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OFFICE OF
INSPECTOR GENERAL

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MEMORANDUM

To: Dr. Steven C. Beering
Chair, National Science Board

Dr. Arden Bement
Director, National Science Foundation

From: Thomas C. Cross for Dr. Christine C. Boesz
Inspector General, National Science Foundation

Subject: Management Challenges for NSF in FY 2009

In accordance with the Reports Consolidation Act of 2000, I am submitting our annual statement summarizing what the Office of Inspector General (OIG) considers to be the most serious management and performance challenges facing the National Science Foundation (NSF). We have compiled this list based on our audit and investigative work, general knowledge of the agency's operations, and the evaluative reports of others, such as the Government Accountability Office and NSF's various advisory committees, contractors, and staff.

This year's management challenges are again organized under five broad issue areas: award administration; human capital; budget, cost and performance integration; U.S. Antarctic Program; and merit review. Twelve challenges appear on this year's list, some of which reflect areas of fundamental program risk that are likely to require management's attention for years to come. There are also two new management challenges: international awards and ethical conduct of research.

If you have any questions or need additional information, please call me at 703-292-7100.

Award and Contract Administration

Post-award administration policies. An effective post-award administration program for NSF grants should provide oversight for both financial and programmatic issues to ensure that awardees: 1) comply with terms, conditions, and regulations; 2) achieve expected progress toward accomplishing project goals; and 3) file accurate financial reports as required. Over the past six years, NSF has improved its monitoring of financial performance by implementing a risk-based system that directs more of the agency's attention to high-risk awardees. In FY 2008, NSF reports that it assessed the performance of 29 percent of grantees managing 93 percent of NSF funds. The challenge for the agency continues to be in improving its monitoring of programmatic performance. Since the primary responsibility of NSF's program officers is *selecting* new awards, active awards frequently do not receive adequate attention. The program officers need more time, guidance, and training to carry out this important job in order to detect problems with an award in time to intervene.

OIG has highlighted problems in administering cost sharing as a major management challenge for NSF for the past 10 years. The agency's decision in 2004 to eliminate non-statutory cost sharing requirements effectively curtailed new cost sharing commitments but failed to address the issue of how to improve the poor documentation by grantees of cost sharing already in place. OIG estimates that despite the elimination of most new cost sharing, $126 million in cost shared commitments remains active. This year the National Science Board, which was asked by Congress to review the impact of the agency's elimination of most cost sharing, recommended that it be reinstated for specific programs. At the same time, the NSB noted the confusion among grantee institutions that surrounds cost sharing policies and their implementation, and emphasized the need for the agency to clearly communicate the requirements of tracking and reporting cost sharing to those institutions that undertake the commitment. The challenge for NSF is to put an effective outreach program in place that will assure that awardees understand and comply with the legal and auditing requirements that go along with cost sharing.

Contract Administration. The administration and monitoring of contracts has been a management challenge for NSF in part because the agency has not had a comprehensive, risk-based system to facilitate its oversight of contracts and ensure that the requirements of each were being met. A timely and effective post-award monitoring program is necessary to assure the accuracy and integrity of the contractor's financial reports, and that it is otherwise performing as agreed. Since contract monitoring was first cited as a deficiency by the agency's financial statement auditors in FY 2004, the agency has improved its contracting policies and procedures each year. During FY 2008, the agency completed an update of its contracting manual, which strengthened its guidance regarding post-award monitoring, risk-assessment, and risk-mitigation procedures. Over the next year NSF will undertake another significant challenge as its $1.3 billion contract to perform logistics, support, operations, and maintenance of NSF activities in Antarctica expires March 31, 2010. NSF is aiming to make an award by October 1, 2009. The challenge for NSF during the procurement will be to ensure that all offerors receive the

same information and opportunities, and that NSF conducts a comprehensive analysis of the information contained in their proposals to arrive at the best contract for the USAP and the government.

Management of large infrastructure projects. NSF's investment in large infrastructure projects and instruments such as telescopes and earthquake simulators presents the agency with a number of administrative and financial challenges that have sometimes not received the same attention as the technical issues associated with building these large-scale scientific tools. Past OIG audits suggest that the agency's oversight of infrastructure projects is in some cases more engaged in dealing with technical issues, where NSF's scientific expertise can be applied, rather than financial and project management matters. The audits provide details about the difficulty of managing the design, construction, and financing of these cutting edge projects and completing the facilities on time and within budget.

During the past year, the agency has continued to make progress in addressing some of our longstanding concerns. In particular, NSF continues to train agency staff on project management and other issues related to large facilities, and has slightly increased staff assigned to the Large Facilities Office (LFO) from 4 to 5. However, some of the issues we have raised in the past persist. For example, NSF has still not fully completed the in-depth guidance necessary to carry out the broader policies described in its facilities manual. Meanwhile, annual operating costs for large facilities now exceed $1 billion and represent a significant portion of NSF's entire budget, as the number of active facilities in all phases of development continues to grow. While NSF has increased the personnel assigned to LFO, we remain concerned that it has not been assigned adequate authority or staff to handle the full responsibility for oversight of the entire life-cycle of these facilities. Therefore, the challenge for NSF is to continue to improve its management of and knowledge about the entire facility life cycle in order to assure their successful operation. To assist NSF in addressing this challenge, OIG is undertaking a series of reviews that focus on the cooperative agreements by which the agency provides for the management and operation of its large facilities.

Audit resolution. Audit resolution, closure and follow-up together comprise a key element of an agency's internal control structure and help to identify and prevent waste, fraud and abuse. For all OIG audits and those of NSF awardees performed under OMB Circular A-133, NSF implements the requirements of revised OMB Circular A-50 on *Audit Follow-up*. The OIG works with NSF staff to resolve internal control, compliance, and questioned cost findings contained in these audits and to ensure that the auditees implement corrective action plans to address the audit findings. Since 57 percent of NSF audits focus on contract or grant funds, there are frequently *three* parties (agency, auditors, and awardees) rather than two participating in audit resolution, making the process more complicated and challenging. Therefore, OIG initiated a review this year to determine whether NSF has adequate policies and procedures to ensure that audit findings and recommendations are fully, effectively, and appropriately resolved. The report will be issued in 2009.

International awards. As funding for scientific research around the world increases and commerce becomes more global, collaborations between countries and their scientists to conduct research are also on the rise. It is estimated that NSF spends between $300 and $400 million annually on research awards that involve participants from overseas. In addition to managing its own international funding, because of its grant administration experience NSF is increasingly being sought after by agencies and non-profits to manage their international awards for a fee. This increase in its international portfolio amplifies the need to ensure the financial and programmatic accountability of these projects in areas such as use of research funds, integrity in research, and project performance. The National Science Board noted in a recent report: "Accountability must be an integral part of planning successful collaborations to assure supporters that research integrity is a priority and that funds are used appropriately".[1]

Past OIG audits of NSF's international awards have found that international awardees are largely unfamiliar with the terms and conditions that are applied by U.S. funding organizations. In those situations where there is more than one funding organization with conflicting administrative priorities, it is unclear to awardees which to follow. Similarly, standards for the conduct of research that define plagiarism and data falsification and their penalties, often differ from country to country depending on the scientific field. NSF must address these financial and programmatic challenges by working with other international science organizations to harmonize their policies and create internationally recognized standards and practices that will protect the integrity of the research enterprise along with the funds that support them.

Ethical conduct of research . In increasing numbers, researchers and students from all over the world who are trained to different standards and expectations of responsible and ethical conduct of research are finding themselves in close collaborations. At the same time studies show that the current training programs in ethical research are ineffective. Advances in computer technology coupled with the increasing amount of information and data stored on the internet, have increased the opportunities for unethical researchers to commit research misconduct or engage in questionable research practices. OIG has long urged NSF to do more to foster integrity among researchers. Last year, the America COMPETES Act of 2007 (The Act) presented the agency with a new mandate. Its states: "The Director shall require that each institution that applies for financial assistance from the Foundation for science and engineering research or education describe in its grant proposal a plan to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduate students, graduate students, and postdoctoral researchers participating in the proposed research project."

Since the passage of The Act, NSF has taken some initial steps toward compliance, such as conducting internal assessments and seeking advice from academe on developing such guidance, but to date has only responded to the requirements regarding postdoctoral researchers. In light of this growing challenge to the integrity of NSF's funded programs NSF needs to immediately implement a more comprehensive, agency-wide program to

[1] National Science Board, *International Science and Engineering Partnership: A Priority for U.S. Foreign Policy and our Nation's Innovation Enterprise.*

instill ethics and integrity at all levels of the scientific, engineering and education enterprise it supports.

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Human Capital

Workforce planning. As a management challenge for NSF, workforce planning refers primarily to three issues: planning for future staffing, management succession, and the use of visiting scientists or "rotators". Management and staff have attempted for most of the past decade to keep pace with an increasing workload, driven by a rising number of proposals from researchers seeking grant funds. Despite this increase in workload, few additional staff have been added to the agency over the past 10 years. Past staffing imbalances at NSF have prompted questions from Congress and others about how it conducts its planning and has driven agency efforts to develop a more formalized process over the past three years.

As part of its Human Capital Management Plan, the agency piloted a workforce analysis tool to assist it in determining the appropriate number of FTEs needed by each individual directorate. While the analytical tool gives NSF an objective basis for projecting its future staffing needs, the methodology is primarily based on the relationship between historical staffing levels and various measures of workload. To date, NSF has not conducted a comprehensive skills analysis to identify gaps between the abilities of the current and projected workforce. A skills analysis is recommended by the Office of Personnel Management to promote informed, forward-looking workforce planning. For this reason, NSF received a "red light" for its management of human capital on the President's Management Agenda Scorecard from OMB this past year. Though NSF's new Human Capital Strategic Plan issued in March 2008 promised "particular focus on addressing identified skill gaps", the agency now believes that a formal skill gaps analysis would be inappropriate for NSF.

Meanwhile the number of NSF staff eligible for retirement is even greater than that of the rest of the federal government. The agency estimates that 34 percent of its workforce is over 55, as opposed to 24 percent for the government overall, and the average age of an NSF employee is 50. NSF has been fortunate that the retirement rate for the past four years has been lower than the rest of government at 13.5 percent. In preparation for the eventual rise in retirements, NSF has articulated three core strategies to guide its succession planning including an effective transition process, comprehensive leadership development, and sound knowledge management practices.

The temporary employment of "rotators" or visiting scientists, as a means of revitalizing the agency's knowledge about specific cutting edge areas of research, also poses an administrative and management challenge for NSF. In FY 2007, there were about 219 rotators working at NSF comprising approximately 15 percent of NSF's workforce and an even greater percentage of its program officers. NSF estimates that 15-20 percent of its executives and 14 percent of its science and engineering staff are subject to annual turnover. The continual replenishing of this critical but temporary workforce presents a challenge for the agency as they require more administrative support in the form of

hiring, processing, training, and supervision, than a permanent employee. The presence of so many rotators also complicate efforts by the agency to conduct effective succession planning as there are certain positions for which their level of institutional knowledge or management skills are not appropriate. NSF recognizes the problem and has focused more attention on the unique issues surrounding rotators in developing their Human Capital Strategic Plan.

Administrative infrastructure. The ability of NSF directorates to hire new employees and to travel continues to be hindered by a lack of resources as well as poorly designed systems, As reflected in the most recent surveys of NSF staff, the agency's understaffed human resource office continues to extend the time required to bring on board needed new employees. Basic human capital services such as staffing and recruitment, workforce planning, and organizational development received among the lowest ratings registered in NSF's 2007 customer satisfaction survey.

In addition, the efforts of NSF program and financial staff to monitor awards through on-site inspections are impeded due to problems associated with funding and scheduling travel. Over the past 5 years, NSF's travel funds have increased at an annual rate of only 4.7%, this during a period when the agency has strengthened its administrative post-award oversight in part by conducting more site visits. Our concern is that that the funding of more financial site visits will be performed at the expense of the program officers who must also be able to observe awardee operations first-hand and meet with grantees. The difficulty of using the Fed Traveler system to schedule and account for travel is reflected in its poor rating in the survey of agency staff. NSF should strengthen its commitment to effective post-award administration by increasing the availability of funds for travel, and streamlining the process for accomplishing it.

Budget, Cost and Performance Integration

Performance reporting. The Government Performance and Results Act (GPRA) requires agencies to identify the outcomes that they were created to accomplish, and to establish and track their progress against performance measures that best reflect progress toward accomplishing those goals. However, as the Committee on Science, Engineering, and Public Policy observed: "evaluating federal research programs in response to GPRA is challenging because we do not know how to measure knowledge while it is being generated, and its practical use might not occur until many years after the research occurs…".[2] For this reason NSF has struggled over the years to define the outcomes that follow from its mission, and to set up appropriate performance measures.

In its 2006-2011 strategic plan, NSF revised its 4 strategic outcome goals, in part to clarify them for reporting purposes. However, the outcomes described are very general and tend to complicate independent efforts to conduct a meaningful evaluation of the agency's performance. George Mason University's Mercatus Center ranked the quality of NSF's performance reporting as 18th out of 24 federal agencies reviewed in its most

[2] *Implementing the Government Performance and Results Act for Research,* p.1

recent *Annual Performance Scorecard.*[3] In addition, NSF's Advisory Committee on GPRA counseled NSF to consider ways to demonstrate the long-term impacts of NSF support to make their reporting more comprehensive. NSF would be wise to follow the Advisory Committee's recommendation.

Cost information. The demand for increased disclosure and transparency by government agencies about their finances continues to grow each year. A recent survey commissioned by the Association of Government Accountants indicates that 1) federal financial reporting is important to taxpayers, 2) it affects their level of trust in government, and 3) government is failing to meet expectations regarding its obligation to explain how it spends its money. In response to this problem, Congress enacted the Federal Funding Accountability and Transparency Act of 2006 (The Act), requiring federal agencies to publicize for the first time detailed information about all grants and contracts over $25,000 in a searchable, on-line format. Since grants and contracts comprise approximately 95 percent of NSF's appropriation, The Act has effectively opened the agency's accounting books to the public for the bulk of its expenditures, a positive development.

However, while information about NSF's awards is now readily available, details about its own operating costs are much harder to find. In its annual financial report and performance highlights, NSF's operating costs are aggregated and presented according to its three strategic goals which are too general to enable any meaningful evaluation of how well the agency is managing its own resources. An annual report that omitted information about how much a business spends on salaries, office space, or other basic expenses would be of limited use to shareholders or regulators. Detailed cost information is not just necessary to determine an organization's cost-effectiveness and efficiency, but is also crucial to fostering *accountability*. For that reason, NSF should strive to improve and increase its disclosure of operating costs.

United States Antarctic Program (USAP)

USAP long-term planning. One of NSF's most important responsibilities is the operation of the USAP which is overseen by the Office of Polar Planning (OPP). Through a 10-year $1.3 billion contract, OPP provides all necessary services and support to three U.S. research stations: McMurdo, South Pole, and Palmer. As part of its mandate, NSF is also responsible for the research infrastructure in Antarctica's harsh polar environment. The agency spent approximately $233 million for USAP infrastructure and logistics in FY 2007. The periodic replenishment of the infrastructure is a key element of USAP's long-term planning efforts, as well as a management challenge, because of its impact on the health and safety of program participants as well as the performance of scientific research.

In a note to its FY 2007 financial statements, NSF reports that scheduled maintenance on 17 items of Antarctic capital equipment in poor condition was deferred, explaining that deferred maintenance on assets in poor condition is considered "critical to maintaining

[3] *9th Annual Performance Report Scorecard*, p. 67

operational status" due to the environment and remote location. OPP commonly defers maintenance when the Program lacks either parts or money. In FY 2008 and 2009, USAP budgets have also been affected by rising fuel costs and a weak dollar, further impeding NSF's ability to make long-planned investments in renewing and upgrading its infrastructure. Several years ago, OIG auditors recommended that NSF develop a life-cycle oriented capital asset management program along with a consistent budgeting mechanism to ensure that USAP's infrastructure needs are adequately addressed and do not pose a risk to the safety and health of USAP participants. NSF disagreed with this proposal.[4] Since thorough planning is particularly critical when managing within limited budgets, NSF should reconsider this suggestion.

As noted in prior Federal Information Security Management Act (FISMA) reports, OPP also needs to improve its disaster recovery planning to be better prepared in the event a disruption in IT services affects its Antarctic operations. In FY 2008, OPP management initiated strategic planning to mitigate the potential risk of interruption to USAP program operations. OPP plans to continue an initiative to create alternate network connectivity for Antarctica operations and estimates that implementation should be completed by the end of FY 2009, contingent on funding. OPP is also in the process of replacing its operating platform with a more current and robust system by the end of FY 2010.

Merit Review

Broadening participation in the merit review process. Increasing the numbers of women and minorities who receive NSF support for their research and participate as reviewers in the merit review process has been a longstanding but elusive goal of the agency. The primary challenge for NSF is to assure that underrepresented groups have the same opportunities, access to funds for research, and information about the process as those that have been successful in receiving funding. In FY 2007 NSF continued to make incremental progress toward achieving many of their goals. In the case of reviewers, a necessary first step toward increasing diversity is to persuade individual reviewers to voluntarily submit demographic information. The number of reviewers who complied with this request increased by 3 percentage points in 2007 to 28 percent. Meanwhile 37 percent of those who responded indicated that they were members of an underrepresented group, a 1 percent increase. As the funding rate for all PIs grew from 25 to 26 percent, the rate at which women and minority PIs are funded also increased by 1 percent to 27 and 25 percent respectively. However In FY 2007, NSF failed to achieve 4 out of 8 performance goals for Broadening Participation included in its Program Assessment Rating Tool (PART) review by OMB.

In its FY 2006 strategic plan, NSF had promised to expand efforts to broaden participation. More detail about those efforts is contained in *Broadening Participation at the National Science Foundation: A Framework for Action*, a draft plan issued in August 2008. It lists seven recommended action items for NSF to undertake to integrate the broadening participation initiative into NSF's core processes. One of the action items

[4] Audit of Occupational and Health & Safety and Medical Programs in the United States Antarctic Program, OIG 03-2-003, March 2003

promises that it will increase the diversity of the reviewer population by 1) initiating the development of a searchable reviewer system with accurate demographic data, 2) encouraging reviewers to provide demographic data, 3) cultivating additional reviewer sources, and 4) encouraging NSF staff to use a more diverse reviewer pool. Just as important, another action item provides a commitment to develop a detailed implementation schedule for accomplishing all of its recommended actions. The proposed development of a timetable accompanied by periodic evaluations of the progress being made by the agency toward meeting this challenge would increase both the agency's accountability and its chances of success.