NSF's process--processes have room for improvement.

In response to past IG reports, NSF has taken concrete steps to improve its practices. It is likely that similar steps will be taken in response to the most recent report. However, based on what I have read, these reports are not signs of systemic problems that require dramatic changes to the overall structure of the Rotator Program. In fact, the costs at NSF has agreed to incur, which are associated with the Rotator Program, in part show how highly NSF values IPAs.

The NSF and our system of university-based research is the envy of the rest of the world. NSF's model for funding has made this program the premier university-based scientific research program. And although we all want to limit costs and be accountable, certainly when it makes sense we should be careful and weigh the savings against any possible

reduction in associated benefits.

Now, Dr. Buckius, in regard to the last series of questions, I'm assuming you might have a response. Instead of going with my questions, I'll give you the time that I have remaining to perhaps respond to that earlier series of questions.

Mr. BUCKIUS. Thank you. I appreciate that. Conflicts of interest are taken very serious at the National Science Foundation. This is one case. This is one individual. And that individual was recommended for termination and that appointment was not renewed by NSF. Remember also NSF is the one that discovered this and told the IG, which subsequently investigated it. We also then took two of our staff that we've--that have been talked about and administratively removed them in accordance with established procedures and applicable regulations. We proceeded very deliberately in this case.

I've been at NSF, for like I said, the last 6 months. I was here 4 years before. This is the only case I have heard of. I did a couple of checks around the agency. We found one person who knew of one other case.

So the point I'm trying to make is conflicts of interest are taken very, very seriously. We can improve. Definitely we can improve and we will try, but this is just one case. And I think we've tried to handle it in as best a way we

possibly can. It's not acceptable what happened. We're not accepting what the IPA did, nor are we accepting what the two NSF staff members did and we're trying to manage that one particular case very, very carefully.

The 10 or so recommendations that the IG provided us on Friday, I got them Friday afternoon, I've had a chance to review them. We will definitely try to meet all of those recommendations as best we possibly can.

Mr. TONKO. Can I get another question in or are we ready to close?

Chairman LOUDERMILK. It looks like we're going to need to close. We're running out of time quickly to get to the Floor to vote so--

Mr. TONKO. Thank you. Thank you, Mr. Chairman.

Chairman LOUDERMILK. Thank you, Mr. Tonko.

Again, I thank the witnesses for their testimony and Members for their questions. I would like to enter into--enter the following documents into the record for the 2010 IG report, the 2012 IG report, the 2013 IG report, and the June 2015 redacted IG report.

Without objection, so ordered.

[The information follows:]

********** COMMITTEE INSERT **********

Chairman LOUDERMILK. And I'll also add Chairman Smith's opening statement.

Without objection, so ordered.

[The statement of Chairman Smith follows:]

********** COMMITTEE INSERT **********

Chairman LOUDERMILK. The record will remain open for 2 weeks for additional written comments and written questions for the Members. The hearing is hereby adjourned. Thank you.

[Whereupon, at 10:26 a.m., the Subcommittees were adjourned.]

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SPEAKER LISTING

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IS NSF PROPERLY MANAGING ITS ROTATING STAFF?

Thursday, June 25, 2015

House of Representatives,

Subcommittee on Oversight,

joint with the

Subcommittee on Research and Technology,

Committee on Science, Space, and Technology,

Washington, D.C.

Committee Hearings

of the

U.S. HOUSE OF REPRESENTATIVES

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IS NSF PROPERLY MANAGING ITS ROTATING STAFF?

Thursday, June 25, 2015

House of Representatives,

Subcommittee on Oversight,

joint with the

Subcommittee on Research and Technology,

Committee on Science, Space, and Technology,

Washington, D.C.

The Subcommittees met, pursuant to call, at 9:34 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Barry Loudermilk [Chairman of the Subcommittee on Oversight] presiding.

Chairman LOUDERMILK. The Committee on Science, Space, and Technology joint hearing of the Subcommittee on Oversight and the Subcommittee on Research and Technology will come to order.

Without objection, the Chair is authorized to declare recess of the Committee at any time.

Good morning and welcome to today's hearing titled ''Is NSF Managing Its Rotating Staff?'' I recognize myself now for 5 minutes for an opening statement.

I would like to thank our witnesses for being here this morning, and I'm looking forward to hearing from both of you on this very important matter.

We're here today to discuss the National Science Foundation's use of the Rotator Program, specifically, the individuals who are assigned through the Intergovernmental Personnel Act, or IPAs. These IPAs are top scientists, engineers, and educators from universities and industry who help staff the NSF on a temporary basis. In addition, the NSF employs Visiting Scientists, Engineers, and Educators, which, together with the IPAs, form the NSF Rotator Program.

While the Rotator Program brings expertise, diverse skill sets, and fresh perspective to the NSF, IPAs come with a significant cost to the NSF, which is completely unacceptable. For example, these IPAs remain an employee of

their home institution and their salaries are matched by the NSF throughout their tenure as an IPA, typically ranging from 1 to 3 years. In addition to salary matching, the NSF pays IPAs lost consulting fees, individual research and development travel, fringe benefits, and temporary living expenses.

Considering that NSF employs 184 IPAs, which is 12 percent of the total NSF workforce, these costs add up very quickly. In fact, according to the 2013 NSF Inspector General report, IPAs cost the NSF $36,448 more per IPA on average than the average permanent federal employee, and in 2013, the NSF spent more than $6.7 million on IPA-related costs.

When an agency is spending millions on rotating staff--not permanent staff--one would hope that they are the best-suited individuals for the positions they are filling. However, that doesn't appear to be the case with the NSF. In 2010, an NSF IG report found that IPAs in management-level positions at the NSF lacked institutional knowledge about the federal employment protocol, training, and expectations, all key management issues and functions.

The NSF funds a variety of large research projects, including multiuser research facilities, tools for research and education, and distributed instrumentation networks. Taking into account that some of these IPAs come from

organizations and institutions that would be interested in some of these funds, there is also the chance that if not properly managed, an IPA could have a conflict of interest with certain proposals and awards. The NSF IG recently released a report detailing a situation that falls into this category, which I am looking forward to learning more about today.

As a small business owner, I unconditionally understand the need for accountability. The fact that these temporary staffers are being paid more money for jobs that they are not necessarily qualified for and have an inherent ability to take advantage of, is completely inexcusable. Without proper oversight, the NSF is wasting taxpayer dollars on individuals who make more money than they should for jobs they may not be qualified for in roles that are susceptible to conflicts of interest. This committee has warned the NSF about the irresponsible spending over the past few years, and this is just another unfortunate example. When will the NSF take adequate measures to implement proper oversight, management, and plain responsibility?

I look forward to today's hearing, which I anticipate will inform us more about IPAs at the NSF, the management of them, as well as the oversight and accountability of what they are being paid. We owe it to the American people to ensure that these assignments are not using hard-earned

taxpayer money to overpay for subpar work. How does that seem fair?

In the end, though, I hope that this hearing will bring to light the issue of rotating staff and inform us of--on how to provide better oversight and management of federally funded rotating staff to guarantee taxpayers that they can trust us with their money and know that it will be spent in the most efficient way.

[The statement of Chairman Loudermilk follows:]

********** INSERT 1 **********

Chairman LOUDERMILK. I now recognize the Ranking Member of the Subcommittee on Oversight, the gentleman from Virginia, Mr. Beyer, for an opening statement.

Mr. BEYER. Thank you, Mr. Chairman.

The National Science Foundation employs thousands of hardworking scientists and staff, many of whom live in my district, and I value the tremendous benefit that the agency has brought to America and Americans over the past 65 years by supporting a wide range of scientific discoveries that have improved our understanding of every facet of the world around us.

As with any organization, public or private, sometimes problems emerge. Management improvements can be made and administrative oversight enhanced. Today's hearing will focus on the management and oversight of the NSF's Rotator Program.

The NSF's Rotator Program, primarily Intergovernmental Personnel Act positions, allows nonfederal employees from academic institutions and research labs to work at NSF for a temporary period of up to 4 years. The advantage of this program is that it guarantees a continuous infusion of scholars at the forefronts of their fields.

This approach to staffing is similar to another program that has long been viewed as one of the most valuable in the U.S. Government, in fact, the most valuable in the world, the

Defense Advanced Research Projects Agency. DARPA also relies on rotators to come in and manage research portfolios focused on innovative emerging research.

While there are obvious benefits to this program, it's impossible to use such a system without running some risks. IPA staff are not necessarily trained managers but fill professional staff positions and as NSF relies on the IPA program to fill positions far in excess of other federal agencies. This can cause some problems among rank-and-file employees. IPAs have also not been brought up through the civil service ranks with an appreciation of the importance of avoiding conflicts of interest.

Each year, NSF provides around 7 billion in grant awards and cooperative agreements to academic institutions. It's widely praised for the efficiency of its grants management system and widely copied by foreign governments looking to spur creativity and innovation.

However, when employees of grant-receiving institutions come to NSF on temporary assignment, it's important that the Foundation routinely ensure that each rotator is properly trained and monitored to ensure they manage their portfolio wisely and in compliance with the law. The Foundation must take prompt steps to identify potential conflicts of interest and that the rotators have the proper training to understand their obligations to avoid violating conflict-of-interest

rules at the agency.

Today, we'll hear from the Inspector General about a single rotator who failed to meet obligations for disclosing conflicts and for taking ethics training. The IG found that the individual was involved in three grant decisions with inappropriate ties to the grant recipient, call into question the integrity of the award. It's hard to determine whether the degree of this one failing represents systemic issues with the way NSF manages IPAs or whether it's just an unfortunate one off failing, but I agree with the IG that this incident points to broader management issues regarding NSF's oversight of the Rotator Program, and the recommendations contained in their report seem reasonable and obviously overdue.

I know NSF has not had much time to evaluate the specific recommendations, but I believe that where management problems exist, they need to be quickly fixed. Where conflicts of interest emerge, they need to be removed and rectified, and the public has to have confidence that NSF is managing its funds with absolute integrity.

These new recommendations regarding conflict-of-interest policies join a standing list of other Inspector General recommendations on the program that were designed to control the costs of that program. While NSF has moved to put some of these changes in place, I'm disappointed to learn that

those reforms have been moving a very, very slow track.

Without endorsing any particular recommendation at this time, NSF should know that we, the members of this Oversight Committee, expect this leadership to do more and quickly in this area. I believe that the Rotator Program as a whole can bring great benefit to NSF and to the Federal Government. It helps to spark fresh and innovative ideas, it fosters collaboration between the Federal Government and America's intellectually rich academic community and improves the advancement of scientific discoveries and cutting-edge technological developments on a wide range of subjects.

As we strive to promote greater economic efficiencies on the NSF Rotator Program, I believe it's important to keep the benefits of the program in mind. One bad case does not a crisis make and the Committee would be well-served to keep this in mind. We read the sad story of the two-star Army' General this week in trouble. We've watched how various Members of our Congress have been in trouble just this year, and we don't want to throw out the baby with the bathwater.

I look forward to hearing from our two witnesses about--both about the issues that have been identified but the acts that you've taken to correct them.

Thanks very much, Mr. Chairman. I yield back.

[The statement of Mr. Beyer follows:]

199 ********** INSERT 2 **********

Chairman LOUDERMILK. Thank you, Mr. Beyer.

If there are any Members who wish to submit additional opening statements, your statements will be added to the record at this point.

At this point I ask unanimous consent to enter documents into the record.

Without objection.

[The information follows:]

********** INSERT 4 **********

Chairman LOUDERMILK. At this time I'd like to introduce our witnesses. Our first witness is Ms. Allison Lerner. Ms. Lerner is the Inspector General for the National Science Foundation, or the NSF. Before joining the NSF in April 2009, Ms. Lerner served in many leadership positions at the Department of Commerce, including counsel to the Inspector General. She has received several national awards for excellence and was selected to be a member of the Government Accountability and Transparency Board by the President in June 2011. Ms. Lerner received her law and undergraduate degrees from the University of Texas.

The final witness today--on today's panel is Dr. Richard Buckius. Dr. Buckius is the Chief Operating Officer for the NSF. Mr. Buckius assumed his position of COO in October 2014, having previously been a Senior Policy Advisor for NSF. He is an author and coauthor of numerous publications on the topics of radiation, heat transfer, numerical fluid mechanics and combustion. Dr. Buckius received his bachelor's, master's and Ph.D. in mechanical engineering at the University of California Berkeley.

At this point the Chair would like to recognize the--I'd like to recognize the Ranking Member of the Subcommittee on Research and Technology, the gentlewoman from Illinois, Ms. Lipinski, for her opening statement.

Mr. LIPINSKI. Well, kind of close.

Chairman LOUDERMILK. Or his. I'm sorry, sir.

Mr. LIPINSKI. Thank you.

Chairman LOUDERMILK. You're--my apologies. Instead of--I thought I was--I had it right and then I read the script.

Mr. LIPINSKI. That's always a mistake.

Chairman LOUDERMILK. Yes.

Mr. LIPINSKI. Well, I--

Chairman LOUDERMILK. My apologies.

Mr. LIPINSKI. I apologize for being late. I understand we had to move this up because of votes.

I want to thank Chairman Loudermilk and Chairwoman Comstock for holding this hearing on NSF's management of the IPA Rotator Program. I want to thank Dr. Buckius and Ms. Lerner for being here. Good morning.

I--you know, we know what the issues are, reports issued by the NSF Inspector General over the last few years, including last Friday's report, make it clear that there are some management and oversight issues with the Rotator Program that are worthy of our concern and attention. However, as we pursue our oversight responsibilities, we should not lose sight of the tremendous value that the Rotator Program brings to NSF and to the scientific community.

NSF has a very talented workforce across the board. Long-term federal employees serving in program officer and

executive positions come to the agency with many years of experience and scientific research, as well as in managing program budgets in participating NSF grant review process. Those recruited to executive positions are also experienced managers. After several years at NSF, their institutional memory and knowledge of federal rules and regulations is invaluable.

But we also know that rotators also come to NSF with many years of experience and similar skills. And what makes the Rotator Program unique and essential is that rotators provide a constant influx of new ideas, new perspectives, and a frontline understanding of emerging trends in science and engineering. As such, they are particularly well placed to evaluate high-risk, high-reward research proposals and ensure that NSF continues to support a portfolio that includes transformative research, a topic which we discuss often in this committee.

While exploring options to strengthen management of the program and to implement cost controls, we should not even unintentionally take steps that compromise the benefits this program provides to the agency and to scientific progress.

Now, having said that, the Inspector General has raised several issues in the last few years that warrant our review. From the cost associated with the IPA program to the management benefits such as independent research and

development and the requirements such as ethics training, there is room for improvement. The Foundation received the most recent report on a conflict-of-interest case only last Friday giving them little time to review the specific recommendations. It might have been better, perhaps, to postpone this hearing by a couple months. However, we are here today.

This particular case dates back to 2013, so I expect Dr. Buckius will be able to share with us some of his thinking about what went wrong in terms of management controls and how procedures can be tightened up going forward. I also hope that Dr. Buckius will be able to share with us actions NSF has taken since the 2012 and 2013 IG reports to strengthen management and oversight of other aspects of the Rotator Program.

In no way do I want to diminish the issues that have been raised. We need to make sure that we are providing oversight and that NSF is responding appropriately to the findings.

I want to thank the witnesses for being here, look forward to your testimony. Thank you.

[The statement of Mr. Lipinski follows:]

********** INSERT 3 **********

Chairman LOUDERMILK. Again, thank you, Mr. Lipinski, and again, my sincere apologies.

Pursuant to the committee rules, all witnesses will be sworn in before they testify. If you'll please rise and raise your right hand.

Do you solemnly swear or affirm that the testimony you are about to give will be the truth, the whole truth, and nothing but the truth, so help you God?

Let the record reflect that the witnesses answered in the affirmative.

Before we begin, I will request that our witnesses please limit your testimony to 5 minutes. It seems there will be another series of votes called in about an hour and I want to make sure that we have time for discussion. Your entire written statement will be made part of the record.

I now recognize Ms. Lerner for 5 minutes to present her testimony.

TESTIMONY OF ALLISON LERNER, INSPECTOR GENERAL, NATIONAL SCIENCE FOUNDATION; AND RICHARD BUCKIUS, CHIEF OPERATING OFFICER, NATIONAL SCIENCE FOUNDATION

TESTIMONY OF ALLISON LERNER

Ms. LERNER. Mr. Chairman and members of the subcommittee, I appreciate this opportunity to discuss my office's oversight of NSF's management of its rotating staff, especially assignments under the Intergovernmental Personnel Act. I'll focus on finding some recommendations made in three audits completed by my office, one on cost associated with NSF's use of rotators, a second on personnel management issues related to rotators, and a third on NSF's management and oversight of the Independent Research and Development program, or IR/D.

Finally, since rotators often make funding decisions, I'll discuss a recent investigative report which identified ways for NSF to improve its controls to identify and mitigate rotators' conflicts of interest.

To advance its mission of supporting science and engineering research and education, NSF brings scientists, engineers, and educators from academia, industry, or other organizations to the Foundation for rotational assignments of up to 4 years. While there are definitely benefits that come

from having rotators at NSF, there are also challenges. For example, because of rotators' limited tenure, there's almost constant turnover in staff, especially in senior leadership positions. Other challenges include higher cost for rotators and rotators' lack of familiarity with government processes and culture.

The additional cost of using rotators instead of permanent federal employees is considerable. We found that NSF paid an added cost of approximately $6.7 million or an average of over $36,000 per IPA for the 184 IPAs we looked at in a 2013 audit. We recommended that NSF evaluate ways to reduce these costs such as increasing rotators' use of telework, increasing cost-sharing by home institutions, and limiting salary to the maximum federal pay rate for the position. NSF has developed a plan to accomplish--a plan to examine rotator cost but much work remains to be done to accomplish the actions included in that plan.

NSF's reliance on rotators also proposes personnel management challenges. For example, at the time of our 2010 audit, NSF did not require rotators to have annual performance evaluations even though they functioned in the same capacity as NSF's federal executives who are evaluated each year. As a result, NSF risks not holding IPAs accountable as it does federal employees for accomplishing NSF's missions and goals. In response to our

recommendations, NSF has put all IPAs under a performance management system and reports that it received 117 IPA appraisals in the most recent cycle.

We also examined controls over NSF's IR/D program, which is utilized primarily by rotators to maintain their professional competencies and remain actively involved with their research while at NSF. At the time of our 2012 audit, NSF policy allowed IR/D participants to spend up to 50 days a year, or 20 percent of their time, on IR/D activities. In 2010, IR/D travel costs were $1.8 million. Rotators and other visiting scientists took 90 percent of the IR/D trips during this period. Since our audit, the Foundation has strengthened oversight at the IR/D program and taken steps to reduce its costs.

In light of the Foundation's reliance on rotators to make funding decisions, it's critical that strong controls be in place to identify and mitigate conflicts of interest that occur as a result of rotators' research activities or their connections with their home institutions. Such controls protect rotators, many of whom have never worked in a federal environment, as well as the Foundation itself.

A recent investigative report documented problems with controls over COIs that we identified in the context of one rotator's tenure at NSF. We found that no concrete plan to manage the rotator's known conflict was developed and

communicated, that there were significant delays in the rotator's completion of a required ethics course and her submission of a required financial disclosure form, that actions taken to assess the impact of the rotator's conflicts of interest on an award she made were seriously flawed, that the names of the persons who wrote the justification for funding and who actually made the decision to fund the award with which the rotator had conflicts were not included in NSF's system of record, undermining the agency's ability to identify and mitigate conflicts of interest, and that a critical tool used to enforce the one-year cooling-off period following the rotator's tenure at NSF was circumvented.

We recommended that NSF take various actions to strengthen its controls over conflicts. Since we just issued our investigative report last week, the agency has not had an opportunity to formally respond.

Rotating staff are an important component of NSF's workforce and bring valuable experience to the Foundation. While we recognize the significant contributions made by rotators, it's essential for NSF to examine the cost associated with the rotator program to ensure that federal funds entrusted to the Foundation are being spent effectively and efficiently. It's also critical that funding justifications and recommendations made by rotators be free from conflicts of interest, as the integrity of those

decisions is essential to NSF's merit review process.

My office remains committed to providing rigorous and dependent oversight of NSF's management of its rotating staff and will continue to work with the Foundation and the Congress to this end.

I'd be happy to answer any questions.

[The statement of Ms. Lerner follows:]

********** INSERT A **********

Chairman LOUDERMILK. Thank you, Mrs. Lerner.

I now recognize Dr. Buckius for 5 minutes to present his testimony.

TESTIMONY OF RICHARD BUCKIUS

Mr. BUCKIUS. Thank you, Mr. Chairman. Thank you, Mr. Chairman. Members of the committee, thank you for the opportunity to discuss NSF's Rotator Programs, particularly as you've heard the IPA assignments.

NSF supports fundamental research at the frontier across all fields of science and engineering through an investment in more than 42,000 active awards. NSF seeks to create and exploit new concepts in science and engineering and provide global leadership in research and education. This requires NSF to create an ever-changing vision for the future innovations and provide the resources to make vision into a reality. The expertise needed to carry out this work is constantly changing. The challenge for NSF is to blend change with continuity in managing our merit review process and overseeing our awards.

A mix of federal employees and rotators, some of whom are IPAs, is essential to NSF. Experienced federal employees provide continuity of scientific expertise, management, and oversight, while rotators come from across the country with

new perspectives in science, engineering, and education. Because NSF supports fundamental research at the frontier, NSF relies on a mix of federal employees and rotators for a constant infusion of new knowledge into the structure of the rigorous merit review process and post-award oversight.

The scientific community sees serving as a rotator at NSF as a public service. The opportunity to serve, while expanding the rotator's scientific perspectives, can disrupt the rotator's personal life and lead to a loss in continuity at the home institution. The IPA's home institution benefits from the experience and expertise the IPA gains, but it does not have access to the faculty members, contributions, and all the usual functions during the IPA assignment. Therefore, it is important for NSF to avoid negative impacts on these rotators who choose to engage in the public service.

NSF costs and the oversight of our staff are continually monitored. Reducing our overhead cost to fund discoverers and discoveries is always a goal, and this must be balanced with the impact on our programs and the community. In the case of IPAs, NSF requests cost-sharing from all potential rotators and scrutinizes all salaries above the maximum federal rate.

While rotators perform their responsibilities at NSF, they are not allowed to handle any matters related to their

home institution and are subject to NSF policies on conflict of interest, performance, training, and conduct. Like federal employees, rotators must follow conflict-of-interest statutes, as well as government-wide ethics regulations.

To bolster the awareness and compliance of these statutes and regulations, IPAs, like other federal colleagues, are subject to mandatory conflict-of-interest training. Also like ~~federal~~ other federal employees, IPAs provide performance plans for their IPA service.

The Foundation has benefited from the Office of the Inspector General reports on opportunities to improve the NSF IPA programs. As she has referred, the 2010 OIG report noted the importance in ~~improving~~ incorporating the IPAs in the agency's Formal Performance Management System. NSF responded by taking action to incorporate all IPAs, including those operating at and below the executive level into the agency's Formal Performance Management System, and the OIG ~~recommended~~ recommendation was satisfied the very next year. The change ensures that IPAs are held accountable to the agency and to the taxpayers.

This approach to accountability is also applied to NSF's Independent Research and Development Program, IR/D. In response to the OIG management report that identified internal control issues on our IR/D program, NSF immediately formed a task group and proposed changes. In 2012 the OIG

auditors favorably reviewed the task force recommendations and suggested additional controls. NSF put those controls in place. The IR/D program, available to federal employees and rotators, has now has much more accountability.

I recognize that the OIG released a new report last Friday focused on the management of conflict of interest of our rotators. It is important to note that this was one specific case. Well before the release of the OIG report, the agency worked to address the situation and hold individuals accountable.

My written testimony does not address the report's recommendations due to the timing of its release. I would like to thank the IG, though, for her support of NSF and for her concerns about the integrity of the IPA program.

Mr. Chairman, members of the committee, bringing scientists, engineers, and educators from the community to join NSF's permanent staff contributes to the NSF mission of advancing the progress of science and its strategic goals of transforming the frontiers and addressing national needs. The Rotator Programs at NSF include the including the IPA assignments are essential elements of achieving NSF's mission. With the support of the OIG and Congress, the Foundation will continue to enhance these programs to best serve science and technology in the national interest.

Thank you again for the opportunity to testify and I

look forward to answering your questions.

[The statement of Mr. Buckius follows:]

********** INSERT B **********

Chairman LOUDERMILK. Thank you to both of our witnesses for being here today, and now we're going to begin our questioning. And the Chair recognizes himself for 5 minutes.

As I mentioned in my opening statement, the IG found that in 2013 the NSF spent more than 6.7 million on IPA-related costs, with the NSF spending on average $33,448 more on IPA assignments than average permanent federal employees. These costs include salary matching, lost consulting fees, individual research and development travel, fringe benefits, and temporary living expenses..

Dr. Buckius, of that 6.7 million spent in 2013, how much of it was spent on these varying costs that I just mentioned?

Mr. BUCKIUS. In--you want the--excuse me, you want the fractions on each one of those?

Chairman LOUDERMILK. Yes, sir.

Mr. BUCKIUS. So the biggest one is $3 million, salaries of the 6.7 million. It's important to note, too, if you read her report carefully, on a footnote it only provides you the numbers for those that are above the federal rate. If you include those that are below the federal rate, the net gain is only half of that, 1.5 million. The other costs, lost consulting, travel--excuse me, location allowance, and IR/D are accurate as far as we can tell.

It's also important to note, though, that the IR/D is available to all rotators and federal employees at NSF. Only

63 percent of those allocations are to IPAs. The rest goes to federal employees and visitors. So it's not only available to IPAs.

Chairman LOUDERMILK. Okay. Thank you.

Can you tell me, what did the National Science Foundation spend in 2014 on IPA-related costs?

Mr. BUCKIUS. I'm sorry. I can get you that number. I don't have that with me.

Chairman LOUDERMILK. Okay. You don't?

Mr. BUCKIUS. No, I do not.

Chairman LOUDERMILK. Mrs. Lerner, do you know what that number is?

Ms. LERNER. I do not.

Chairman LOUDERMILK. Okay. That'll be helpful if you could get back with us on that number.

Dr. Buckius, how do you justify the additional cost these IPA assignments--of these IPA assignments than what you pay the average permanent federal employee?

Mr. BUCKIUS. So as it's been discussed by Ms. Lerner, as well as Mr. Lipinski, this is a very different agency than a lot of the other agencies. The IPA, the Rotator Program, is an absolutely essential part of our program. We have very, very excellent federal employees that give us the continuity but we don't have the ability, unlike, say, DOE that has staff that does research at the forefront, has facilities at

the forefront. We don't do that. That's not in our mission. So by bringing these front--these forefront leaders into our agency, they're able to bring that new expertise, bring that new knowledge, and bring the ability to change into our agency. This is essential to our agency.

So the costs that we have to pay, we want to make sure that we can recruit the best possible leaders and scholars to come and help this agency, and therefore, we really need to be able to pay market-force value for these folks in order to get them to come to the agency and serve.

Chairman LOUDERMILK. Can I ask you, is--what benefit do these scientists and other IPAs have leaving their permanent job to take a leave of absence or whatever to come to NSF?

Mr. BUCKIUS. Okay. So let me just preface this with I am an IPA and so--and I also was a department head and I also was an AD and so I've been on all sides of this issue. So the IPA is probably, as a rotator and when they first come, which I did in '88, you're trying to manage your program at the university, your students, and you're trying to also manage the portfolio that you're having to access at NSF. So it requires you to really--I would argue most IPAs that are involved in this probably work, you know, more than 40 hours a week for sure just in order to make it all work. Your family sometimes stays at home. You then come and spend your time here, and in all fairness, it's a 24/7 kind of a job

then because, right, you don't have your family with you. And so you spend a lot of time doing it.

The home institution, though, gains too, so I don't want to ever belittle that. By bringing the IPA back, the IPA then has a much broader perspective of what the country's about, what the research is about, and that will help--that will definitely help the home unit.

But, unfortunately, the home unit doesn't gain all the other attributes that the faculty member provides, committee work, general advising, and issues that relate to the community aspects of a department. You lost all that. So the department gains and loses, the IPA gains and loses.

What happens, though, is when you're on the side of NSF and we want to recruit these top scholars and we want them to come, we don't want to have any impediments that'll make it more difficult for them to come. As a department head also, I often don't want them to go either because I need them as a department head. So it's this constant balance. And I think the way we've done it so far, I think everybody gains and everybody loses, and I think that's probably the fairest way we can go.

Chairman LOUDERMILK. One last question. I see I'm running out of time and I'll be respectful of everyone's time. Is there a recruitment issue or do you have a backlog of those that want to be IPAs?

Mr. BUCKIUS. It is a recruitment issue. We often don't get the people we want for all the commitments that I've just said. Individuals, when they consider coming to NSF, they often--it really affects their long-term career programs, their research programs, and they have to balance that with the public service.

Chairman LOUDERMILK. Are you fully staffed now?

Mr. BUCKIUS. In IPAs, no. We can go up to 195 and I think we--I think you said we're at 180. We've been down to as low as 173.

Chairman LOUDERMILK. Okay. Thank you. I see my time is expired and I now recognize Mr. Beyer for 5 minutes.

Mr. BEYER. Thank you, Mr. Chairman.

Dr. Buckius, I was going to ask you a question about can full-time, long-term government employees provide the same kind of insight and creativity in science that these IPAs do? And I think you've done a great job answering that. I am concerned, though, that the same argument could be made for many other government agencies, for example, the Department of Justice where I see lots of sort of mid-career brilliant attorneys stolen out of private practice who come work for the same governmental maximum for 3, 4, 6 years in order to contribute their expertise on terrorism, on financing, and lots of interesting things.

And--but I'm also particularly aware of the balance

between outside people who come in and the long-term federal employees. I was a politically appointed ambassador, and so I'm very sensitive to how that affected the morale of the career foreign service officers who perhaps didn't get a chance to be ambassador because these political guys were there.

So I look at the numbers, the ones that I have at least, of the seven Assistant Directors, six are IPAs; of the 32 Division Directors, 24 are IPAs. If so many of these top-level positions are filled by IPAs, doesn't it give the rank-and-file federal service worker not much hope for career advancement? And what is the effect on morale?

Mr. BUCKIUS. So that's a very difficult question for me to answer. I have heard of a few complaints, really very few though, by the career federal employees regarding their interactions with the IPAs. So they also gain a lot, too, right? So if I'm a federal employee running a program, and I have an IPA that comes in and runs a similar program, I get to exchange creative ideas where the--that the IPA can bring at the forefront where I might not have that experience. So even individual, at the one-on-one kind of level, there's a lot to be gained.

Regarding the executive service, we--I think you're accurate. I think that the percentage of IPAs in our most senior leadership positions is larger than the overall

fraction of IPAs in the agency. We do, though, have a number of federal employees that end up having being our Division Directors, as well as our office heads, and so it's not that it's closed out; it's just that it's not as probable.

Typically, though, I noted a couple of comments that they don't bring the federal experience to these leadership roles. That's a true statement but they bring a lot of leadership. We have folks that have led major departments, led major colleges, in the case of engineering, around this country. So they have a lot of leadership skills. They just might have to get a little more fine-tuned on the federal issues. But by and large I think they're really superb leaders.

Mr. BEYER. You jumped ahead to another question I had, which is what necessarily makes a great scientist a great manager because I don't see them as equivalent at all.

Mr. BUCKIUS. And I think you're right, okay, and I'll agree with that. There are some scientists, and engineers, who probably shouldn't be leaders, okay. They're much better doing the fundamental research and leading students. But then there are those that actually have a very strong research portfolio, and they also are very good leaders. And so in the case I just referred to, you know, we have deans and department heads who are leading major, major units around this country who come to NSF and impart that

leadership ability into the agency, and I think it's really valuable.

Mr. BEYER. Doctor, let me get to what seems to me perhaps the most existential question here, and forgive me for misinterpreting this. How much of the dependence on IPAs with the associated problems and benefits is--or let's just say overdependence on IPAs is because we in Congress don't authorize enough money for long-term federal staff, and therefore, you have to take resources out of the research budget to fund the IPAs? And what if we had--if we committed more money to the full-time government service, you know, say, a 50/50 ratio or whatever it is, would we be able to have more money for the research that then does so much good things?

Mr. BUCKIUS. Well, so that--

Mr. BEYER. Is this--are IPAs a back way of avoiding what decisions we make in our Budget Committee?

Mr. BUCKIUS. So my answer to that would be no. Regardless of where you tell us to put the money for an IPA, we would still think that they're essential and we would still hire them and recruit them the way we do now, regardless of where the money comes from for the reasons I've just stated. Because of the nature of this agency, because of the fact that we don't have these large facilities doing fundamental research, we need this infusion of folks. So we

take it out of R ~~and~~ & RA. If it was in AOAM, I have no role--input on that because we still would need those folks in the agency in order to be able to make us have the impact that we're having.

Mr. BEYER. Okay. Thank you, Doctor.

I yield back, Mr. Chairman.

Chairman LOUDERMILK. Thank you, Mr. Beyer.

The Chair now recognizes Mr. Posey for 5 minutes.

Mr. POSEY. Thank you, Mr. Chairman.

Dr. Buckius, can you describe in one sentence the rotators or the IPA employee--I mean would you call them like rental experts that you bring in, just the shortest possible description for me.

Mr. BUCKIUS. Of what they do or who they are?

Mr. POSEY. Both.

Mr. BUCKIUS. Okay. So they're typically leaders and scholars from around the country and they provide two things for us. They provide an infusion of new, creative, leading-edge thought, as well as function to perform some of the functions--

Mr. POSEY. Okay. But--so they're part-timers you bring on?

Mr. BUCKIUS. No, they're full-time employees for a short period of time.

Mr. POSEY. For a short period of time, okay. Can you

give me an example of one or two of them that you think are especially valuable in what they do?

Mr. BUCKIUS. Okay. Well--so let me be personal because I did them--I've done all--so I've been a program person--

Mr. POSEY. No, not you. Give me another one. Use another one.

Mr. BUCKIUS. Okay. Good, because I don't like to talk about myself. So in the case of, say, one of our leaders who comes from a major institution, was a dean, leads now one of our major directorates, has moved that directorate into different areas that weren't before, hasn't even taken employees--

Mr. POSEY. Okay. That's satiric platitudes. Anything really specific you can tell me?

Mr. BUCKIUS. I think we're looking for leadership and that's leadership.

Mr. POSEY. Well, you can say that about anybody. In March 2013 it was stated that the NSF paid 54 IPAs' salaries exceeding the federal executive pay limit of almost $180,000, which is about probably five times the average annual wage in my district, which is the highest salary earned by federal employees at NSF, including presidential appointees. Of these 54 IPAs, the NSF paid 34 a salary of over $200,000 in annual salary and over $300,000 to an Assistant Director. Do you believe that was appropriate compensation?

Mr. BUCKIUS. Yes, I do.

Mr. POSEY. Okay. What procedures does NSF have in place to properly assess the cost-to-benefit ratio of these high-dollar rental people or temporary people?

Mr. BUCKIUS. So NSF over the years has done a number of independent studies by various organizations. NAPA, OPM, GAO have all done assessments of our program and they have recommended changes, just like Ms. Lerner has recommended. At the same time, they've given very positive remarks about the program.

Mr. POSEY. Okay. Fifty-four IPAs earned a salary over the federal executive pay limit. Do you believe that's fair to the NSF's own employees who cannot receive compensation that exceeds a pay grade of almost $180,000?

Mr. BUCKIUS. So remember the reason why we bring them. We bring them to do functions and we bring them to do leadership in forefront activities--

Mr. POSEY. I know. They have talent that your own people don't have presumably.

Mr. BUCKIUS. No, they have different talents.

Mr. POSEY. Oh, okay. I was surprised to find Mrs. Lerner's revelation that the temporary employees you bring in are responsible for making award funding decisions. Can you tell me if any of them had any hand in awarding these grants: 340,000 to study human-set fires in New Zealand in the 1980s;

227,000 to study pictures of animals in National Geographic magazine; $200,000 to study Turkey's failing fashion industry; 1.5 million to study pasture management in Mongolia; 50,000 to study civil lawsuits in Peru in 1600 to 1700; 200,000 to study gender bias in Wikipedia pages; 164,000 to study Chinese immigration in Italy; 170,000 for two studies of native people's basket weaving in Alaska; 487,000 to study textiles and gender in Iceland from 874 to 1800, the Viking Era; 136,000 to repatriate recordings of traditional Alaskan music from the 1940s; $50,000 for stem cell education in Sri Lanka; 15,000 to study gender and fishing practices at Lake Victoria, Africa; 147,000 to study international marriages between France and Madagascar? And, you know, I have pages here, but can you tell me if any of these temporary employees were responsible for funding any of those projects absolutely unequivocally yes or no?

Mr. BUCKIUS. I cannot tell you who has funded those, but we surely can get you that information, whether they're federal employees or rotators.

Mr. POSEY. But they would have--rotators would have responsibility to fund crap like this, right? I mean--

Mr. BUCKIUS. Rotators--

Mr. POSEY. --projects like this, excuse me. I'm sorry.

Mr. BUCKIUS. --could fund projects like that, yes.

Mr. POSEY. Thank you. I see my time is up, Mr.

NEED TO INSERT ROTATOR NAMES ASSOCIATED W/ AWARDS REP. POSEY HIGHLIGHTED.

Chairman. I yield back.

Chairman LOUDERMILK. Thank you, Mr. Posey.

The Chair now recognizes Mr. Lipinski.

Mr. LIPINSKI. Thank you, Mr. Chairman.

Yeah, I certainly agree, Dr. Buckius, that the rotator program is an essential element of the NSF mission, as you stated, and I have to say it's a little surprising to me to hear such strong Republican support for federal employees, as we've heard here, but welcome that.

But I think the Rotator Program is very important. But--and I've been a defender of it, and when there have been issues that have come up, I've defended it. But there are issues that need to be dealt with here. And I wanted to ask about a couple of the IG recommendations that have not been--my understanding is that NSF has not followed through on the recommendations. And these two are, first of all, that the IG recommended the NSF appoint a single individual to help champion NSF Rotator Program, would also help improve NSF oversight of the program. The second one is the IG recommended that the NSF produce formal guidelines on travel and possible telework for those engaged in the IR/D program. Could you address why NSF has not followed through on either of those recommendations?

Mr. BUCKIUS. So the first one regarding an individual, I cannot really answer that question. As I said, I came in

October and I don't know what the practices were before then. I think it's a very good recommendation. I see no reason why we shouldn't do that.

On the telework issue, we are starting to implement that. I'm not confident it's going to see the significant cost-savings that it's been purported to. So I think we have to run the experiment and see if this actually plays out.

The ~~other two issues that or the~~ main issue that was brought up was regarding cost-share. We ask every IPA when they are working on their contract if they will cost-share, and some can and some do not. Part of the problem I think is with, you know, a lot of the public institutions around the country now are not seeing the budgets that they saw before, and therefore, providing cost-share for these kinds of activities is becoming harder and harder. And so that's a worry from the point of view of cost savings.

Mr. LIPINSKI. Okay. And I was going to ask this the other--two questions the other way around. I wanted to make sure you had an opportunity to answer those two.

Ms. Lerner, can you just mention some of the things very briefly--now, you had discussed some of these. What has the NSF recommendations--have they implemented in a way that you think has been very responsive and helpful to the Rotator Program?

Ms. LERNER. I think NSF has done a fantastic job of

implementing the recommendations that we made with respect to the IR/D program. And we made recommendations initially out of a Management Implication Report and NSF set up an IR/D task group. We also did a further audit, made additional recommendations, and NSF has been tremendously responsive. They have--let me see. They've--when we did our audit, they had no idea how much money they were spending on the IR/D program and they didn't know how much time people were charging. They now have codes to track both of those things. There's an annual report on costs associated with the IR/D program that they've provided in 2013/2014, and I'm sure they will in 2015, so there's much more oversight of the program that's taking place.

They have provided more training for people who are using the program and who are approving the proposals for people who want to participate in the programs so there's a better understanding of how that's working. So I think what--in that area in particular you've seen a great way that the agency can respond to concerns that the IG has raised and take them to the next level so--

Mr. LIPINSKI. And not to diminish any of your recommendations, but what do you think are the most important ones that NSF still needs to follow up on?

Ms. LERNER. I think certainly taking more concrete actions with respect to the recommendations that we made

about the cost of rotators would be quite important.

I know there--what we recognized is that there are a large number of rotators who are not the senior managers and so it seems like there are--you know, after an initial period for them to get used to the Foundation, there are real opportunities to use telework there more robustly, especially with all of the technical tools that we have and the ability to run virtual panels as well. So I would--I really would like to see more action on that--with respect to that recommendation.

And on the cost-sharing, I mean certainly we recommend--as people are asked about whether they want to cost-share but there hasn't been--we did not see, when we did our audit work--much in the way of negotiation. So it would be helpful if the document that they had wanted to prepare that outlined the benefits and that made it easier for them to have--to really negotiate that was finalized.

Mr. LIPINSKI. Thank you. I yield back.

Chairman LOUDERMILK. All right. Here's the posture we're in right now. Votes obviously have been called. We only have two other Members who are here to ask questions. And what I propose is if each Member would keep their questions to less than 5 minutes and if the witnesses would be succinct and concise with their answers, we could go ahead and finish out. Otherwise--that way we wouldn't have to hold

you over until after votes if that works with everyone.

All right. So at this point the Chair recognizes Mr. Westerman.

Mr. WESTERMAN. Thank you, Mr. Chair, and I'll talk fast for a guy from Arkansas.

Ms. Lerner, your most recent report focused on an IPA conflict of interest at the NSF and found that NSF failed to develop a clear plan to manage and mitigate the IPA's known conflict of interest from the outset. Is it true that it took months for the IPA to meet with their division conflicts official to discuss how to handle the conflict of interest?

Ms. LERNER. That's what we were informed.

Mr. WESTERMAN. So given the seriousness of conflict of interest and those type of issues, have you found that this kind of delay is commonplace at NSF based on your work?

Ms. LERNER. I can't speak to--we haven't looked broadly to see if this is--this issue is recurring. That's certainly something that, you know, I think we want to talk with the agency about, you know, what we do moving forward to access--to determine the breadth of these issues.

Mr. WESTERMAN. Do you believe proper procedures are in place to mitigate this kind of issue in the future?

Ms. LERNER. If I did, we would not have made the recommendations that we did. I think what we identified are real opportunities to tighten controls so that it's clearer

to everybody that when these people come on, they need--there needs to be prompt action to train them, to identify the conflicts, and to make sure that there's a plan in place to manage them.

Mr. WESTERMAN. Okay. So from your work when you investigated an IPA at the NSF you found that it had clear conflicts of interest present and they ultimately contributed to the awarding of three grants that you found did not meet the merits consistent with standard NSF practices. That is correct?

Ms. LERNER. That's--it wasn't our determination. It was the determination of--the reviewers raised questions about that process, yes.

Mr. WESTERMAN. So what were the total dollar figures of those grants?

Ms. LERNER. I believe total they came to about $2 million but I'd have to get back to you with the precise number.

Mr. WESTERMAN. Are they still open?

Ms. LERNER. They are still open and there's about--at least at the--as of the end of May there was about $400,000 remaining on those three awards.

Mr. WESTERMAN. Okay. So one of the more startling observations made in your testimony is about how a rotator violated a one-year ban when applying for $14 million in NSF

funding and how it appears that someone within the agency tried to cover that person's tracks by creating a different ID number for that person. Do you think that this is an isolated incident with one person knowingly and willfully ignoring government ethics rules or do you have concerns that ethics violations are more widespread?

Ms. LERNER. I certainly hope that this particular creation of a second PI ID is isolated, and I don't have evidence to show that that is a widespread problem, but what we also found is, you know, it would be very difficult for us to tell if that--if--you know, who was doing that. So that is--certainly is a matter of concern for us.

Mr. WESTERMAN. So do you think that a single person overseeing all of NSF's rotating personnel might do a better job in ensuring compliance with government ethics laws?

Ms. LERNER. A single person overseeing? I think, you know, that would certainly--having one person with broad responsibility to look at, you know, the use of rotators and to ensure that they are being appropriately trained and sensitive to the issues of conflicts would help. Right now, the management is very diffuse and that makes it difficult to ensure accountability.

Chairman LOUDERMILK. In the interest of time so we have one more Member, is it all right if we--

Mr. WESTERMAN. I'll yield back, Mr. Chairman.

Chairman LOUDERMILK. Okay.

Mr. WESTERMAN. Thank you.

Chairman LOUDERMILK. Thank you, Mr. Westerman.

The Chair recognizes Mr. Tonko.

Mr. TONKO. Thank you, Mr. Chair.

While NSF's system is by no means perfect, I'm concerned by the majority's continued fixation with NSF's peer-review process, which in large part relies on IPAs. Like any organization, NSF's process--processes have room for improvement.

In response to past IG reports, NSF has taken concrete steps to improve its practices. It is likely that similar steps will be taken in response to the most recent report. However, based on what I have read, these reports are not signs of systemic problems that require dramatic changes to the overall structure of the Rotator Program. In fact, the costs at NSF has agreed to incur, which are associated with the Rotator Program, in part show how highly NSF values IPAs.

The NSF and our system of university-based research is the envy of the rest of the world. NSF's model for funding has made this program the premier university-based scientific research program. And although we all want to limit costs and be accountable, certainly when it makes sense we should be careful and weigh the savings against any possible

reduction in associated benefits.

Now, Dr. Buckius, in regard to the last series of questions, I'm assuming you might have a response. Instead of going with my questions, I'll give you the time that I have remaining to perhaps respond to that earlier series of questions.

Mr. BUCKIUS. Thank you. I appreciate that. Conflicts of interest are taken very seriously at the National Science Foundation. This is one case. This is one individual. And that individual was recommended for termination and that appointment was not renewed by NSF. Remember also NSF is the one that discovered this and told the IG, which subsequently investigated it. We also then took two of our staff that we've--that have been talked about and administratively removed them in accordance with established procedures and applicable regulations. We proceeded very deliberately in this case.

I've been at NSF, for like I said, the last 6 months. I was here 4 years before. This is the only case I have heard of. I did a couple of checks around the agency. We found one person who knew of one other case.

So the point I'm trying to make is conflicts of interest are taken very, very seriously. We can improve. Definitely we can improve and we will try, but this is just one case. And I think we've tried to handle it in as best a way we

possibly can. It's not acceptable what happened. We're not accepting what the IPA did, nor are we accepting what the two NSF staff members did, and we're trying to manage that one particular case very, very carefully.

The 10 or so recommendations that the IG provided us on Friday, I got them Friday afternoon, and I've had a chance to review them. We will definitely try to meet all of those recommendations as best we possibly can.

Mr. TONKO. Can I get another question in or are we ready to close?

Chairman LOUDERMILK. It looks like we're going to need to close. We're running out of time quickly to get to the Floor to vote so--

Mr. TONKO. Thank you. Thank you, Mr. Chairman.

Chairman LOUDERMILK. Thank you, Mr. Tonko.

Again, I thank the witnesses for their testimony and Members for their questions. I would like to enter into--enter the following documents into the record for the 2010 IG report, the 2012 IG report, the 2013 IG report, and the June 2015 redacted IG report.

Without objection, so ordered.

[The information follows:]

********** COMMITTEE INSERT **********

Chairman LOUDERMILK. And I'll also add Chairman Smith's opening statement.

Without objection, so ordered.

[The statement of Chairman Smith follows:]

********** COMMITTEE INSERT **********

Chairman LOUDERMILK. The record will remain open for 2 weeks for additional written comments and written questions for the Members. The hearing is hereby adjourned. Thank you.

[Whereupon, at 10:26 a.m., the Subcommittees were adjourned.]

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SPEAKER LISTING
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RANKING MEMBER

Congress of the United States

House of Representatives

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July 10, 2015

Richard Buckius
Chief Operating Officer
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Arlington, Virginia 22230

Dear Dr. Buckius,

On behalf of the Committee on Science, Space, and Technology, we want to express our appreciation for your participation in the June 25, 2015, hearing titled, *"Is NSF Properly Managing Its Rotating Staff?"*

We have attached a verbatim transcript of the hearing for your review. The Committee's policy pertaining to the printing of transcripts is as follows:

> *The transcripts of those hearings conducted by the Committee shall be published as a substantially verbatim account of remarks actually made during the proceedings, subject only to technical, grammatical, and typographical corrections authorized by the person making the remarks involved. Individuals whose comments are to be published as part of a Committee document shall be given the opportunity to verify the accuracy of the transcription in advance of publication.*

Transcript edits, if any, should be submitted no later than July 24, 2015. If no edits are received by the above date, we will presume that you have no suggested edits to the transcript.

We are also enclosing questions submitted for the record by Members of the Committee. These are questions that the Members were unable to pursue during the time allotted at the hearing, but felt were important to address as part of the official record. **All of the enclosed questions must be responded to no later than July 24, 2015.**

All transcript edits and responses to the enclosed questions should be submitted to us and directed to the attention of Brian Corcoran at Brian.Corcoran@mail.house.gov. If you have any further questions or concerns, please contact Mr. Corcoran at (202) 225-6371.

Dr. Buckius
July 10, 2015

Thank you again for your testimony.

Sincerely,

Rep. Barry Loudermilk
Chairman
Subcommittee on Oversight

Rep. Barbara Comstock
Chairwoman
Subcommittee on Research and Technology

cc: Rep. Don Beyer
Ranking Member
Subcommittee on Oversight

Rep. Dan Lipinski
Ranking Member
Subcommittee on Research and Technology

Enclosures: Transcript, Member Questions for the Record

HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON OVERSIGHT
SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY

Is NSF Properly Managing Its Rotating Staff?
Thursday, June 25, 2015

QUESTIONS FOR THE RECORD

Questions submitted by Oversight Subcommittee Chairman Barry Loudermilk and Research and Technology Chairwoman Barbara Comstock

Dr. Richard Buckius

1. NSF matches the IPAs salaries and fringe benefits they were making at their home institutions, and also reimburses them for travel, temporary living expenses, lost consulting income, and state income taxes. The IG's March 20, 2013 report found that at the time, the annual ***additional*** costs for NSF's then 184 IPAs was over $6.7 million, or roughly $36,000 per IPA.

    a. What is the 2014 or current annual costs related to all IPAs?

2. The March 20, 2013 IG report stated that the IPA rotator program is mutually beneficial to the NSF, the home institution, and the individual. If that is the case, why is the NSF fronting most of the additional costs associated with IPAs?

    a. Does the NSF negotiate with the IPA's home institution to share more than 15 percent of the associated costs?

    b. Under what circumstances does this usually take place?

3. Are the benefits the NSF receives from hiring IPAs who make over the federal executive pay limit proportionate to the costs associated with those employees?

    a. Who makes that decision?

    b. Do you approve these types of decisions?

4. IPAs continue to receive fringe benefits, such as retirement health and life insurance, from their home institutions. The total of these fringe benefits totaled almost $790,000 in 2013. Dr. Buckius, what are the current total fringe benefit costs at the NSF associated with IPAs?

    a. Do costs associated with fringe benefits factor into the decision to hire particular IPAs?

5. The March 20, 2013, IG report stated that the NSF did not know the components or costs comprising the fringe benefit package it pays for IPAs. The NSF simply reimburses the home institution for its contribution to the IPA's fringe benefit package based on percentage or dollar amount provided by the institution. What information is made available to the NSF regarding IPA fringe benefits?

    a. Is the NSF concerned that they are covering costs they are not fully informed of?

    b. Is that practice a responsible use of taxpayer dollars?

6. According to the IG, the NSF paid employer contributions for IPA fringe benefits at rates ranging as high as 60 percent of the IPA's salary. To put this in context, the NSF paid its permanent employees an average fringe benefit of 26 percent. Why is the NSF paying fringe benefits at such a high rate for temporary employees?

    a. Has the NSF negotiated with the home institution to help pay for their fringe benefit package while the employee is an NSF IPA?

7. The NSF's Independent Research and Development program provides IPAs paid time and travel to return to their home institution and continue their research while working at the NSF. IPAs are allowed to spend up to 50 works days a year on Independent Research and Development. In 2012, 171 of the 184 IPAs participated in this program, representing 93% of the IPAs at that time. Dr. Buckius, what is the current number of IPAs participating in this Independent Research and Development Program?

    a. According to the IG in 2012, the additional cost incurred by the NSF totaled over $1 million to allow IPAs to participate in the Independent Research and Development program. Does the home institution pay for any of these associated costs?

8. IPAs can receive household move or partial reimbursement for lodging, meals, and incidental expenses for temporarily relocating to the NSF when becoming an IPA. In 2012, 92% of IPAs came from outside of the Washington, D.C. area and opted to receive temporary living expenses. This cost the NSF approximately $3.8 million annually. What is the current IPA relocation related costs the NSF is paying?

    a. Has there been any discussion of ways to lower the costs incurred by relocating IPAs to the NSF headquarters?

9. How much time do IPAs physically need to be present at the NSF to effectively fulfill the duties of their assignments?

10. Some IPAs are placed by the NSF into managerial positions within the organization. Dr. How many IPAs are currently in managerial positions at NSF?

a. When hiring IPAs for managerial positions, what qualities do you look for and how does that process work?

11. What type of training do IPAs who become managers receive when they arrive at the NSF?

    a. What does the training consist of?

    b. Is there a time period in which an IPA is required to receive proper training when joining the NSF?

    c. Does the NSF have safeguards in place to ensure IPAs complete the necessary training?

    d. In the recent 2015 IG report, one IPA was able to delay receiving proper ethics training for more than a year. Is this acceptable?

12. Many of these IPAs lack the experience of managing in a federal program. Could you please describe the struggles that the NSF's IPAs face when transitioning to the NSF's managerial positions.

    a. What resources are available for IPAs who request or require assistance and direction when placed in a NSF managerial position?

13. How many IPAs in managerial positions participate in the Independent Research and Development program?

    a. How are their managerial responsibilities impacted when they are absent for up to 50 days of the year through the Independent Research and Development program?

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

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October 7, 2015

Dr. James L. Olds
Assistant Director
Directorate for Biological Sciences
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Dear Dr. Olds,

On behalf of the Committee on Science, Space, and Technology, we want to express our appreciation for your participation in the September 18th hearing titled, "*NEON Warning Signs: Examining the Management of the National Ecological Observatory Network.*"

We have attached a verbatim transcript of the hearing for your review. The Committee's policy pertaining to the printing of transcripts is as follows:

> *The transcripts of those hearings conducted by the Committee shall be published as a substantially verbatim account of remarks actually made during the proceedings, subject only to technical, grammatical, and typographical corrections authorized by the person making the remarks involved. Individuals whose comments are to be published as part of a Committee document shall be given the opportunity to verify the accuracy of the transcription in advance of publication.*

Transcript edits, if any, should be submitted no later than October 20, 2015. If no edits are received by the above date, we will presume that you have no suggested edits to the transcript.

We are also enclosing questions submitted for the record by Members of the Committee. These are questions that the Members were unable to pursue during the time allotted at the hearing, but felt were important to address as part of the official record. **All of the enclosed questions must be responded to no later than October 20, 2015.**

All transcript edits and responses to the enclosed questions should be submitted to us and directed to the attention of Christian Rice at Christian.Rice@mail.house.gov. If you have any further questions or concerns, please contact Mr. Rice at (202) 225-6371.

Thank you again for your testimony.

Sincerely,

Rep. Barbara Comstock
Chairwoman
Subcommittee on Research and Technology

Rep. Barry Loudermilk
Chairman
Subcommittee on Oversight

cc: Rep. Dan Lipinski
Ranking Member
Subcommittee on Research and Technology

Rep. Don Beyer
Ranking Member
Subcommittee on Oversight

Enclosures: Transcript, Member Questions for the Record

HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY
SUBCOMMITTEE ON OVERSIGHT

"NEON Warning Signs: Examining the Management of the National Ecological Observatory Network"

Dr. James L. Olds, Assistant Director for Biological Sciences, National Science Foundation

Questions submitted by Rep. Barbara Comstock, Chairwoman, Subcommittee on Research and Technology and Rep. Barry Loudermilk, Chairman, Subcommittee on Oversight

1. What formal and informal communications did NSF and NEON, Inc. have between January 1, 2013-September 18, 2015 regarding construction schedule and budget issues at NEON? As part of your response, please provide copies of every relevant e-mail, letter, memorandum, record, note and text message as well as any internal NSF staff correspondence or notes regarding NEON's schedule or budget.

2. According to the NSF Inspector General Alert Memorandum issued on September 15, 2015, it appears that NEON, Inc. moved $35 million of contingency funds into the base construction budget.[1]

    a. Has NSF determined the amount of funds that NEON, Inc. has moved from contingency into the base construction budget? If yes, what is the amount?
    b. Did NSF approve the transfer of contingency funds? If yes, please provide documentation of that approval. If no, what actions does NSF plan to take to correct the improper transfer?

3. The NSF Inspector General has previously recommended that NSF should retain contingency funds for projects like NEON, and pay the contractor as those expenses are approved as appropriate contingency costs.[2] NSF has not agreed with this recommendation.

    a. Why has NSF not adopted this recommendation?
    b. Would retaining contingency funds for NEON have helped alert NSF to the possibility of a cost overrun sooner?

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[1] National Science Foundation Office of Inspector General Alert Memorandum, September 15, 2015. Available at: http://www.nsf.gov/oig/_pdf/15-3-001-NEONOverrun.pdf

[2]National Science Foundation Office of Inspector General Audit Report No. OIG-15-6-001. Available at: http://www.nsf.gov/oig/_pdf/15-6-001-neon.pdf
National Science Foundation Office of Inspector General Audit of NSF's Management of Contingency in the EarthScope Awards, Report No. 12-2-010. Available at: http://www.nsf.gov/oig/_pdf/12-2-010-Contingency.pdf

4. According to Dr. James Collins' testimony, at least "five previous NSF MREFC projects underwent scope revisions, management adjustments, and instrument configuration changes during construct based on challenges with increased costs for production of instrumentation, delayed site permitting, and schedule delays." Is this statement correct? If so, please provide a brief description of each project that underwent a significant scope revision, including the estimated total dollar amount of the potential cost overrun that necessitated a revision.

Attachment 1

Timeline of Identification of Issues and Actions Taken

2013

Date	Activity	Involvement	Outcomes
January 28-29	NEON CEO and PM/COO visit to NSF	NSF Program and BIO OAD Staff	Discussion Schedule slippage, strategic planning, CCB/CRE, procurement/production, senior Staffing
February 7-8	NEON Inc. Board Meeting	NSF Program Staff, NEON project Staff, NEON Board	
February 11-15	NSF visit to NEON facilities, Boulder CO Site visit and program analysis of the new schedule and review material	NEON Program and BIO OAD Staff	Raised significant concerns about production/procurement; cyberinfrastructure and data products
May 13-17	Baseline Review, Boulder, CO	NSF Program Staff, External Review Team, DACS representatives	Areas requiring improvement: issues identified in February site visits with schedule, manufacturing, logistics, data products development, aligning budget and schedule.
May 30-31	NEON Inc. Board Meeting	NSF Program and BIO OAD Staff	Reiterated concerns about the lack of schedule float
August 19-29	In-depth site visits on construction issues causing delays	NSF Program Staff	Beginning of extensive site visits to understand construction schedule delays
September 16-20	In-depth site visits on construction issues causing delays	NSF Program Staff	
October 2	Letter to NEON Inc. Board for their Meeting	NSF Program Staff	Significant concerns raised about the status of site deployments and lack of deployments of sensors. Root cause is the leadership of the construction project and of NEON, Inc.
December 2-5	Annual Construction Review	NSF Program Staff, External Review Team, DACS and LFO representatives	Areas requiring improvement: Schedule performance and tool effectiveness, cost basis, production/procurement, cyberinfrastructure and data product deliver, transition to operations

2014

Date	Activity	Involvement	Outcomes
January 27-31	In-depth site visits on construction issues causing delays	NSF Program Staff	Focus on Data Products and CYI issues relating to delay in delivery issue identification and plan to resolve, NEON project controls, budget, and schedule

February 4-7	NEON Inc. Board Meeting	NSF Program Staff, NEON project Staff, NEON Board	Discussions included CI and data products delivery
February 24-27	In-depth site visits on construction issues causing delays	NSF Program Staff	Topics included strategic management, EVM, performance baseline, production/procurement, data product log jam.
April 16-18	In-depth site visits on construction issues causing delays	NSF Program Staff	Discussions to develop transitions to operations criteria
May 13	NEON, Inc. Staff visit NSF	NSF Program Staff, BIO OAD Staff, NEON, Inc. Staff	Discussions about the status of the cost to complete and schedule updates, milestones, transition to operations and Observatory capability delivery
May 14-16	NEON Inc. Board Meeting, Airlie House, VA	NSF Program Staff, NEON project Staff, NEON Board	
May 19-20	NSF visit to NEON facilities, Boulder CO	NSF Program Staff	Topics included strategic management, EVM, performance baseline, production/procurement, data product log jam.
August 12	BIO Letter	BIO AD	NEON Board requested for its plans to address management concerns
August 25-29	Baseline Review, Boulder, CO	NSF Program Staff, External Review Team, LFO & DACS representatives	Positive report. NSF representatives noted concerns about the depth of analysis of the cost book and remaining contingency following the proposed re-plan.
September 20-21	Science Capability Review, Boulder, CO	STEAC, NSF Program Staff (observers)	
September 22-24	NEON Inc. Board Meeting, Boulder, CO	NSF Program Staff, NEON project Staff, NEON Board	NSF excluded from several important discussions.
October 1	New Observatory Director appointed		C. J. Loria appointed and named as PI of operations award.
November 6	IPT Kick-Off Meeting, NSF	NSF Program Staff, LFO, DACS, OGC, OLPA	Largely informational meeting about the status of NEON construction and transition to operations
November 10	LFO September Monthly Report	NSF Program Staff, LFO	NEON cost performance index green. NEON schedule performance index red.
November 18	Call with NEON Board Chair, Jim Collins	NSF Program Staff	NSF informed Board Chair that NSF would participate in all Board meeting sessions and phone calls from now on.
November 26	BIO Science Engagement Working Group (SEWG) Charged	BIO and CISE Program Directors, NSF Program Staff	Development of messaging on NEON transition to operations and early science. Development of a DCL for use of NEON data.
December 1-5	Annual Work Plan Review	NSF Program Staff, External Review Team	Positive review based on outcomes of the August 2014 Baseline Review

December 3	House Science Committee Hearing	Alison Lerner (NSF IG), Anita Bales (DCAA)	IG audit of NEON management fee usage
December 8	NSF Program Meeting with AIBS	NSF Program Staff, AIBS leadership	Update on NEON construction and transition to operations

2015

Date	Activity	Involvement	Outcomes
January 26-28	Operations Kick-Off Review, Boulder, CO	NSF Program Staff, External Review Team,	Concern about loss of contingency, lack of a clear plan for T2O
January 29	NEON Science Day, NSF	NSF Program Staff, NEON project Staff, NEON Inc. CEO	Opportunity for Program directors across BIO to meet the NEON Staff and understand what NEON is funded to deliver and when.
January 29	NEON Leadership Meeting	NSF Program Staff, NEON Inc. CEO, Project Manager, Observatory Director	Presentation indicating rapid decrease in contingency, delays in planned T2O activities, evidence of financial errors.
February 3	House Science Committee Hearing	Richard Buckius (NSF COO), Jim Collins (NEON Board Chair)	NEON management fee usage
February 5-6	NEON Board Meeting, Boulder, CO	NSF Program Staff, NEON project Staff, NEON Board	NSF Program expressed serious concerns about the T2O plan and containment of costs and schedule escalation. NEON Board instituted additional oversight of finances, operations, and communications. Notification of planned Operations Review in June 2015 after which NSF would make a decision to recomplete NEON operations after Observatory construction is completed.
February 19-20	France Cordova visit to NEON	NSF Director, BIO leadership and NSF Program Staff	Opportunity for the NSF Director to see the NEON Headquarters and meet the NEON leadership.
March 4	IPT Meeting	NSF Program Staff, LFO, DACS, OGC, OLPA	Schedule and contingency concerns discussed. Suggested due dates for a revised scope management plan were given. Updates on audit resolution activities provided (associated with cost estimates).
March 19-20	NEON Board Meeting, Boulder, CO	NSF Program Staff, NEON project Staff, NEON Board	NEON Board follow-up on outcomes of additional oversight
March 26	ESA and AIBS Visit, NSF	NSF Program Staff, society leadership	Update on NEON construction and transition to operations
First week of April	"NEON DCL: Stimulating Research Using NEON Data" posted on the NSF web site	NEON SEWG	Pitches for EAGERS and workshops requested by May 8 for funding in FY 2015
April 16	IPT Meeting	NSF Program Staff, LFO, DACS, OGC, OLPA	Emergency meeting to discuss schedule slippage and potential cost overruns. Recommendation to convey concerns to NEON via a warning letter and postpone the Operations Review scheduled in June until after the project is in compliance.
April 16	LFO January/February Monthly Report	NSF Program Staff, LFO	NEON cost performance index and schedule performance index green.

April 20	NEON Staffing reorganization	NSF Program Staff, NEON CEO	C.J. Loria terminated after submission of a request for reorganization submitted
April 21	Phone call with NEON Board Chair	BIO OAD Staff and NEON Program Staff	Conveyed outcomes of the IPT meeting
May 14	Delivery of warning letters to NEON, Inc. from DACS and BIO	DACS leadership, BIO OAD and Program Staff	DACS letter listed non-compliant items and appendix lists required materials and deadlines for delivery. BIO letter referenced DACS letter and indicated that assistive visits will begin to correct non-compliance. Planned Operations Review replaced with an assistive visit.
May 14	Phone call with NEON Board Chair	BIO OAD and Program Staff	Reviewed the warning letters
May 14	Phone call with NEON Inc. CEO and Project Manager	BIO OAD Staff and NSF Program Staff	Reviewed the warning letters
May 21-22	NEON Board Meeting, Boulder CO	NSF Program Staff, NEON project Staff, NEON Board	Discussion of the warning letters and NSF follow-up actions
May 25-29	NSF Assistive Visit, Boulder, CO	NSF Staff (BIO, LFO, DACS)	Improvements to financial reporting and EAC/ETC reporting
June 1-5	NSF Assistive Visit, Boulder, CO	NSF Program Staff	CI discussions
June 8-12	NSF Assistive Visit, Boulder, CO	NSF Program Staff, (BIO,DACS, LFO), NEON Inc. CEO, NEON Staff	NSF Program, LFO and DACS discussion of issues. Sufficiency review.
	BIO briefing document for NSF Director	Prepared by NSF Program Staff	Identified issues with the NSF review process that missed critical issues with NEON management
June 26	Briefing for NSF COO	BIO and LFO Staff	Provided a summary timeline showing integrated activities of Program, LFO, and DACS to bring NEON into compliance
June 29	LFO March/April Monthly Report	BIO Program Staff, LFO	NEON cost performance index green and schedule performance index yellow.
July 10	NSF Program Meeting with OGC	BIO and OGC Staff	Discussion of options for replacement of NEON Inc. as the managing organization
July 14 -17	NEON Scope Management Meeting, Arlington, VA	BIO Program Staff, community scientific experts, NEON Inc. CEO, Project Manager and Visiting Observatory Director, NEON Board representatives, STEAC Chair	Agreement on scope of the funded construction project, identification of scope management options, development of a communications plan.
July 20	NEON Scope Management Meeting debrief	DACS, LFO, OGC representatives	Provided summary outcomes of the meeting and discussed next steps, including development of a directive letter to come from DACS
July 27-31	NSF Assistive Visit, Boulder, CO	BIO, DACS, and LFO Staff	Follow-up on sufficiency review outcomes, business processes, financial reporting, supply chain issues, CI
July 29	NSB call	NSF Director and COO, NSF Program Staff, NSB Staff, LFO Staff	Briefing on the current issues with NEON and the outcomes of the scope management meeting

July 30	NSB letter	NSF Director and NSB Chair	Written summary of the Board Call discussion for the NSB Executive Committee
July 31	DACS letter	DACS Officer	Scope Management Directive letter that outlines the revised project documentation required descope NEON and provide a revised cost and schedule to complete the remaining scope.
September 3	NEON IPT	NSF Program Staff, LFO, DACS, OGC, OLPA	Award/Procurement Management Issues with respect to the NSF BIO, DACS, and LFO efforts underway with NEON, Inc. and the coordination necessary to ensure effective outcomes.
September 15	Efficiency Management Plan Review	BIO Program Staff, DACS, and LFO Staff	Plan to reduce NEON, Inc. corporate costs and improve efficiencies on the Project to reduce the overall construction project descope costs.
September 21-25	NSF Assistive Visit	BIO, DACS, and LFO Staff	Follow up on Shared Supply, Financial Expenditures, Transition to Operations, Data Products, Cost Estimating, PMCS Plan, Summary Schedule, Key Milestones and CP Analysis, Contingency Management Plan, Risk Management Plan and Risk Register, Configuration Control and PCCB & CRE
September 25	Management Fee Determination	DACS Officer	Letter to NEON, Inc. on the amount and allocation of management fee that would be allowable based on June 1, 2015 request by NEON, Inc.

NEON Change Request

Date Submitted	6/5/2015	Award	1029808
CRE Title	Cost & Schedule Baseline Replan Application for Cost	CRE #	2.04.0085
WBS Title	Total Program	WBS	2-04

Scope: This CRE (with the attached memo) addresses the revised EaC/EtC costs as presented during the August, 2014 Cost & Schedule Baseline Review

Justification: Motivation

The NEON Construction schedule and budget were subject to a series of reviews since the start of the program. Three consecutive reviews in 2012 and 2013 concluded that the materials presented by NEON did not provide a sound justification for both the schedule and cost. After the May 2013 review, the project initiated a schedule management change from a functionally oriented schedule to a product delivery oriented one. At the December 2013 review, the cost was not properly integrated with the schedule which in addition did not contain sufficient float for the stage of the program. With the change in Project Management in March 2014, NEON undertook a complete revision of the schedule and the estimate to complete using a bottoms-up approach, followed by an joint confidence analysis that integrated cost, schedule and risk. The NEON project prepared a re-plan of all activities and a new estimate to complete using an incremental development plan (see Figure on the right).

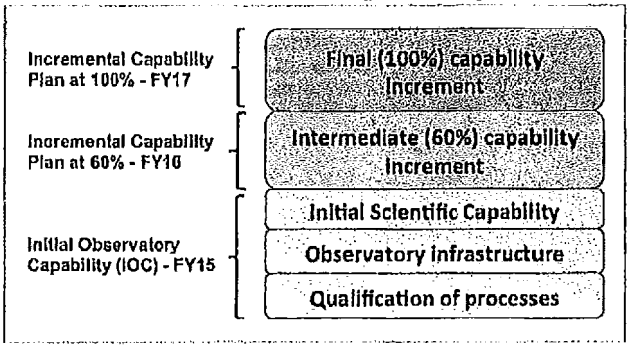


Figure 1. Incremental capabilities approach

The motivation for the replan was fourfold:

- the project was still using the 2009 cost estimate and no revision had been made since then;
- the need to move from a functionally driven schedule to a product oriented schedule to focus on an incremental delivery of the Observatory infrastructure and Science capabilities that provides a better management of the program development;
- the need to incorporate key project milestones to the development plan that provide a sense of progress and enable an accurate tracking; and
- the recognition from past reviews that the project progress was slipping and there was a need to get the schedule and cost back on track and under control.

The review held in August 2014 applauded the re-plan and the joint confidence level analysis that integrated risks, schedule and cost. The latter provided 80% level of confidence as follows:

- End of project: March 2018
- EtC $270M if risks cannot be mitigated
- Etc $ 263 if risks are mitigated

The NSF recommended the implementation of the replan following submission and approval of a CRE that captured the required contingency calls on both cost and schedule following the replan.

The calculated risk exposure was in the order of $9M, which provided an estimate of the minimum contingency level desired for the remainder of the construction project. The new contingency cost level was derived from the difference between the new Budget at Complete (BAC, Estimate to Complete plus Actuals to date, $411,442,787) and the Total Project Cost (TPC, $433,789,931) as indicated below:

Contingency level after replan = TPC – BAC = TPC – (EtC + ACWP) = $22,347,144

Since the risk exposure was less than half of the newly calculated contingency level, the latter was considered in August 2014 adequate to complete the remainder of the construction project as it provided a contingency profile of about $7M/yr. In fact, the actual calls on contingency in FY15 to end of May 2015 is $3,217,835, which is well within the linear profile of $7M.

The replan addressed all scoped NEON capabilities and a new schedule was established in accordance with an incremental approach to the delivery of the Observatory. The initial development plan as reflected in the old IMS had several main deficiencies: 1) it did not include all scoped activities; 2) it did not include the logical linkages to determine critical paths; 3) it contained a high number of critical milestones concentrated at the end of construction, which posed a high risk of schedule slippage; and 4) it was a functional schedule rather than a product oriented one. The new IMS addressed these deficiencies by including all scoped activities, eliminating duplicate activities, rearranging activities using a product oriented delivery, correcting linkages and anticipating key milestones.

In addition to the above and related to the functional approach, the project had executed inefficiently and translated in a significant lack of traction in terms of deliveries. The subsequent impact is that more deliverables were concentrated in the remainder of the schedule that caused further slippage of the date of end of construction.

The strategy NEON used to replan the sequence of activities took into account a number of factors, namely:

- Permitting – the timeframe on which NEON believes they can acquire the necessary permits for a specific activity (site characterization, construction, deployment, etc.)
- Seasonality – the optimal season in which to conduct an activity (building in winter in Alaska, sampling during green season, etc.)
- Resources – the number of resources available for a particular activity (# of construction supervisors, # of field deployment teams)
- Synergistic Opportunities – the ability for one resource/set of resources to cover off multiple areas concurrently (i.e. one construction supervisor managing construction at two nearby sites)
- Supply Chain – the availability of equipment, materials, power, etc. to build out a site

- Science needs – whether or not construction/deployment during a particular window will negatively impact necessary science activities (i.e. aquatics deployment concurrent with sampling activities)

Based on the above factors, the PTLs generate their optimal schedule execution for incorporation into the schedule. Once the activities have been incorporated, a collaborative meeting was held to discuss the linkages and to perform further optimization of the schedule.

Furthermore, the addition of Observatory delivery incremental milestones provided the means to group logically the multiple parallel deliveries of the NEON project allowing thus the determination of critical paths to those milestones and a better management and control of the construction development. Finally, the incremental delivery of the Observatory allows capturing lessons learned at an earlier stage of the development (as soon as FY15/16) while still having time to implement eventual corrective actions.

The new sequencing of deployments and activities is summarized at high level in the schedule overview shown in Figure 2. As a consequence of all corrections and adjustments made to the IMS and development plan, the overall schedule necessitated to use all schedule contingency that was available (88 days) and further introduced a slippage of 3 months beyond the end of construction (marked by the Final Observatory Operational Capabilities Review, FOOCR) that was originally planned by end of Q4 FY17 and is now planned by the end of Q1 FY18. This change of the end date of the NEON Construction project does not impact the TPC. NEON will work with the NSF on re-establishing adequate schedule float in a follow-on CRE and after further re-planning.

The table below compares the major milestone dates from August 2014 Schedule and Cost review with the dates from before the review.

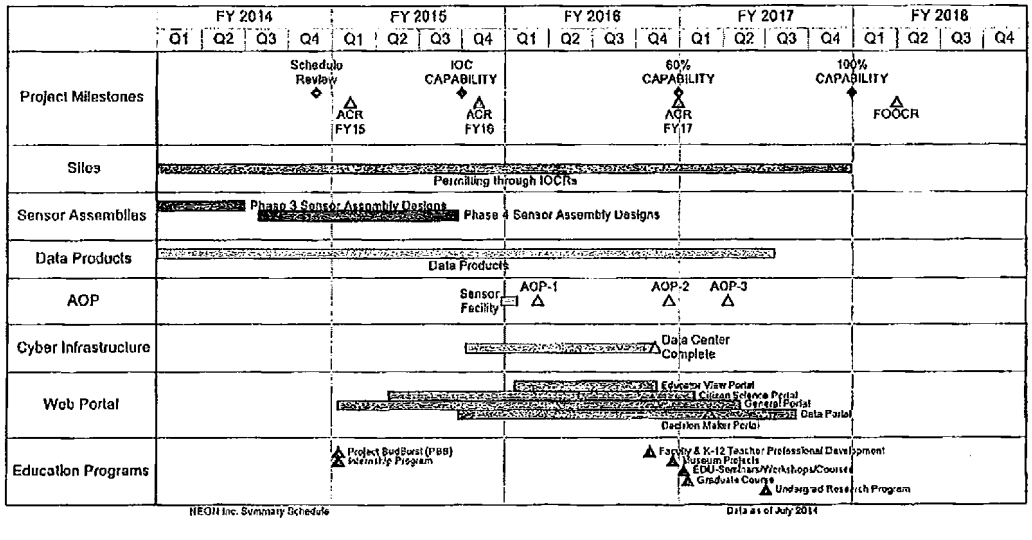


Figure 2. NEON high level schedule overview

DWBS	Activity ID	T20 (Pre-Aug14 review)	T20 (Aug14 review)	Variance (months)
SITES	Domain: 01 NORTHEAST	17-Jul-14	31-Dec-14	6
SITES	Domain: 02 MID-ATLANTIC	27-May-14	31-Jan-15	8
SITES	Domain: 03 SOUTHEAST	11-Sep-13	30-Nov-14	15
SITES	Domain: 04 ATLANTIC NEOTROPICAL	10-Mar-15	18-May-15	2
SITES	Domain: 05 GREAT LAKES	5-Dec-14	31-Dec-14	1
SITES	Domain: 06 PRAIRIE PENINSULA	31-Mar-16	6-Jul-15	-9
SITES	Domain: 07 APPALACHIAN/CUMBERLAND PLATEAUS	18-Nov-14	18-Mar-15	4
SITES	Domain: 08 OZARKS COMPLEX	24-Nov-14	5-Dec-14	0
SITES	Domain: 09 NORTHERN PLAINS	1-Oct-14	29-May-15	8
SITES	Domain: 10 CENTRAL PLAINS	28-Oct-13	30-Nov-14	13
SITES	Domain: 11 SOUTHERN PLAINS	11-Mar-15	9-Jun-15	3
SITES	Domain: 12 NORTHERN ROCKIES	12-Jul-16	5-Dec-16	5
SITES	Domain: 13 SOUTHERN ROCKIES	1-May-15	30-Jun-15	2
SITES	Domain: 14 DESERT SOUTHWEST	11-Mar-15	26-May-15	3
SITES	Domain: 15 GREAT BASIN	11-May-15	21-May-15	0
SITES	Domain: 16 PACIFIC NORTHWEST	2-May-16	6-Jul-16	2
SITES	Domain: 17 PACIFIC SOUTHWEST	12-Jul-16	25-May-16	-2
SITES	Domain: 18 TUNDRA	13-Sep-16	25-Aug-16	-1
SITES	Domain: 19 TAIGA	8-Sep-15	30-Aug-16	12
SITES	Domain: 20 PACIFIC TROPICAL	10-May-16	12-Sep-17	16
Portals	General Web Portal	2-Dec-14	14-Oct-14	-2
Portals	CSA Web Portal	2-Dec-14	28-Jan-15	2
Portals	Citizen Science Web Portal	28-Oct-16	4-Nov-16	0
Portals	Educator Portal Landcover, Landuse, Land Processes	(1)	23-Oct-15	-
Portals	Educator Portal Atmosphere	(1)	27-Apr-16	-
Portals	Educator Portal Ecosystem Health and Diversity	(1)	16-Aug-16	-
Portals	Decision Maker Portal	(1)	5-Dec-16	-
EDU	Project Bud Burst Program	17-Mar-14	16-Oct-14	7
EDU	Museum Projects	2-May-16	20-Sep-16	5
EDU	Professional Development program	18-May-16	2-Aug-16	3
EDU	Undergrad Programs	1-Mar-17	4-Apr-17	1
EDU	Internship programs	31-Dec-13	14-Oct-14	10
EDU	Graduate programs	19-Oct-16	21-Oct-16	0
EDU	Workshops, Seminars & Courses	17-Sep-16	27-Oct-16	1
AOP	AOP Lab IOCR	5-Oct-15	5-Oct-15	0
AOP	AOP Payload 1 IOCR	31-Aug-15	10-Dec-15	3
AOP	AOP Payload 2 IOCR	12-May-16	9-Sep-16	4
AOP	AOP Payload 3 IOCR	19-Sep-16	11-Jan-17	4

N.B. milestones related to aggregated data products is still being worked
(1) activity in scope, but milestone was not in IMS

Following the NSF guidance to implement this replan, this change request addresses the following:

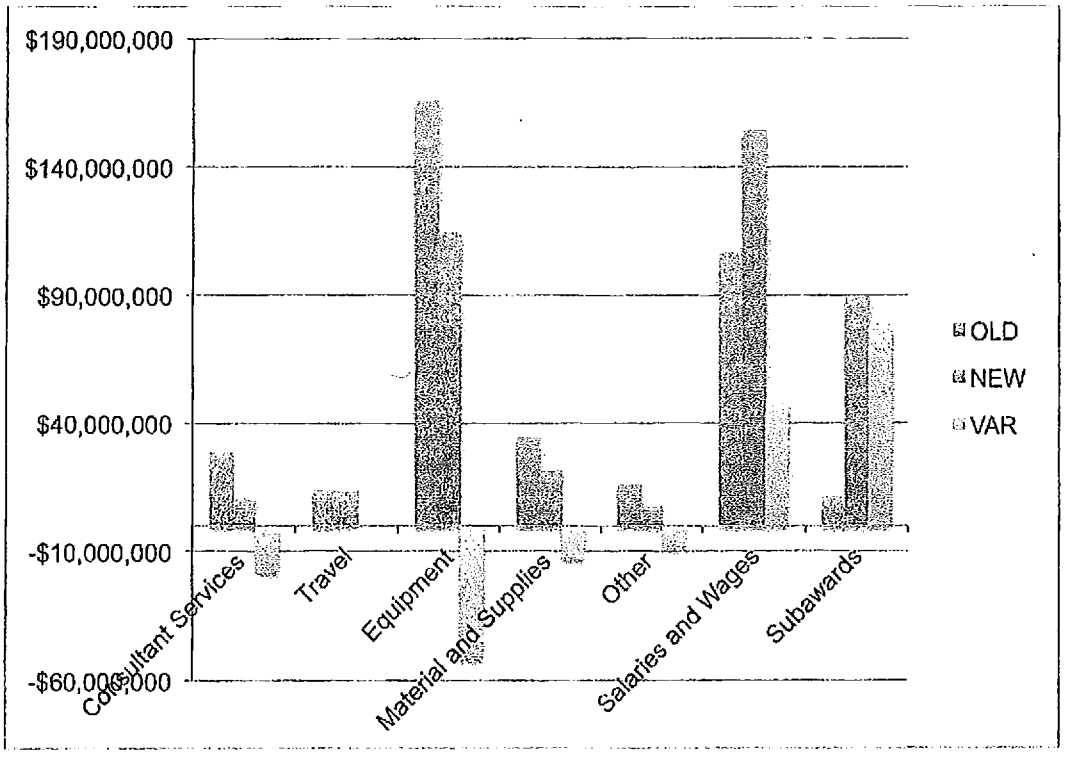
- Cost contingency: use $35,142,305 from cost contingency, which changes the cost contingency from $57,489,451 (before replan) to $22,347,144 (after replan).
- Schedule contingency: use 88 working days of schedule contingency (May 25th 2017 to September 30th 2017) and additional 3 months to change end date of Construction to end of Q1 FY18 (December 31st 2017), which changes the schedule contingency from 88 (before replan) to -60 (after replan).
- Performance: no changes to NEON scope or performance are requested with this CRE.

With the implementation of this CRE, NEON establishes a new cost baseline and a realistic construction schedule.

Analysis of BAC – per fastlane categories

As a consequence of the review of the EtC, the BAC changed. The following table provides an overview of the old and new BAC as well as the variance between the two. The graphs below provide the comparison between the EAC right before the replan and after. The following sections describe the reasons for the changes in each category.

	OLD	NEW	VAR	%
Salaries and Wages	$106,472,777	$154,336,584	$47,863,807	45%
Travel	$13,781,629	$13,430,219	$351,410	-3%
Consultant Services	$28,490,024	$10,542,714	$17,947,310	-63%
Equipment	$165,811,376	$114,522,769	$51,288,607	-31%
Material and Supplies	$34,326,067	$21,433,940	$12,892,126	-38%
Subawards	$11,411,318	$89,774,508	$78,363,190	687%
Other Direct Costs	$16,007,293	$7,402,053	$8,605,240	-54%
TOTAL	$376,300,482	$411,442,787	$35,142,305	9%


$190,000,000
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Consultant Services
Travel
Equipment
Material and Supplies
Other
Salaries and Wages
Subawards
OLD
NEW
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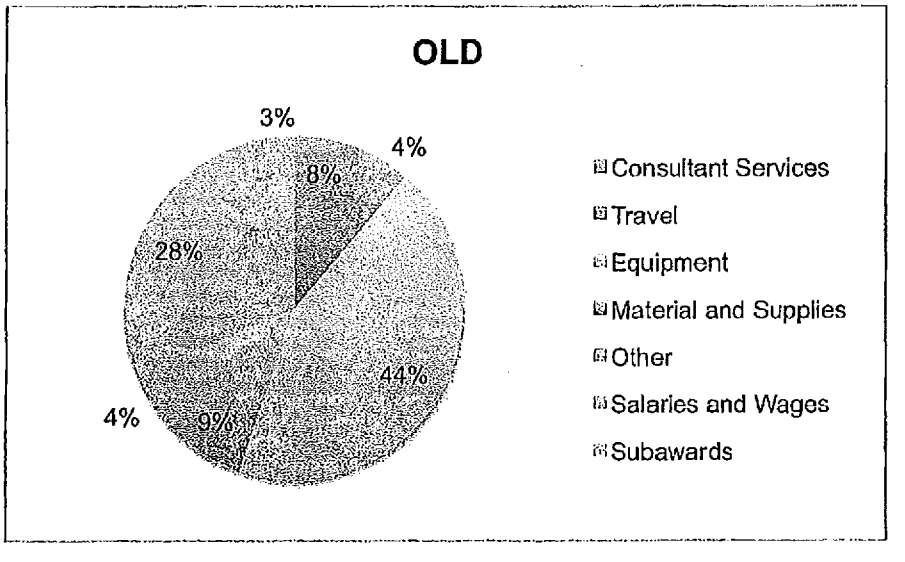
OLD
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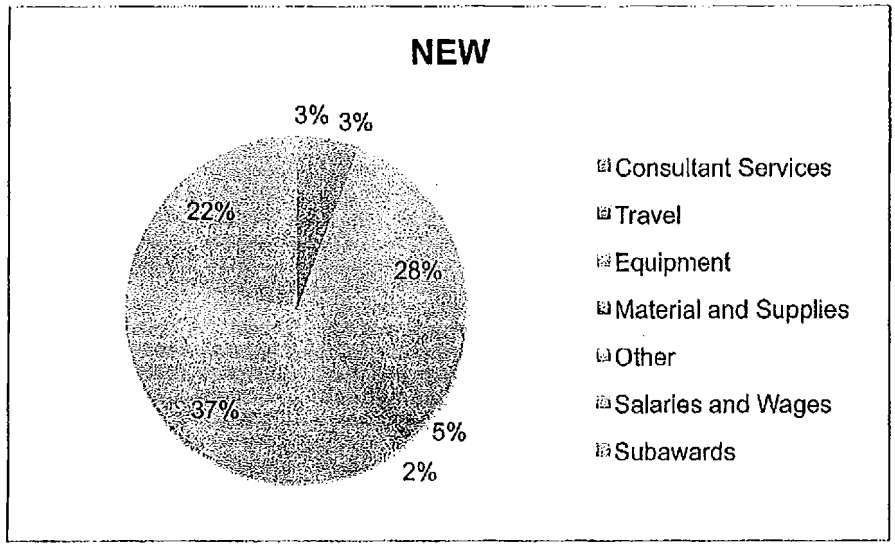
Consultant Services
Travel
Equipment
Material and Supplies
Other
Salaries and Wages
Subawards



Salaries and wages

The updated labor costs were calculated using the resource loaded Integrated Master Schedule (IMS). The main reasons for the increase of $47,863,807 (45% increase) in this category is due to the following:

- Extension of the program duration: The increased duration of the program from five (5) to seven (7) years resulted in an extension of labor to cover the additional constructions years. The labor cost for 2 years based on the average of labor actuals from project inception to date is on the order of $52M.
- Delay in Transitioning to Operations: The requirements for the start of transitioning to Operations the completed Observatory capabilities were not met until end of 2014. As a primary consequence, Field Operations labor and the costs of the facilities were carried over for a longer period than anticipated in the original plans. The labor cost for this is $3.4M. Labor cost because of delay in transitioning EDU programs is $352K.
- Underestimated level of effort: the scope of CYI was underestimated for resulting in an increase of labor cost.

Synergies were also explored and implemented across the team in order to contain the increase, e.g. Systems Integration and Validation, Integrated Product Teams for sensor assembly designs and development of data products. The

	Old BAC	New BAC	Variance
FCC - 2.01	$6,123,311	$9,372,324	$3,249,013
ENG - 2.02	$2,815,332	$11,482,405	$8,667,074
CYI - 2.03	$16,349,702	$24,699,028	$8,349,326
PMO - 2.04.10	$4,465,359	$9,681,253	$5,215,894
PSE - 2.04.20	$630,305	$1,877,427	$1,247,123
PER - 2.04.30	$5,431,827	$3,362,987	$(2,068,840)
SCI - 2.04.70	$2,079,089	$3,549,430	$1,470,340
CLA - 2.04.75	$572,629	$321,629	$(251,000)

PMCS - 2.04.80	$3,848,195	$5,975,052	$2,126,857
FOPS - 2.04.95	$7,721,116	$11,895,390	$4,174,274
CVAL - 2.05	$1,376,335	$2,974,692	$1,598,357
EDU - 2.06	$7,746,710	$6,840,399	$(906,311)
SIV - 2.07	$20,102,472	$23,690,842	$3,588,370
PROD - 2.08	$3,024,108	$5,744,317	$2,720,209
DPS - 2.10	$4,305,289	$5,102,067	$796,778
FIU - 2.11	$3,914,580	$5,864,327	$1,949,747
FSU - 2.14	$5,256,165	$7,661,147	$2,404,982
AOP - 2.15	$5,611,733	$9,264,037	$3,652,303
AQU - 2.16	$5,098,520	$4,977,831	$(120,688)
TOTAL	**$106,472,777**	**$154,336,584**	**$47,863,807**

Travel

The travel plans for all WBS was re-evaluated using actuals leading to an overall decrease of the cost of this category by $351,410 (3% reduction). The reasons are:

- Use of a more refined basis of estimate. Prior to the replan, a parametric value was used to calculate the number and cost of trips. For the replan, the number of trips was reassessed with an emphasis on reducing the traveling requirements (duration, number of travels) and taking into account the travel destinations (use of GSA rates). As a result, the use of more accurate estimates led to a reduction of cost in this category.

In addition, a transfer of costs was performed between WBSs following a project reorganization performed in 2013, e.g. from 2.02 ENG to 2.07 SIV where also a refined estimate was used with subsequent reduction of cost.

	Old BAC	New BAC	Variance
FCC - 2.01	$2,212,395	$2,037,187	$(175,208)
ENG - 2.02	$5,472,087	$410,849	$(5,061,238)
CYI - 2.03	$352,246	$339,474	$(12,771)
PMO - 2.04.10	$503,385	$575,118	$71,733
PSE - 2.04.20	$ -	$2,976	$2,976
PER - 2.04.30	$615,258	$364,637	$(250,621)
SCI - 2.04.70	$272,687	$231,547	$(41,140)
CLA - 2.04.75	$50,484	$470	$(50,014)
PMCS - 2.04.80	$143,381	$39,214	$(104,167)
FOPS - 2.04.95	$389,418	$511,755	$122,337
CVAL - 2.05	$3,825	$18,057	$14,232
EDU - 2.06	$613,676	$571,642	$(42,034)
SIV - 2.07	$335,883	$4,816,027	$4,480,144
PROD - 2.08	$41	$45,440	$45,399
DPS - 2.10	$292,529	$139,191	$(153,337)
FIU - 2.11	$679,872	$845,032	$165,160
FSU - 2.14	$630,083	$1,466,802	$836,719

AOP - 2.15	$488,280	$445,272	$(43,008)
AQU - 2.16	$726,098	$569,526	$(156,571)
TOTAL	**$13,781,629**	**$13,430,219**	**$(351,410)**

Equipment

The Equipment category was reduced by $51,288,607 (31% reduction) mainly due to the following:

- A re-categorization of $46.4M from 2.01 FCC equipment related costs to Subawards. Same applies to $7.8M from 2.04.95 FOPS. This re-categorization was performed in order to follow the correct NSF cost categorization.
- The equipment costs for 2.03 CYI were reduced by $5M due to a more accurate basis of estimate using actuals and recent quotes instead of engineering estimates.
- ENG experienced $3.6M increase based on actuals.
- Other WBS resulted in an overall net increase of about $4.3M by using more accurate basis of estimate for both quantities and costs, e.g. use of actuals or average of relevant actuals.

In addition, three main transfers were performed to 2.08 PROD in order to centralize sensor procurements in this WBS:

- $33.3M from 2.11 FIU
- $6.8M from 2.16 AQU

	Old BAC	New BAC	Variance
FCC - 2.01	$73,006,977	$26,563,793	$(46,443,184)
ENG - 2.02	$70,232	$3,880,396	$3,810,164
CYI - 2.03	$18,948,054	$13,892,290	$(5,055,764)
PMO - 2.04.10	$761,720	$1,056,040	$294,319
PER - 2.04.30	$ -	$14,589	$14,589
PMCS - 2.04.80	$ -	$9,500	$9,500
FOPS - 2.04.95	$9,281,355	$1,489,445	$(7,791,911)
CVAL - 2.05	$676,010	$1,539,768	$863,758
EDU - 2.06	$785,123	$120,367	$(664,756)
SIV - 2.07	$ -	$561,132	$561,132
PROD - 2.08	$ -	$43,879,955	$43,879,955
DPS - 2.10	$32,219	$16,333	$(15,886)
FIU - 2.11	$33,912,440	$562,315	$(33,350,125)
MDP - 2.12	$2,343,743	$1,926,509	$(417,234)
FSU - 2.14	$38,366	$7,622	$(30,744)
AOP - 2.15	$16,164,974	$16,039,518	$(125,455)
AQU - 2.16	$9,790,163	$2,963,198	$(6,826,965)
TOTAL	**$165,811,376**	**$114,522,769**	**$(51,288,607)**

Materials

The Materials category was decreased by $12,892,126 (38% reduction) due to the following:

- $20.6M were moved from ENG to contingency (N.B. At the time of writing this CRE, it is evident that this amount should have been repurposed to PROD, but it was repurposed by increases seen in other categories).
- Increase of $4.9M in FOPS following recategorization of equipment into materials to follow the correct NSF cost categorization.
- Increase of $5.9M in SIV following the shift of Field Deployment scope from ENG to SIV and to take into account.

	Old BAC	New BAC	Variance
FCC - 2.01	$ -	$142,874	$142,874
ENG - 2.02	$28,815,934	$2,213,739	$(26,602,195)
CYI - 2.03	$356,084	$1,850,681	$1,494,597
PMO - 2.04.10	$13,493	$130,283	$116,790
PSE - 2.04.20	$153	$459	$306
PER - 2.04.30	$545,442	$283,692	$(261,750)
SCI - 2.04.70	$ -	$3,140	$3,140
CLA - 2.04.75	$1	$15,244	$15,242
PMCS - 2.04.80	$91,733	$64,034	$(27,699)
FOPS - 2.04.95	$896,770	$5,812,030	$4,915,260
CVAL - 2.05	$996,085	$1,202,410	$206,325
EDU - 2.06	$222,035	$372,428	$150,393
SIV - 2.07	$308,713	$6,287,436	$5,978,724
PROD - 2.08	$50,304	$109,621	$59,317
DPS - 2.10	$364,107	$55,213	$(308,894)
FIU - 2.11	$494,676	$752,139	$257,463
FSU - 2.14	$424,520	$228,377	$(196,143)
AOP - 2.15	$183,199	$812,908	$629,710
AQU - 2.16	$562,818	$1,097,230	$534,412
TOTAL	**$34,326,067**	**$21,433,940**	**$(12,892,126)**

Subawards

This category was significantly increased by $78,363,190 (about 690% increase) mainly due to:

- An increase of $69M in FCC following the re-categorization of the FCC equipment and other direct costs ($57.4M) to follow correct NSF cost categorization. The additional increase is due to new cost estimates that have used of a more accurate basis of estimate[1] which rely on actuals costs (or relevant averages) incurred to date.
- The reduction of non-committed $2.2M subawards in SCI
- An increase of $1.4M in laboratory analyses of field collected samples, following a more accurate basis of estimate using actuals;

[1] See Facilities and Civil Construction Basis of Estimate, NEON.DOC. 002270

- An increase of $3.7M in FOPS is due to transferring the consulting costs along with equipment costs(vendor supply) to subawards.
- An increase of $1.0M in FSU following a more accurate basis of estimate using actuals;
- An increase of $2M in AQU to outsource the construction of water wells and building/testing/integrating and delivery of Buoys; and
- An increase of $1.6M in EDU following the re-categorization of consultant services for web development and faculty/teacher summer salaries.

	Old BAC	New BAC	Variance
FCC - 2.01	$ -	$69,039,326	$69,039,326
PER - 2.04.30	$ -	$692,807	$692,807
SCI - 2.04.70	$2,207,758	$ -	$(2,207,758)
CLA - 2.04.75	$1,332,799	$2,746,298	$1,413,499
FOPS - 2.04.95	$ -	$3,747,118	$3,747,118
EDU - 2.06	$ -	$1,666,434	$1,666,434
FIU - 2.11	$ -	$348,364	$348,364
FSU - 2.14	$5,612,816	$6,629,034	$1,016,218
AOP - 2.15	$2,257,944	$2,908,596	$650,652
AQU - 2.16	$ -	$1,996,531	$1,996,531
TOTAL	**$11,411,318**	**$89,774,508**	**$78,363,190**

Other Direct Costs

Overall the ODC were reduced by $8,605,240 (54% reduction) primarily due to:

- A recategorization of $11M in FCC to subawards in order to reflect the actual procurement approach.
- An increase of $1.1M in FOPS to reflect actual costs of the domain support facilities.

	Old BAC	New BAC	Variance
FCC - 2.01	$11,502,924	$466,749	$(11,036,175)
ENG - 2.02	$196,411	$159,202	$(37,209)
CYI - 2.03	$ -	$278,580	$278,580
PMO - 2.04.10	$631,742	$1,172,714	$540,972
PER - 2.04.30	$1,257,135	$455,449	$(801,687)
SCI - 2.04.70	$ -	$45,813	$45,813
PMCS - 2.04.80	$80,616	$68,072	$(12,544)
FOPS - 2.04.95	$958,826	$2,086,061	$1,127,235
CVAL - 2.05	$9,000	$100,911	$91,911
EDU - 2.06	$134,889	$16,260	$(118,629)
SIV - 2.07	$116,536	$125,908	$9,372
PROD - 2.08	$148,428	$784,392	$635,964
DPS - 2.10	$-	$879	$879
FIU - 2.11	$43,961	$20,104	$(23,857)
FSU - 2.14	$901,768	$35,186	$(866,582)
AOP - 2.15	$25,013	$1,516,769	$1,491,756

AQU - 2.16	$43	$69,005	$68,962
TOTAL	**$16,007,293**	**$7,402,053**	**$(8,605,240)**

Consultant Services

This category was reduced by $17,947,310 (63% reduction) as a result of removing uncommitted funds from almost all WBSs. This category was overestimated in the original NEON baseline. The only areas that required additional funds were 2.01 FCC, 2.04.80 PMCS, 2.05 CVAL and 2.08 Production for consultant support activities and temp labor for manufacturing (i.e. temp assembly work).

	Old BAC	New BAC	Variance
FCC - 2.01	$27,500	$248,499	$220,999
ENG - 2.02	$1,456,878	$1,082,593	$(374,285)
CYI - 2.03	$11,848,137	$3,437,747	$(8,410,390)
PMO - 2.04.10	$512,769	$18,940	$(493,829)
PSE - 2.04.20	$59,541	$24,137	$(35,404)
PER - 2.04.30	$673,511	$486,448	$(187,062)
SCI - 2.04.70	$ -	$ -	$ -
PMCS - 2.04.80	$169,556	$386,748	$217,192
FOPS - 2.04.95	$1,364,949	$37,501	$(1,327,448)
CVAL - 2.05	$52,777	$96,433	$43,656
EDU - 2.06	$1,091,341	$335,759	$(755,583)
SIV - 2.07	$123,794	$68,565	$(55,229)
PROD - 2.08	$7,273	$2,017,586	$2,010,312
DPS - 2.10	$986,903	$13,007	$(973,896)
FIU - 2.11	$434,866	$420,423	$(14,443)
FSU - 2.14	$2,598,760	$1,011,867	$(1,586,893)
AOP - 2.15	$2,597,327	$620,384	$(1,976,943)
AQU - 2.16	$4,484,140	$236,077	$(4,248,063)
TOTAL	**$28,490,024**	**$10,542,714**	**$(17,947,310)**

Associated Risk or Opportunity (include # and description): not associated to a risk ID in the risk register. However the implementation of this CRE mitigates the programmatic risk of working on incorrect estimates to complete the construction project.

Schedule Impact: Absorb 88 days of schedule contingency and extend the project completion date through 3/31/2018. The project has therefore no schedule contingency and with this CRE is also requesting an extension of the end date of construction to 3/31/2018.

Cost Impact: $35,142,305

Contingency Impact: $35,142,305 will be drawn from contingency

NEON CCB Approval:

Kathy Kirby – Deputy Project Manager — Date: 6/5/15

Larry Davidson – Project Engineer — Date: 6/5/15

Hanne Buur – Project Systems Engineer — Date: 6/5/2015

Andrea Thorpe – Project Scientist — Date: 6/5/2015

Jill Ryan – Director of PMCS — Date: 6/5/15

NEON CCB Chair Final Approval:

Javier Marti, NEON Project Manager — Date: 6/5/15

NEON Change Request - NSF Approval Request

Date Submitted	6/5/2015	**Award**	1029808
CRE Title	Cost and Schedule Baseline Re-plan Application for Cost	**CRE #**	2.04.0085
WBS Title	Total Program	**WBS**	2-04

Reason for required NSF Approval:	☒ Contingency request above $150,000 threshold	☐ Schedule delay beyond 45 days	☐ Other	

NSF Approval:

Elizabeth Blood, NEON Program Officer — Date: 7/28/15

Comments:

House Committee on Science, Space and Technology Subcommittee on Research and Technology
"NEON Warning Signs: Examining the Management of the National Ecological Observatory Network"
Friday, September 18, 2015

Questions for the Record

Questions submitted by Rep. Barbara Comstock:

1. What formal and informal communications did NSF and NEON, Inc. have between January 1, 2013 – September 18, 2015 regarding construction schedule and budget issues at NEON? As part of your response, please provide copies of every relevant e-mail, letter, memorandum, record, note, and text message as well as any internal NSF staff correspondence or notes regarding NEON's schedule or budget.

   NSF Response: Since the beginning of the project, NSF has received monthly reports from NEON, Inc. that document the cost and schedule status. NSF conducts weekly phone calls with Project leadership to assess detailed progress on cost and schedule issues, such as permitting, production and procurement, data products, transition to operations, and cyberinfrastructure. With the current ongoing assistive visits, frequent dialog between NSF and NEON, Inc. is being conducted to discuss, review and evaluate deliverables related to cost and schedule.

   At table summarizing these (and additional) communications since January 2013 is attached (Attachment 1).

2. According to the NSF Inspector General Alert Memo issued on September 15, 2015, it appears that NEON, Inc. moved $35 million of contingency funds into the base construction budget.

   a. Has NSF determined the amount of funds that NEON, Inc. has moved from contingency into the base construction budget? If yes, what is the amount?

      NSF Response: Yes; movement (allocation) of contingency to the base construction budget was $35,142,305. However, it should be noted that NSF has not yet obligated all of the funds necessary to actually spend this allocation of contingency and most of the re-budgeted work will take place in the future. Even though NEON, Inc. (like all Recipients) has re-budgeting authority for work activities, NSF is in the process of determining if NEON actually spent (and drew down) funds associated with some portion of this contingency allocation in advance of NSF approval. This will require a detailed look by individual work activities. NSF is working closely with the OIG on this issue.

   b. Did NSF approve the transfer of contingency funds? If yes, please provide documentation of that approval. If no, what actions does NSF plan to take to correct the improper transfer?

NSF Response: Yes; NSF approved the allocation of contingency on July 28, 2015 after being satisfied with the sufficiency of the documentation. The approval documentation is attached (Attachment 2).

3. The NSF Inspector General has previously recommended the NSF should retain contingency funds for projects like NEON, and pay the contractor as those expenses are approved as appropriate contingency costs. NSF has not agreed with this recommendation.

    a. Why hasn't NSF adopted this recommendation?

    NSF Response: NSF's normal practice of awarding contingency as part of the budget is in conformance with 2 CFR, part 200.433 – Contingency provisions (Uniform Guidance). That said, NSF always maintains the option of retaining (holding) contingency if there is a perceived risk with the Recipient's management practices and as an additional lever to enhance oversight. It should be noted that the full budget (including the contingency budget) is never obligated at once, but rather in annual increments that align with the appropriations from Congress. NSF currently has the mechanisms in place to hold contingency back and obligate only as needed to meet project objectives. Going forward, NSF will likely withhold more of the contingency on NEON given past performance.

    b. Would retaining contingency funds for NEON have helped alert NSF to the possibility of a cost overrun sooner?

    NSF Response: No; the retention of contingency funds has no relation to the projected cost overruns on any project. Under Earned Value Management (EVM), projected cost overruns are the difference between the approved Total Project Cost (TPC) and what the project currently estimates the actual, final total project cost to be (i.e., Estimate At Complete; EAC). EAC is the sum of actual expenses to-date plus the estimated cost of the remaining work.

4. According to Dr. James Collins' testimony, at least "five previous NSF MREFC projects underwent scope revisions, management adjustments, and instruments configuration changes during construct based on the challenges with increased costs for production of instrumentation, delayed site permitting, and schedule delays." Is this statement correct? If so, please provide a brief description of each project that underwent a significant scope revision, including the estimated total dollar amount of the potential cost overrun that necessitated this revision.

NSF Response: All MREFC projects go through significant cost, scope and schedule refinement during the Design Stage. However, once construction begins, very few are forced to go through significant scope reductions to keep actual costs below the approved Total Project Cost (TPC). NSF implemented a "No Cost Overrun" policy in FY2009. If contingency is not able to cover all known and realized risks, de-scoping is the first line of defense to meet this policy as published in NSF's Large Facilities Manual.

The following table summarizes the MREFC projects completed (or nearly completed) in the last 10 years as well as those currently in construction. The table indicates those that had to be de-scoped during the Construction Stage (i.e. once the construction award was made) to maintain costs below the approved TPC, the items removed from scope, and the approximate value of the scope removed to maintain budget.

Project	Year Complete	TPC ($M)	Required De-Scoping During Construction
Daniel K. Inouye Solar Telescope (DKIST); formerly ATST	-	$344	In construction. None to-date.
Large Synoptic Survey Telescope (LSST)	-	$473	In construction. None to-date.
Alaska Region Research Vessel (ARRV)	2015/16	$200	None.
Ocean Observatories Initiative (OOI)	2015	$386	None. Minor scope modifications were conducted for technical maturity reasons; not cost.
Atacama Large Millimeter Array (ALMA)	**2015**	**$499**	**Antenna reduction ($56M), Site Infrastructure ($2M)**
Advanced Laser Interferometer Gravitational-wave Observatory (AdvLIGO)	2015	$205	None.
Ice Cube	2012	$202	None.
Scientific Ocean Drilling Vessel (SODV)	**2008**	**$115**	**Drill String ($1M)**
South Pole Station Modernization	2010	$149	None.
EarthScope	**2008**	**$197**	**Borehole reduction ($55M)**

In short, implementation of de-scoping as has been required of NEON is not a common occurrence for NSF projects. NSF has only been able to identify two facilities in the past 10 years that meet the same criteria and approach a similar de-scope level as NEON.

"NEON Warning Signs: Examining the Management of the National Ecological Observatory Network"

Friday, September 18, 2015 - 9:00am

Inserts for the record

"Dr. Olds, one of the things in the IG's letter, she talked about the NSF hadn't required the incurred cost submissions from NEON nor has it conducted an incurred-cost audit of NEON, and if NSF had taken either action, NSF could have been able to identify unallowable or poor spending money on NEON, and yet I think what we've just heard is, the $80 million wasn't unallowable or poor spending, that it was permitting, it was the shift to operations, and it was the absence of a secure supply chain. Am I reading that correctly, and does that make this particular IG recommendations less meaningful?" p. 43-44

Insert for the Record #1, (page 44, line 980 of the transcript)

***Mr. OLDS**: Congressman Beyer, you are correct; the approximate $80M cost increase was not the result unallowable spending. The original NEON project was approved for $433.8M and reevaluated by a detailed cost and schedule review in August 2014. Based on rising concerns about schedule and cost performance against the new August 2014 plan, NSF requested a revised total project cost estimate in May 2015. NEON Inc.'s revised estimate (received on June 15, 2015) was $517.9M. NEON Inc. has asserted that the potential overrun resulted from a combination of underestimating costs, not appropriately accounting for costs and underestimating time/effort to complete the project as follows:*

- *Production of sensors and other site components*
- *Corporate overhead and fringe benefits*
- *The annual cost escalation*
- *Toolik site construction*
- *Data products and cyberinfrastructure*
- *Schedule delays (12-16 months) associated with permitting, delayed field deployments and field operations*
- *Contingency to manage future risks*

NSF has relatively low confidence in the estimates presented in June. To inform future decisions, NSF has required a full revised and updated total project cost estimate and schedule by December 1, 2015. NSF officials are closely monitoring the development of these new deliverables for sufficiency.

Insert for the Record #2

"Again, Dr. Olds, the NSF Inspector General has previously recommended that NSF should retain contingency funds for projects like NEON and pay the contractor as those expenses are approved as appropriate contingency costs. The NSF has not agreed with this recommendation. Would retaining contingency funds for NEON have helped NSF notice the cost overrun at NEON sooner." p. 45

(page 45, line 1029 of the transcript)

Mr. OLDS: ***No; the retention of contingency funds has no relation to the projected cost overruns on any project. Under Earned Value Management (EVM), projected cost overruns are the difference between the approved Total Project Cost (TPC) and what the project currently estimates the actual, final total project cost to be (i.e. Estimate At Complete; EAC). EAC is the sum of actual expenses to-date plus the estimated cost of the remaining work.***

Insert for the Record #3

"Dr. Olds, it appears that NEON has moved 35 million of contingency funds into the base construction budget. The cooperative agreement requires approval by NSF for NEON to use contingency funds. Did NSF approve the transfer of contingency funds?" p. 47

(page 47, line 1029 of the transcript)

***Mr. OLDS:** Yes; NSF approved the allocation of contingency on July 28, 2015 after being satisfied with the quality of the required documentation.*