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OFFICE OF THE
GENERAL COUNSEL

April 6, 2026

Via email

Re: NSF FOIA 2016-126

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Thank you for your interest in the National Science Foundation.

Sincerely,

Spencer

D. Christian

FOIA/Privacy Act Officer

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82-pages

Strengthening Transparency and Accountability at the National Science Foundation: Policy and Practice Recommendations for a Path Forward

Report from the Transparency and Accountability Working Group
Final Submission May 12, 2014

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Executive Summary

The National Science Foundation is the only federal agency whose mission is to promote the progress of science and basic research in all fields of science and engineering. The Merit Review Process is the basis upon which NSF makes decisions to fulfill this mission.

Rapid changes in science and society as well as demands of good stewardship require ongoing examination of our processes and procedures, reaffirming a core principle of continuous improvement[1]. As a public agency, the NSF is responsible for building and sustaining the public trust through the transparency of our processes and the accountability of our organization

The Transparency and Accountability Working Group (TAWG), comprised of representatives from each research directorate, the Office of International and Integrative Activities, and Local 3403, American Federation of Government Employees, was established by the Acting Director in December 2013[2] and charged with aiding the Assistant Directors to:

- Assess how the Foundation uses portfolios, training, and other topics related to transparency and accountability;
- Seek input on these activities from staff at all levels; and
- Identify issues arising both within and outside NSF regarding transparency and accountability.

TAWG members continually briefed their senior managers and held discussion sessions with program staff to seek inputs on the group's activities as one of its concerns was to ensure that improvements could be made without imposing unnecessary additional workload.

The variety of practices concerning portfolios across NSF were identified and discussed. The term portfolio is used to describe a collection of activities (e.g., awards) with a common logic (e.g., intellectual theme, or broader impact). For this document, portfolios serve two key functions: to provide context for decisions and to ensure alignment with NSF's mission by programs, divisions, and directorates, and the Foundation as a whole.

This report focuses on two issues:

- Ensuring NSF award abstracts and titles, the prominent public face of NSF's investments, clearly describe the award activity and justify the expenditure of Federal funds;
- Clarifying the roles and responsibilities of Program Directors (PD) and Division Directors (DD) in merit review and resulting proposal decision making, to ensure the integrity of the merit review process through transparency of process and accountability of organization with appropriate oversight at each level.

In developing recommendations the workgroup also drew upon expertise in the Office of Legislative and Public Affairs (OLPA), Office of Budget, Finance and Awards Management (BFA), and Office of Information and Resource Management (OIRM).

[1] NSF Strategic Plan for 2014-2018: Investing in Science, Engineering, and Education for the Nation's Future. page 7 (http://www.nsf.gov/pubs/2014/nsf14043/nsf14043.pdf)
[2] OD Memo 14-01. Transparency and Accountability Working Group charge and membership. January 14, 2014.

Two of TAWG's recommendations on NSF award abstracts and titles have been implemented:

- The significance of the funded activity, that is what justifies the expenditure of public funds, has been moved to the beginning of the abstract with the technical description to follow. This reverses the order in the current policy.
- Award abstracts and titles belong to NSF, and Program Directors are responsible for ensuring that titles are meaningful to the general public. Approval for PDs to seek input from Principal Investigators so as to assure accuracy and completeness in award abstracts and titles has been requested.

This report makes recommendations for changes in the Proposal and Award Manual (PAM), the internal policy document, and Grant Proposal Guide (GPG), the external document, to comport with the policy changes on award abstracts and titles as well as to NSF's e-business systems where needed.

These changes led TAWG to identify the need to clarify the role of Program Directors and Division Directors, including their designees. Since its inception in 1951 NSF PDs have been central to NSF's mission and operations. Their role in promoting science, engineering, and education is unquestioned and well documented, and workshops to assist in understanding the merit review process are well established. Less well-documented is the role of Division Directors, not extending in the PAM beyond an under-defined "DD concur" action of all award and decline actions. TAWG recommends

- Defining the important term "DD concur" in the PAM;
- Developing mechanisms better to inform DDs, and their designees, of their role, especially for the large number of "rotators" who serve in these capacities; and
- Establishing a mechanism to document decisions that overturn a PD proposal recommendation.

Further Recommendations and Opportunities

TAWG has concluded that portfolio is a useful concept and context for many Foundation activities and is being used effectively in some units. "Most effective" practices differ and one size does not fit all; but there is the danger of drift from policy without some coordination and attention to the various practices. The following recommendations involve OLPA, OIRM, BFA, and perhaps others:

- Communicate the additive nature of portfolios in addition to individual awards which will require a revamped NSF website and communication strategy where directorates and OLPA form closer partnerships.
- Develop and disseminate analytic tools to characterize and track better existing and historical portfolios by better resourcing the existing NSF Evaluation and Assessment Capability (EAC). As part of its roadmap, EAC chairs the Portfolio Analysis and Tools Working Group.
- Further develop the portfolio framework for aligning investments to mission into the future as well as measuring impact of prior investments.

Due to time and resource constraints, TAWG discussed but could not fully develop positions on other important and pressing issues. However, this report should be viewed as a single step in maintaining and continually improving NSF's merit review which is seen as the gold standard across the globe.

An Act "to promote the progress of science..."
National Science Foundation Act of 1950 (Public Law 81-507)

1. Introduction and Background

Science is as important today to our country as it was to the law makers who enacted legislation in 1950 that established the National Science Foundation[3]. Today that vision endures and thrives in the functioning and successes of an organization constantly seeking to remake itself to fit the times and the progress of science.

We live in a time of significant changes: increasing access to information through technology development and deployment; larger investments by more countries in science and technology; greater focus on multi-disciplinary approaches to address significant challenges, and great opportunities and need for science to address societal challenges. These changes affect society, its citizens and institutions, and the conduct of science.

As a public agency, to effectively "promote the progress of science...", 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[4], at all times, whether budgets are expanding or fiscally constrained. **Within the context of the NSF we take 'transparency' to mean the openness with which we discharge our responsibilities, to the extent possible**[5]. **'Accountability' references the definition of roles and responsibilities of all engaged in our processes as well as a collective, agency-level responsibility**. Our faithful discharge of our obligation continues to advance our mission while strengthening ties with the scientific community, the public, and other stakeholders[6]. Particularly in times of great change, opportunities and constraints, it is necessary to review our policies and processes to ensure we adhere to core principle, revisit the rationale for policy, and effectively discharge our obligations.

NSF officially undertook an agency wide effort in November 2013[7] to ensure and enhance transparency and accountability at NSF through a portfolio framework, a framework 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." A Transparency and Accountability Working Group was established in January 2014[8] to support efforts of the Assistant Directors by "addressing issues that cross directorate and program office

[3] Even in 1787 the framers of the U.S. Constitution were prescient when they declared, in the U.S. Constitution, that the promotion of science was central to the advancement of the American economy and culture. Science was seen as so critical to the working of the federal government and the sustainability of the new Nation that it preceded the authority granted to the new federal government, under the Constitution, to establish a navy or army.
[4] From Investing in Science, Engineering, and Education for the Nation's Future, the National Science Foundation Strategic Plan for 2014 – 2018, a core strategy is to "maintain the public's trust by operating with transparency, accountability, integrity, and ethical conduct" and a core value is Accountability for Public Benefit, which includes "operating with integrity and transparency"
[5] NSF operates at the intersection of competing notions of public versus private, or openness in sharing ideas versus safeguarding proprietary ideas and data as well as confidentiality of external reviewers, whose input is the cornerstone of the NSF merit review process. This balance is an inherent challenge for NSF.
[6] Including the Administration's Open Government Initiative (http://www.whitehouse.gov/open) and Congress: Frontiers in Innovation, Research, Science, and Technology (FIRST) Act (H.R. 4186), sections 105 and 106.
[7] OD Memo 13-26, https://inside.nsf.gov/tools/toolsdocuments/Inside%20NSF%20Documents/od1326.pdf . See Appendix F for all OD Memos and important notices.
[8] OD Memo 14-01, https://inside.nsf.gov/tools/toolsdocuments/Inside%20NSF%20Documents/od1401.pdf

boundaries and warrant deliberations by senior management." The working group engaged senior management to communicate their ideas, shared current practices in directorates, and engaged in dialog with individuals throughout NSF. These discussions led the working group to focus efforts in two key areas:

- NSF Award Abstracts and Titles, to provide clarity on the value of the NSF award abstract and title to NSF's mission, and on abstract components as NSF documents;
- Roles and Responsibilities of Program Directors (PD) and Division Directors (DD) in merit review and resulting proposal decision making.

The merit review process[9] and its implementation are central to carrying out the NSF mission, and to the success that NSF has experienced in its more than sixty years of existence. Proposal recommendations are made in a "logical" context (or a portfolio – described in the next section). The NSF Award Abstract with Title is a prominent public face of NSF's investment and the output of the merit review process; it is here that we can first present public justification for expenditure of public funds.

In this report we make recommendations about NSF Award Abstracts and Titles and on the roles and responsibilities of PDs and DDs in merit review and the funding decision process. In addition we make recommendations in the area of portfolio communications; comment on the future opportunities in analysis tools to describe and understand portfolios; state the need for an agency-wide, coordinated on-boarding of division and deputy division directors; and suggest components of an approach for NSF to sustain a continuous focus on transparency and accountability activities.

Throughout our deliberations, the group has adhered to the importance of both transparency and accountability as guiding principles, within the constraints noted above. We have also balanced the need for this adherence to principles with the diversity of programs and practices within the Foundation. Programs, often because of the characteristics of the communities they serve, may pursue different means to the end goals of transparency and accountability. We attempt to avoid being prescriptive in the means to the end; flexibility is to be desired when it is supportive of, and not antithetical to, the highest standards of transparency and accountability.

[9] http://www.nsf.gov/bfa/dias/policy/merit_review/index.jsp

2. Portfolio

A portfolio can be defined as a collection of activities that are linked together via a logical connection. The connection may be thematic, intellectual, or scientific connection, e.g., disciplinary, methodological etc. It may also cut across intellectual questions and disciplines, by addressing another goal, e.g. multidisciplinary research, broadening participation, enhancing research experiences for undergraduates, integrating research and education, providing for international collaborations, or supporting facilities or other infrastructure. As such it is a means for aggregating a set of activities with a common purpose or goal.

A portfolio provides a view of NSF investments. NSF's mission to support basic research, education, the required infrastructure and human capital is broad and covers all areas of science and engineering. As science evolves, portfolios change over time. Viewed at one point in time a portfolio may be a snapshot. A retrospective, longitudinal view of a portfolio can provide a vision of the evolution of ideas and knowledge and the success at achieving goals. A forward looking plan can frame an aspirational portfolio. Portfolios serve to describe how NSF works in light of issues addressed in this report and any subsequent work on Transparency and Accountability, and do not have a policy-driven definition.

Portfolios can be described at different levels of the organization. While higher organizational portfolios include activities within individual units in the organization, the descriptions can range from the pure enumeration of programs to broader themes. This reflects the fact that many activities cut across units, and that priorities change at different levels of the organization.

There are several uses of the portfolio concept. The first three are discussed later in the report.

- Context for proposal recommendations. As noted in the Proposal and Award Manual (VI.B.3.d), Program Directors consider several factors in developing a balanced portfolio of funded projects that addresses a variety of considerations and objectives, and in light of current and previously funded awards.
- Accountability in NSF. Division Directors[10] are responsible for knowing the portfolios and programs within their purview and for understanding the impact of these activities. The DD concurrence is a checkpoint to ensure that an award is consistent with the scope of research covered by the program portfolio and aligns with the NSF mission. The review of a division by Committee of Visitors or AD allows for an assessment of portfolios and accountability of the organization.
- Communicating NSF's awards. Portfolios are a means to provide context to individual awards and to monitor the progress of science and the return on NSF's investment. They also provide institutional memory that informs both new Program Directors and Division leaders of past and current directions.
- Alignment with Mission. The hierarchy of portfolios (OD 13-26) provides a means of aligning programs, divisions, and directorates with NSF's mission.

[10] In many contexts referencing Division Directors, it is understood that the comment may also include Deputy Division Directors or Section Heads. Delineating the boundaries between Division Directors, Deputy Division Directors, and Section Heads is left to the Directorates.

- Budgeting, both at the point of the request and the appropriation. It is important to ensure the funding matches the portfolio opportunities.
- Strategic Planning. Portfolios can help identify opportunities and needs, which can be then conveyed "up" the organizational chain.

In short, portfolios need to be understood as flexible tools, which are context dependent, can evolve over time, change by level of organization, and reflect balanced and diverse investments.

Portfolio Analysis: Describing Portfolio Theme and Trends

Portfolio analysis is used as a way to describe the major themes and understand trends in a set of awards or proposals in a portfolio. Portfolio analysis "tools" include those computerized systems that are capable of recreating visual and other descriptions of what the portfolio is, or a retrospective view of what it was, and are used by those who need a first look at the characteristics of a set of documents (proposals and/or awards). These methods can complement other analytical portfolio descriptors already in use.

The NSF-wide Portfolio Analysis Taskforce is currently evaluating all the tools and analysis systems funded by different directorates and offices to make recommendations for future investment in portfolio analysis vis-à-vis the state of the art and NSF's real needs and requirements (function and frequency).

The TAWG sees the value of such tools to describe a portfolio to incoming Program Directors and Division Directors, to set its history and context, to understand trends for developing new opportunities for future investments, and as a way for evaluating previous funding investments[11]. Moreover, tools being developed by and for the community to analyze the NSF abstract database will help investigators understand NSF's funded portfolios[12] and identify new research opportunities.

Recommendations of the TAWG:

1. The development and assessment of portfolio capabilities is of great importance. A detailed examination of NSF's capabilities falls to the Portfolio Analysis Taskforce, a component of the NSF Evaluation and Assessment Capability. We look forward to the report from this group and believe it will help ongoing efforts of the Transparency and Accountability Initiative at NSF. [See Appendix C for more details.]
2. We believe this effort should be ensured adequate resources to take advantage of these new tools.

[11] We note that NIH has an Office of Portfolio Analysis, with a staff of more than 15 individuals. See http://dpcpsi.nih.gov/opa/index

[12] For example, see Deep Insights Anytime, Anywhere (DIA2), http://www.dia2.org/, for a web-based knowledge mining and interactive visualization platform for non-experts in data mining and data visualization. (direct link http://ci4enc04.ecn.purdue.edu/DIA2/pages/)

3. Abstracts and Titles

"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."[13]

The TAWG extensively discussed the issue of Award Abstracts and Titles. The group points out that abstract preparation practices varies considerably across the Foundation and are less well aligned to policy in PAM (February, 2014) than they should be. The TAWG proposes several recommended changes in current PAM guidance on Award Abstracts in order to guide the program directors responsible for Award Abstract preparation and to convey the desired information more clearly to the community and to the public. Working Group members have discussed the current policy and these changes with their respective division/directorate program and management staff in order to obtain feedback, consensus (whenever possible), and commitment to the policy.

Finally, we note that NSF needs to provide staff involved in writing abstracts opportunities to share effective practices, both through workshops and through engagement with PIs. The training by OLPA subsequent to the release of OD 14-10 has generated discussion within directorates of how best to share effective practices. Having Directorates and Divisions experiment is appropriate. Appendix B contains examples of abstract training materials. Furthermore, allowing PDs the opportunity to interact with investigators in the preparation of award abstracts is desirable. Doing so requires an alteration to the GPG (see Appendix A).

Recommended Changes in Award Abstracts:

1. To place priority on clearly communicating to the public, we recommend reversing the ordering of the two Abstract component parts, as follows:
   i) A nontechnical description of the project written for a public audience.
   ii) A technical description of the project written for a scientific audience.

   We note that this recommendation is the basis for both the Staff Memorandum O/D 14-10, released on March 20 2014 and the Important Notice No 136 to the Community, issued March 28, 2014.
2. Moreover, to accomplish this change in clarity and purpose, we recommend modifications to the PAM (Section VI.B.1.) statement of content of the Award Abstract as follows:
   i) A nontechnical description of the project that explains the project's significance and importance, and serves as a public justification for NSF funding. This part should be understandable to an educated lay reader. It may include such information as the fundamental issues the project seeks to address and other potential benefits such as in advancing the field, in education and diversity, and to society.
   ii) A technical description of the project that states its goals and scope, the methods

[13] Important Notice No. 136 to the Community, issued March 28, 2014

and approaches to be used, and its potential contribution. In many cases, the technical project description may be a modified version of the project summary submitted with the proposal, but should reflect any changes in the project's goals subsequent to the review process.

3. Abstracts should appropriately describe how the project addresses both review criteria *but need not use the specific words "intellectual merit" and "broader impact."* The additional wording, in italics, is recommended to avoid confusion with proposal review documents that use these words as section headers. No direct correspondence between review criteria and the two sections of an Award Abstract is intended.
4. Clarify NSF ownership of the Award Abstract and Title. Program Directors may ask the PI to provide a draft version of the award abstract and title according to the proposed new guidelines, but it is the responsibility of the Program Director to provide the final version and it is the responsibility of the Division Director to approve these.
5. Use the name "Award Abstract". The public abstract for the award is a post-award document and should be overtly distinguished from the Project Summary. The term 'abstract' can be misleading as in general usage it refers to a précis of work that has been completed. However, given the long-standing use of the term in this context, it is recommended that the public abstract be referred to as the Award Abstract.

Other Near-Term Recommended Activities

1. Revise the wording in PAM consistent with the recommended changes.
2. Make appropriate changes in GPG to clarify ownership of the Award Abstract and Title, and to formalize the role of the PI in the process.
3. Make appropriate change in the ordering of component parts on the Award Abstract page in eJacket.

Other Recommended Activities to be Undertaken in the Future

1. Develop an assessment mechanism to monitor abstracts compliance with PAM, e.g., use of COV to evaluate Award Abstracts.
2. Develop means to assess the impact of the change, in terms of usefulness for different audiences, and the level of time and effort required of Program Directors and others.
3. Develop plans for appropriate training for new Program Directors and Division Directors, as well as refresher training for longer-term staff. Experience indicates that implementation is most effective when carried out at the local level.
4. Make compliance with the Award Abstract and Title policy part of the performance review of all appropriate employees.
5. Convene a group to discuss how abstracts might include the context (portfolio) in which a decision is made. Our group had several discussions and several good ideas about how to construct abstracts that put a specific activity within the context of a larger set of questions addressed by the research field (for example) and also in the context of programmatic decisions.

Award Abstract and Title Guidance for PDs and Materials for PIs

1. We endorse having Directorates and Divisions experiment with creating opportunities for staff to develop and share effective practices on writing Award Abstracts that adhere to NSF Policy. See Appendix B for examples.
2. In addition, we recommend changes to the GPG to allow for overt engagement of the PI community in award abstract construction (see Appendix A).

4. Improving Communication of NSF's Investments

As part of the effort to improve NSF's ability to communicate the value and excitement of its investments, including individual investment decisions in the context of broader research portfolio objectives, the working group considered existing mechanisms and approaches for information dissemination in consultation with colleagues in OLPA, which oversees NSF's communications strategy, as well as DAS, which runs NSF's website.

Through these discussions, it became apparent that a key challenge to improving communications is the Foundation's broad array of constituents, ranging from the general public to members of the research, education, and infrastructure communities, and including internal programs and staff. In addition, common themes that emerged were the lack of flexibility of the current web design and infrastructure; a general lack of awareness across all levels of the tools and capabilities available to OLPA; and the lack of shared resources and platforms to facilitate a culture of communicating investments.

Beyond the essential communication role of the Award Abstract, the working group recommends:

- **Modernize the NSF website to communicate NSF's mission and 'brand', including its investments, and to address continually evolving needs.** The website should provide intellectually rich information content that can be easily accessed through interactive, user-friendly portals across a variety of computing and "edge" devices (i.e., smartphones and tablets, etc.) and platforms (e.g., Windows 8, iOS, etc.). It must also be adaptable in an era of constantly changing technological capabilities (e.g., new opportunities for social engagement are emerging)[14]. The revamped website, including the underlying information architecture and content management system, would facilitate a major expansion of NSF's current web capability by (1) enabling NSF to steer visitors to program pages, solicitations, award abstracts and portfolios, and the myriad of OLPA products (including LiveScience and Science360 stories) as appropriate; and (2) allowing individual divisions and offices within the Foundation to customize their webpages to meet their needs and upload dynamic content through an integrated, streamlined clearance process. Websites to consider as successful examples include NASA.gov (www.nasa.gov), which conveys the mission and 'brand' of NASA in a strategic, compelling manner, as well as various university websites, which have tabs and pages tailored to their specific constituencies (e.g., see www.virginia.edu, comprising tabs/pages titled "Prospective Students," "Current Students," "Alumni + Friends," etc.).

- **Develop and implement a strategic plan for portfolio communication.** This plan should make use of communication resources provided by OLPA and collaboration with directorate

[14] Modernizing the NSF website is deemed of importance to others at the Foundation. For example, colleagues in ENG have independently described to the Capital Planning and Investment Control (CPIC) the challenges of the current NSF web architecture and content management system as part of a proposal under consideration for FY16 IT investment: https://inside.nsf.gov/tools/toolsdocuments/Inside%20NSF%20Documents/IT%20Funding%20-%20Website%20CMS%20and%20Architecture.pdf.

liaisons. A key objective is to move away from single project articles toward content that more effectively communicates a reasonable collection of investments. Elements of the strategic plan may include:

- Press releases about award portfolios (e.g., http://www.nsf.gov/news/news_summ.jsp?cntn_id=125453);
- Video introductions of programs/portfolios; and
- News features for LiveScience and/or Science360 that are encompassing of a given portfolio (perhaps focusing on a set of programs or divisions on a rotating basis).

Some divisions prepare annual reports (e.g., for Committees of Visitors) that summarize investments by their programs over a given fiscal year. Sharing sanitized versions of such reports may provide another vehicle for communicating NSF's investments to the public, offer context for the research, education, and infrastructure communities, or aid in future Program Director and Division Director transitions. The Foundation may consider exploring this possibility in the future.

- **Develop kits that provide program directors and principal investigators with improved understanding of the various tools and capabilities that are available to them for communicating their investments and research activities, respectively.** These kits would help disseminate information such as a step-by-step guide/protocol on what to do if contacted by the media; as well as resources such as a collection of available portals with links to directorate/division-specific examples (e.g., a directorate/division-specific story on Science360) demonstrating how these portals are instantiated in practice. Pilot kit development is already underway in MPS/PHY, with the goal of making such kits easily replicable and deployable by other directorates and divisions.

- **Encourage NSF scientific staff to speak about their organization in public presentations at conferences and workshops.** As an important component of their job descriptions, Program Directors should be able and willing to describe the programs across their division, with Division Directors covering divisions in their directorate, and Assistant Directors covering NSF overall. To facilitate this recommendation in practice, common slide decks conveying NSF goals (perhaps through the NSF Academy and/or Policy, etc.), directorate-specific (through the Assistant Directors) activities, and division-specific or crosscutting programs (through the Division Directors) should be made available for broad use.

Modernizing the NSF website is of the highest priority since it is a key element of any effort to communicate the Foundation's investments. A preliminary back-of-the-envelope calculation from the DAS web team estimates a cost on the order of about $2 million.

Meanwhile, some of the above recommendations are asynchronous. For example, encouraging staff to speak about NSF's investments does not depend (at least directly) upon modernizing the NSF website. Similarly, the concept of communication kits can move forward (as it is already an active pilot within MPS/PHY), but details are contingent upon the website structure, either current or future. The strategic plan is independent of the other recommendations, but should be modified and enhanced as a new website, communications kits, and/or staff outreach are pursued.

5. Program Director and Division Director/Deputy Division Director Roles and Responsibilities Regarding Proposal Recommendations

Transparency and accountability demand that there be clear description of the roles and responsibilities of Program Directors (PDs) and Division leadership at each step in the process leading to a proposal action recommendation. Transparency and accountability also demand that the justification for a recommendation be well-reasoned, well-documented and made in alignment with organizational policies and procedures. The Proposal and Award Manual delineates some of roles and responsibilities for these actions.

The Program Director has initial responsibility for a proposal award (or declination) action. A recommendation should take into account several factors. The most important is the set of reviewer (individual and/or panel) comments. These comments are advisory in nature; the PD can recommend an action that differs from that of some or all of the reviewers, but significant differences should be well reasoned in the review analysis. Other factors include portfolio balance (ensuring, for example, that one narrow research area does not receive a large fraction of funds available, or that a particular area should be preserved from elimination), and concentration vs. broad distribution of resources across the research community.

The Division Director and/or the Deputy Division Director (DDD), representing division management, complete the division's recommendation process (for award or declination) by means of concurrence. Concurrence is a checkpoint to ensure that an award is consistent with the scope of research covered by the program portfolio, that the recommendation is carefully documented in the review analysis, that the abstract and title are well written for public access, and that all such documents are consistent with best practices across the division. It also enables DDs to become familiar with all programs across their division (including both awards and difficult declinations) so that they can articulate the relevant research goals to a broader audience.

Lack of concurrence (disagreement between PD and DD/DDD) should be rare in a well-functioning recommendation process. The concurrence step does not mean that the DD/DDD take over the role of the Program Director, but it does mean that division management should be aware and confident of the recommendations that come from the review process.

Division management should be broadly familiar with programs across the division, both to articulate the division's research portfolio and to assume concurrence responsibilities in a knowledgeable way. Apart from carefully reading each proposal recommendation, division management may meet with Program Directors to discuss their proposal portfolios immediately following a panel meeting, near the end of the fiscal year, or at other times. The path to concurrence may also be an iterative process between PD and DD, but in the end concurrence is a checkpoint that rests with division management.

We summarize here the checks and balances in place for the review process. The following two were discussed above:

- Merit review provides a check on the preferences of individual Program Directors, who must document his or her recommendation, particularly when that recommendation runs

counter to reviewers' opinions.
- Division Directors serve as a check on Program Director decisions to ensure that proper justification is provided for a recommendation and that the review process is fair.

There are two additional checkpoints that are not discussed in detail in this document:
- The Division of Grants and Agreements serves as a check on division-level recommendations, particularly with respect to budgetary issues, permissions and certifications, titles, etc.
- Committees of Visitors serve as a check on division-level review processes, practices, portfolios, and recommendations.

Appendix D: Merit Review Process, provides an example of the merit review process, with its checkpoints.

Recommendations of the Working Group:

1. The Academy be charged with responsibility to develop division leadership-specific training. The on-boarding process should begin at the earliest date possible; prior even to arrival at NSF if permissible. Current guidance at the New Executive Transition (NExT: https://inside.nsf.gov/aboutyou/newemployeeresources/newexecutivetransition) is useful but densely presented and is unavailable prior to official appointment. An elaborated, interactive and updated on-boarding experience that details the roles, responsibilities, challenges and opportunities of division leaders is strongly recommended.

2. Assessment of contribution to transparency and accountability is an overt critical component in the evaluation of Program Directors and Division leaders.

3. Appendix A details specific wording recommendations of the Working Group:

    a) PAM should be modified to clarify aspects of the PDs' role in the recommendation process.
    b) PAM should be modified to clarify the role of Division Directors. In particular, the suggested changes acknowledge explicitly the dialog that must occur if PD justification for a proposal recommendation is not considered sufficient by the DD.
    c) Exhibit II of PAM should be modified to indicate that there is the potential for revisions or rejections of some PD recommendations.

6. NSF's Continuous Focus on Transparency and Accountability

NSF is continuously seeking to improve it practices and processes. Improving Transparency and Accountability is an ongoing effort by NSF to advance our mission by building and sustaining the public trust and is consistent with our core strategy in the new strategic plan[15].

The Office of the Director Staff Memo 13-26 confirms an ongoing commitment to sustained improvements, with a central, critical role for the Office of the Director. Such a high-level, agency wide commitment will help ensure NSF's continuous focus on transparency and accountability. _As noted in the OD Memo 13-26, two responsibilities of the Office of the Director are to establish the directions and goals of the entire Foundation and to conduct agency-wide management reviews to ensure that investment decisions promote and align with NSF's mission and investment priorities. Furthermore, with providing direction comes the responsibility to promulgate new or revised policies (e.g., clarification of the NSF Abstract policy).

In support of the role of the Office of the Director we identify several responsibilities that could facilitate NSF-wide and Directorate efforts. Most of these suggestions are focused on NSF operations but some require community dialog.

Coordination: Coordination promotes alignment and synchronization of NSF's various components, across all units of NSF. Furthermore, coordination can lead to appropriate levels of consistency in conformity to policy at all levels of the organization: program, division, and directorate.

NSF as an agency is committed to continual improvement in transparency and accountability. Directorates are incubators of new ideas and approaches. A part of coordination is to share effective practices as well as to ensure consistency and compatibility among activities related to transparency and accountability, including activities undertaken by programs, divisions, and directorates. Although many differences across programs can be justified, noticeable inconsistencies in practices may undermine NSF's stewardship.

Coordination needs to extend to units beyond the Directorates, for example to the

- Office of Legislative and Public Affairs (OLPA) for communication;
- Budget and Financial Affairs (BFA) for changes to policy in documents such as Proposal and Awards Manual and the Grant Proposal Guide;
- Office of Information and Resource Management (OIRM) for activities such as the Academy for training, and groups for external web as well as InsideNSF issues.

Our working group, consisting of members from directorates, has had the opportunity to interact with each of these groups[16]. Working together will make implementation of changes and their adoption more effective.

[15] NSF Strategic Plan 2014 – 2018. Investing in Science, Engineering and Education for the Nation's Future. http://www.nsf.gov/pubs/2014/nsf14043/nsf14043.pdf

[16] As an example of the need for coordination, implementing the award abstract clarification required involvement of BFA/DIAS to ensure adherence to policy; OLPA and ultimately the Academy and Directorates for development of workshops with consistent terminology; HRM for coordination with the Academy to highlight the importance of award abstracts and to include the policy clarifications in the Merit Review Basics courses; OIRM to improve processes for ensuring that the most recent versions of PAM are discoverable in InsideNSF.

One particular coordination activity is the onboarding of Division Directors and Deputy Division Directors to clarify their roles and responsibilities in Merit Review and the Proposal Decision Making[17]. This should be developed and conducted in coordination with the Deputy Assistant Directors and other senior leadership. This coordination is critical to ensure the integrity of the Merit Review Process[18]. This high priority recommendation will require coordination by OD, across Directorates and Offices and with other units at NSF, for example OIRM/HRM and the Academy. Finally, we would recommend onboarding of DDs **prior to** their start at NSF.

Planning, Implementation, and Monitoring Improvements: Developing, innovating, implementing, monitoring, and evolving approaches to Transparency and Accountability are essential for NSF to succeed. Plans are tools to prioritize activities. Such a plan would likely comprise interrelated components that emphasize clarity of roles and responsibility, continual improvement of our processes and service, and the value of clear communications with the public. Effective plans will require appropriate implementation details (e.g., who does what when, and how much will it cost) as well as measures for the plan's success. Furthermore, plans will evolve to reflect what has been learned.

Communication: There are multiple constituencies interested in or affected by NSF's Transparency and Accountability activities: NSF Staff, the National Science Board, the investigator communities, University leadership, as well as the Administration and Congress, and other groups and societies. Keeping each of these groups aware of our activities, and engaged to the degree appropriate, will be a factor in the initiative's success.

One key recommendation: It is necessary to appoint an individual reporting to the Office of the Director with the responsibility, the authority, and appropriate level of resources to coordinate, plan, implement, monitor and communicate to fulfill the expectations of the position. The coordination is across directorates and research offices as well as across administrative units. Without the authority, efforts will be less effective and may fail

To succeed with these responsibilities, in particular with Coordination and Planning, Implementation, and Monitoring, there must be authority and resources to go with the responsibility.

Finally, we note that having uniform policies is essential for transparency and accountability. We strongly recommend NSF retain the **flexibility** to allow for variable implementation across directorates. There are often multiple approaches to address policy. Having flexibility ensures the approaches are tailored to needs, rather than trying to insist on one-size fits all. Furthermore, flexibility will allow for experimentation and innovation leading to improvements across NSF.

[17] We note that very little is stated in PAM about the critically important role of the DD in the merit review process. Moreover there is little in the Academy for onboarding DDs.

[18] We note that onboarding for ADs should be considered, since they must hold accountable DDs for issues of compliance around the merit review process.

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   - Summary of Key Issues and Recommendations
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F. OD Staff Memos and Important Notices
   - OD 13-26. Portfolio Framework. November 19, 2013.
   - OD 14-01. Transparency and Accountability Working Group charge and membership. January 14, 2014.
   - OD 14-10. Award Abstract and Title Policy Clarification. March 20, 2014.
   - Important Note 135: Transparency and Accountability at NSF. December 11, 2013.
   - OD Important Notice No. 136: NSF abstracts and Titles. March 28, 2014.

A. Summary of Recommendations (including specific edits to Proposal and Award Manual and Grant Proposal Guide)

The ideas received by the NSF, in the form of proposals, are proprietary in nature and therefore protected from public scrutiny until funded. Ideas articulated in proposals that are not funded are not revealed to the public, as a means to protect the intellectual property of the proponents.

The NSF therefore operates at the intersection of the competing notions of public versus private; of openness in sharing ideas versus exclusivity in safeguarding proprietary ideas and data. This balance has always been a challenge for the NSF.

The notions of Transparency and Accountability are not anathema to the NSF. Quite the contrary; the NSF needs the expertise and judgment of the scientific community, external to the NSF, to evaluate scientific projects with objectivity and discretion. External merit review is the cornerstone of the NSF merit review process and is emulated through the world.

Consequently, this report attempts to strike a balance between providing effective practices for better communicating what we do and how we do it against protecting the rights of individuals to their ideas.

In this Appendix we collect the recommendations of the report and relate them in two subsections. The first subsection provides a summary of key issues addressed by the report and lists key recommendations addressing those issues. In the second subsection we aggregate all of the recommendations by sections of the report, and we also provide suggested language changes to PAM as well as the GPG.

Finally, we note that principles and practices of transparency and accountability are intertwined. For example, in our efforts to be transparent in what is funded and why, we also indicate who is responsible for those efforts, and to whom they are accountable.

Summary of Key Issues and Recommendations

In this subsection, we summarize key issues addressed by the TAWG, and highlight recommendations to address those issues. This subsection presents major recommendations (the complete collection of recommendations are presented in the second subsection).

a) **Award Abstracts and Titles**
   i) Issues:
      - Some Award Abstracts may not clearly describe the project nor clearly justify the expenditure of Federal funds.
      - There was confusion among some program staff about who is responsible for the abstract and title, and thus NSF staff's freedom to make changes.
   ii) Recommendations

- Policy Clarifications: OD 14-10 made policy changes to emphasize both clarity of description and justification the expenditure of Federal funds, and placing the non-technical description ahead of the technical description in the award abstract. (Additional clarifications are recommended for PAM in the second subsection.)
- Accountability: OD 14-10 made clear that the Program Director is responsible for the award abstract and title.
- Public Clarification: Proposed change to the GPG will indicate the possible role for the PI in the preparation of an award abstract.
- Training: Based on OLPA's efforts, additional efforts are underway to create opportunities for sharing effective practices in writing award abstract and engaging the PI community.
- System Change: It is recommended that eJacket be updated to reflect the policy clarification (non-technical prior to technical component in an award abstract).

b) **Communication**

1) Issue: Award abstracts are one way to communicate funding decisions to the NSF community, including the public at large. Many other mechanisms exist for communicating to NSF's stakeholders about individual award decisions as well as program- and division-level funding portfolios. One key issue is that the current NSF website (and associated information infrastructure) was designed and implemented years ago, and lacks the flexibility and capability for tailoring the content and format of division and program webpages to present information about our investments.

ii) Recommendations:

- Invest in modernization of the NSF website to communicate NSF's mission and 'brand', including its investments, and to address continually evolving needs. This website should provide intellectually rich information content through interactive, user-friendly portals that can be accessed on a myriad of device types.
- As part of this modernization, allow greater division control of website content (after proper and timely review) to allow for targeted, meaningful, and timely outreach to the public.

c) **DD Concur in the Merit Review Process**

i) Issues:

- There is a perception that there is insufficient oversight of the process by which recommendations are made.
- There may be confusion in the roles of the PD and the DD/DDD because very little is stated in the PAM about the role of the DD in the process of "DD Concur."

ii) Recommendations

- Policy Change in PAM: We are suggesting language change to clarify roles of both PD and DD in the merit review process. This includes change to Exhibit II to reflect the dialog between PD and DD about recommendations.
- Training: We recommend specific DD onboarding to be developed, as a high priority item. We note that there are several courses for PD onboarding, but none for DDs. We recommend onboarding be initiated prior to the DD's start at NSF.

- Accountability: There is a clear line from AD to DD to PD in adherence to policy around Merit Review.

d) NSF-wide Co-ordination

i) Issue: Considerable variation exists across the Foundation in core practices. This variation is beneficial and even necessary, but occasionally leads to drift in the translation of policy into practice.

ii) Recommendation: An individual, located in the Office of the Director, should have responsibility and resources for oversight of Transparency and Accountability efforts such as a) NSF policy, b) PD and DD training, c) adherence to roles and responsibilities, and other effective practices. Such co-ordination will continue to strengthen the Foundations' transparency and accountability.

Recommendations by Section

This subsection contains all recommendations made in the report. In addition it proposes specific wording changes to PAM and GPG. We note that there are activities being undertaken by Directorates. This report does not attempt to reflect all work being undertaken by Directorates or other working group, although we do reference some of that work in other Appendices (in particular B and C). Nor do these recommendations address all of the issues raised in discussions by the working group. In part, we focused on the key issues above; in part, we ran out of time. Several issues involved engaging more staff in thinking about abstracts; others involved additional specific changes to PAM (e.g., Delegation of Authority for Programmatic Approval of Award Recommendations, in particular relative to the funding limits).

Section 2: Portfolio and Portfolio Analysis Tools

The Transparency and Accountability Working Group (TAWG) sees the value of such tools and approaches to better understand portfolios and conduct portfolio analysis, and TAWG strongly supports their development and application. We look forward to the report from Portfolio Analysis Taskforce, a component of the NSF Evaluation and Assessment Capability, and believe it will help ongoing efforts of the Transparency and Accountability Initiative at NSF. We believe this effort should be ensured adequate resources to take advantage of these new tools.

Section 3: Abstracts

Recommended Changes in Award Abstracts:

1. To place priority on clearly communicating to the public, we recommend reversing the ordering of the two Abstract component parts, as follows:
   i) A nontechnical description of the project written for a public audience.
   ii) A technical description of the project written for a scientific audience.

   We note that this recommendation is the basis for both the Staff Memorandum O/D 14-10, released on March 20 2014 and the Important Notice No 136 to the Community, issued March 28, 2014.

2. Moreover, to accomplish this change in clarity and purpose, we recommend modifications to the PAM (Section VI.B.1.) statement of content of the award Abstract as follows:
    i) A nontechnical description of the project *that* explains the project's significance and importance, and serves as a public justification for NSF funding. This part should be understandable to an educated lay reader. It may include such information as the fundamental issues the project seeks to address, and other potential benefits such as in advancing the field, in education and diversity, and to society.
    ii) A technical description of the project that states its goals and scope, the methods and approaches to be used, and its potential contribution. In many cases, the technical project description may be a modified version of the project summary submitted with the proposal, but should reflect any changes in the project's goals subsequent to the review process.

3. Abstracts should appropriately describe how the project addresses both review criteria *but need not use the specific words "intellectual merit" and "broader impact."* The additional wording, in italics, is recommended to avoid confusion with proposal review documents that use these words as section headers. No direct correspondence between review criteria and the two sections of an Award Abstract is intended.

4. Clarify the NSF ownership of the award abstract and title. Program Directors may ask the PI to provide a draft version of the award abstract and title according to the proposed new guidelines, but it is the responsibility of the Program Director to provide the final version and it is the responsibility of the Division Director to approve these.

5. Use the name "Award Abstract". The public abstract for the award is a post-award document and should be overtly distinguished from the Project Summary. The term 'abstract' can be misleading as in general usage it refers to a précis of work which has been completed. However given the long-standing use of the term in this context, it is recommended that the public abstract be referred to as the Award Abstract.

Other Near-Term Activities

1. Revise the wording in PAM consistent with the recommended changes.
2. Make appropriate changes in GPG to clarify ownership of the award abstract and title, and to formalize the role of the PI in the process. (see recommended wording change below)
3. Make appropriate change in the ordering of component parts on the Award Abstract page in eJacket.

Other Activities to be Undertaken in the Future

1. Develop an assessment mechanism to monitor award abstracts' compliance with PAM, e.g., use of COV to evaluate Award Abstracts.
2. Develop means to assess the impact of the change, in terms of usefulness for different audiences, and the level of time and effort by Program Directors and others.
3. Develop plans for appropriate training for new Program Directors and Division Directors,

as well as refresher training for longer-term staff Experience indicates that implementation is most effective when carried out at the local level.

4. Make compliance with the Award Abstract and Title policy part of the performance review of appropriate employees.
5. Convene a group to discuss how abstracts might include the context (portfolio) in which a decision is made. Our group had several discussions and several good ideas about how to construct abstracts that put a specific activity within the context of a larger set of questions addressed by the research field (for example) and also in the context of programmatic decisions.

Award Abstract and Title Guidance for PDs and Materials for PIs

1. We endorse having Directorates and Divisions experiment with creating opportunities for staff to develop and share effective practices on writing award abstracts that adhere to NSF Policy. See Appendix B for examples.
2. In addition, we recommend changes to the GPG to allow for overt engagement of the PI community in award abstract construction (see below).

GPG: For inclusion in new GPG on page III-4

This wording change has been submitted to BFA/DIAS on April 15, 2014.

E. Funding Recommendation

[Note: recommended changes are in red.]

"After scientific review....

(New paragraph)

Should a proposal be recommended for an award, the principal investigator may be contacted by the program officer for assistance in preparation of the public abstract and its title. An NSF award abstract, with its title, is an NSF document that describes the project and justifies the expenditure of Federal funds.

Note that a recommendation...."

Section 4: Communications

- Modernize the NSF website to communicate NSF's mission and 'brand' and to address continually evolving needs.
- Develop and implement a strategic plan for portfolio communication.
- Develop kits that provide program directors and principal investigators with improved understanding of the various tools and capabilities that are available to them for communicating their investments and research activities, respectively.
- Strongly encourage NSF scientific staff to speak about their organization in public presentations at conferences and workshops.

Modernizing the NSF website is of the highest priority since it is a key element of any effort to communicate the Foundation's investments.

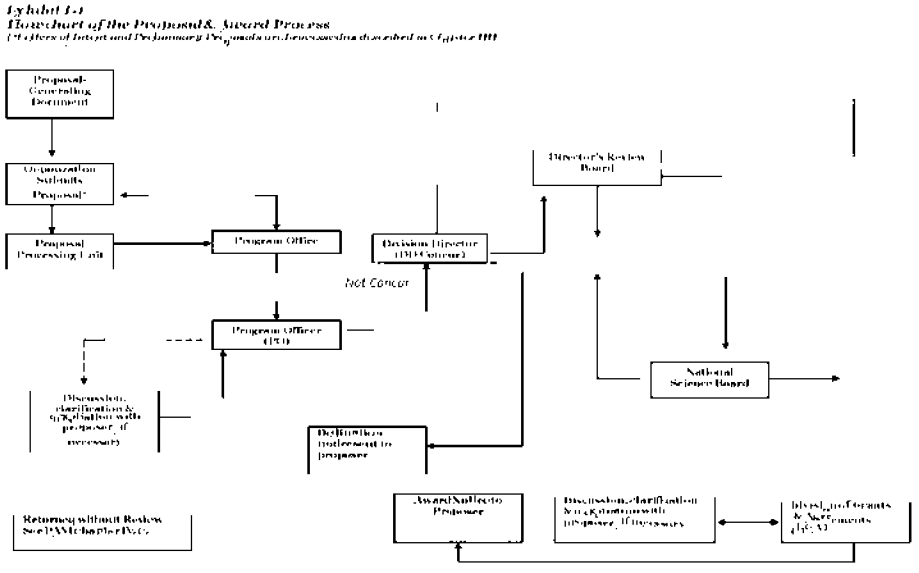
Section 5: PD and DD/DDD Roles and Responsibilities Regarding Proposal Recommendations

1. The Academy be charged with responsibility to develop division leadership-specific training. The on-boarding process should begin at the earliest date possible; prior even to arrival at NSF if permissible. Current guidance at the New Executive Transition (NExT: https://inside.nsf.gov/aboutyou/newemployeeresources/newexecutivetransition) is useful but densely presented. An elaborated, interactive and updated on-boarding experience that details the roles, responsibilities, challenges and opportunities of division leaders is strongly recommended.

2. Assessment of contribution to transparency and accountability is an overt critical component in the evaluation of Program Directors and Division leaders.

3. Appendix A details specific wording recommendations of the Working Group:

    a) PAM should be modified to clarify aspects of the PDs' role in the recommendation process. See wording changes to PAM, Chapter VI (below).
    b) PAM should be modified to clarify the role of Division Directors. In particular, the suggested changes acknowledge explicitly the dialog that must occur if PD justification for a proposal recommendation is not considered sufficient by the DD. See wording changes to PAM, Chapter VI (below).
    c) Exhibit II of PAM should be modified to indicate that there is the potential for revisions or rejections of some PD recommendations. See suggested modification of Exhibit I1 that includes a loop back to the PO, with words "Not Concur".



Specific Edits

PAM: Chapter VI - Processing of Proposals at the Program, Division and Directorate Levels

A. Processing of Proposals
[Note, recommended changes are in red.]

NSF program office award approvals are electronically executed within eJacket's Division Director concurrence functionality ('DD Concur'). The functionality includes an electronic 'PD recommend,' a 'PD sign-off,' and a 'DD concur' for awards. The 'PD recommend' approval occurs when the cognizant program director electronically recommends the proposal for award. The 'PD recommend' indicates that the proposal is in compliance with NSF policies and all information is accurate and memorializes the Program Officer's recommendation on the disposition of a proposal in the form of a recommendation to the Division of Grants and Agreement (or Large facilities Office). An optional administrative review and a required financial operations specialist review follows. The cognizant program officer then provides their approval of the award recommendation with NSF's policies and approves any subsequent changes made since the 'PO recommend.' The cognizant program director then provides their approval of the award recommendation via 'PO sign off'. The electronic 'PO sign off' confirms that the proposal is in compliance with NSF's policies and approves any subsequent changes made since the 'PO recommend.'

...

The 'DD concur for award', also within eJacket, occurs when the cognizant division director electronically signs the award recommendation. The 'DD concur' indicates that, to the best of his/her knowledge, the proposal is in compliance with NSF policies and the information is accurate, as well as commits funds in the Financial Accounting System. All signatures and approvals for awards by the program offices are electronic in eJacket. There is no need for hardcopy forms or signatures. 'DD concur' is the final step before the proposal is logged into the Awards System for BFA's business review. The Delegation of Authority section (PAM Chapter VI.G below) outlines policy regarding the commitment of funds.

If the Division Director cannot concur with the recommendation, he/she should work with the Program Officer to resolve the situation. If the Division Director and Program Officer still disagree, then the Division Director must provide a Diary Note in eJacket documenting the nature of the disagreement and justifying the Division Director's decision.

Section 6: NSF's Continuous Focus on Transparency and Accountability

Two key recommendations from this section include

- It is necessary to appoint an individual reporting to the Office of the Director have the responsibility, the authority, and appropriate level of resources to coordinate, plan, implement, monitor and to fulfill the expectation of the position. The coordination is across directorates and research offices as well as across administrative units. Without the authority, efforts will be less effective and may fail.
- Develop as soon as possible an effective onboarding for division directors and deputy division directors, to ensure the integrity of the merit review process. We recommend onboarding prior to the start of a DD at NSF.

B. Materials on Award Abstracts: Program Director Resource Guide

As NSF implements the revision to policy, providing guidance to NSF staff on how best to construct award abstracts that adhere to the policy is important. We give one example (GEO) of materials used inside NSF to help prepare NSF staff for implementing the clarification to policy. We expect that once the recommended changes are made to the Grant Proposal Guide (see Appendix A: Summary of Recommendations, Section 3: Abstracts) that guidance to PIs regarding NSF Award Abstracts and Title will be developed so as to engage the PI community. The guidance should be shared among programs at NSF so as to help provide a uniform and consistent message to the PI community. The coordination of this and other activities will be implemented through the Office of the Director.

Directorate for Geosciences Title and Award Resource Guidance (GEO)

See next pages.

DIRECTORATE FOR GEOSCIENCES (GEO) TITLES AND ABSTRACTS RESOURCE GUIDE

April 21, 2014

Working Document

Snapshot on April 27, 2014

Questions about a GEO title or abstract? Contact Neysa Call (x8430), Dave Verardo (x8527), Terry Davies (x7103), or Susan Mason (x7748)

DIRECTORATE FOR GEOSCIENCES (GEO)

TITLES AND ABSTRACTS RESOURCE GUIDE

Table of Contents:

A. NSF Official Issuance OD 14-10, Award Abstract and Title Policy Clarification (March 21, 2014)
B. NSF Official Issuance OD 13-26, Portfolio Framework (November 19, 2013)
C. Letter Notice to Presidents of Universities and Colleges and Heads of Other National Science Foundation Awardee Organizations (NSF Notice No. 135)
D. February 2014 NSF Proposal and Award Manual #10 (PAM) "NSF Abstracts" in Chapter VI.B.1, pages VI-4-5.
E. February 2014 NSF Proposal and Award Manual #10 (PAM) "Titles of NSF-Supported Projects" in Chapter VII.K, pages VII-41-42.

TITLE AND ABSTRACT POLICY "CLIFF NOTES"

Titles and Abstracts Are NSF Property

NSF abstracts and titles are the property of the agency and are "a public record of active and expired awards and are an important source of information on NSF activities. The purpose of the abstract is to describe the project and justify the expenditure of Federal funds." (Proposal and Award Manual, NSF)

Titles and Abstracts Must Adhere to New Guidelines

As of March 20, 2014, NSF award titles and abstracts must adhere to new guidelines to ensure a heightened focus on clarity and to better communicate agency investment decisions to the public.

All recommended award titles should adequately describe the purpose of the research in non-technical terms to the fullest possible extent. All abstracts will consist of two components, in the following order:*

1. A **non-technical explanation of the project's broader significance and importance**, that serves as a public justification for NSF funding. This part should be understandable to an educated reader who is not a scientist or engineer.

2. A **technical description of the project that states the problem to be studied, the goals and scope of the research, and the methods and approaches to be used**. In many cases, the technical project description may be a modified version of the project summary submitted with the proposal. As the project summary is prepared and submitted for consideration by reviewers, the abstract should reflect the project's goals as they may have been modified subsequent to the review process.

Titles and Abstracts Content Is Program Officer Responsibility

Program officers are responsible for reviewing abstracts—ensuring that they clearly describe how the project addresses both merit review criteria, and approving the contents.

Compliance with New Policy Is Division Director Responsibility

Division Directors should concur on all new and renewal awards only when they are satisfied that the abstract and title are in compliance with the new policy.

* The language on the abstract form page in eJacket and in the eJacket user's manual does not list the parts of the abstract in the correct order. Also, the abstract section of the February 2014 version of the Program and Award Manual (PAM) #10 does not list the parts of the abstract in the correct order. The aforementioned systems will be updated to reflect the new policy.

STYLE GUIDANCE FOR TITLES AND ABSTRACTS

TITLES

- All titles do NOT have to be rewritten. Do not alter declinations, and only edit/rewrite a title if it has an issue to be addressed, e.g., too technical, excessive jargon, missing the purpose of the research. Titles should accurately describe the purpose of the research.

- The title should be understandable, clear and concise. Do not use excessive technical jargon, abbreviations, acronyms, or cute, provocative teasers.

- Terms/acronyms required in proposal titles per solicitations (such as Collaborative, Career, SEES) do not have to be removed from award titles. Other terms/acronyms/abbreviations that are superfluous should be removed.

- Award titles aligned with Human Research Subject Protections, Institutional Animal Care and Use Committee, or other such compliances do not have to be changed if the editing/rewriting puts the approval in jeopardy.

ABSTRACTS

- Abstracts consist of two parts, in this specific order:

    1. The first paragraph should be clear, concise, non-technical language stating what the research is about and why it is important to society and science. It should provide broader context for an educated, non-technical audience. It should be obvious why NSF views this award as important from this paragraph. Avoid scientific and technical jargon as much as possible. Offer explanations of scientific terminology to the extent possible. This part of the abstract may also include the broader impacts, or the broader impacts may stand alone in its own paragraph.

    2. The second paragraph is the technical description of the project. The second paragraph should be written such that a geologist can have an accurate picture of the research activities, e.g., hypotheses to be tested, approaches, methods, analyses, specific study area, experimental design, modeling approach, etc. This part may be similar to the technical description in the proposal project summary.

- The entire abstract is NSF's statement about an award. Do not refer to "The proposal..." Abstracts should be written as if from NSF and in third-person narrative, e.g., "This research...", "The researchers...", "The project ...". Do not use first person, e.g., "We," "I," or "ours."

- Use short, straightforward sentences whenever possible in the abstract. Write out internal NSF vocabulary, e.g., "post doc" as post-doctoral researcher and "PI" as principal investigator or change it to researcher.

TITLES AND ABSTRACTS CHECKLIST

☐ Title describes the purpose of the research?

☐ Title/abstract free of cutesy words, excessive technical jargon, extra acronyms/abbreviations?

☐ Two paragraphs (parts) included in abstract? First paragraph (part) is non-technical context including what the research is about, and why it is important to society and science in terminology an educated lay audience can understand, e.g., some context? Second paragraph (part) is technical description of the project?

☐ Both merit review criterion addressed?

☐ Language is third-person narrative, i.e., no "our", "we", or "I" used?

☐ Standard grammar style used throughout?

☐ Internal NSF terminology is written out, e.g., "post doc" is postdoctoral researcher; "PI" is principal investigator or changed to researcher.

FREQUENTLY ASKED QUESTIONS

1. **Do all award titles have to be edited/re-written?**

   No, "If it ain't broke, don't fix it."

2. **Do decline titles have to edited/re-written?**

   No, only awards.

3. **May GEO program managers, science assistants, section heads, division directors, etc., change an NSF title or abstract?**

   Yes, they are the property of the agency.

4. **If I change a title and abstract, do I have to get the approval of the PI?**
   No, a PIs approval on edits to titles and abstracts is not required. Their input or approval may be solicited, but it is not mandatory.

5. **Does the non-technical paragraph still have to include the broader impacts review criterion?**

   The non-technical paragraph may address either or both review criteria. However, both review criteria should be addressed in the award abstract. The NSF's merit review criteria have not changed.

6. **Who reads NSF titles and abstracts?**

   We know from Internet data that our main audiences are the public, the scientific community, and oversight bodies such as Congress.

7. **Does Congress see all award titles and abstracts?**

   Yes. The NSF Congressional Notification System sends copies of all NSF awards to Congress. On the same day an institution receives an official award notification from NSF, the U.S. Representative and Senators representing that institution get a copy of the official award notification, including the title and abstract.

8. **At what grade level should titles focus?**

   To an educated lay audience.

9. **What does "an educated lay audience" mean?**

   "Not educated or trained to a high or professional standard in a particular subject."

NSF Titles/Abstracts for which additional information was requested

Examples of NSF awards in which a Congressional office has asked for more information, clarification, and context are below. Their motivation was to send a congratulatory letter to the researcher, to write a positive press release or blog post about the project, or to act in an oversight capacity.

TITLES FLAGGED FOR LACK OF SOCIETAL IMPACT, TECHNICAL CLARITY, "PURPOSE"

1. CAREER: Microorganisms Swimming Around Microstructural Heterogeneity. NSF #1252182
2. Regulating Accountability and Transparency in China's Dairy Industry. NSF #1157551
3. CI-ADDO-NEW: PhoneLab: A Programmable Participatory Smartphone Testbed. NSF #1205656
4. Full-Scale Development: Collaborative Research Advancing Informal STEM Learning Through Scientific Alternate Reality Games. NSF #1323787
5. I-Corps Node: DC, Maryland, Virginia Region. #1304387
6. Action's Effect on Perception. NSF #0957051
7. Temperature-Dependent Male Sex Determination in the Red-Eared Slider Turtle. NSF #0095753
8. STEM Women of Color Conclave. NSF #1220582
9. REU Site: A Broad View of Environmental Microbiology. NSF #1005223
10. LHC Theory Initiative. NSF#0969510

TITLES FLAGGED BECAUSE OF CUTESY/PROVOCATIVE LANGUAGE

1. The Great Immensity. NSF #1010974
2. SBIR Phase I: Contemporary Studies of the Zombie Apocalypse: An Online Game to Teach Mathematical Thinking to Middle School Students. NSF #1315412
3. EAGER: DIG: Scientists in Alaska's Scenery. NSF #1058800

ABSTRACT FLAGGED FOR LACK OF SOCIETAL IMPACT AND TECHNICAL CLARITY

CAREER: Haptic Guidance Systems. NSF #0746914. The PI's goal in this project is to advance the state-of-the-art of haptics research, which has to date centered primarily on the use of point-based force-feedback devices, by exploring and comparing two novel approaches to providing haptic guidance for path following and fine motor tasks. These two approaches are: (1) using tactile shear guidance to provide directional information through the grip of a stylus; and (2) augmenting a traditional stylus-based haptic interface with an active handrest.

GEO TITLE AND ABSTRACT CASE STUDIES (BEFORE AND AFTER NEW POLICY)

CASE STUDY ONE

TITLE *(AS SUBMITTED BY RESEARCHER):*

WSC-Category 2 Collaborative Research: Planning And Land Management - Tropical REsearch in Ecosystem Services (PALM-TREES)

ABSTRACT *(AS SUBMITTED BY RESEARCHER):*

The sustainability of the Panama Canal is intricately connected with land-use. The Canal was created by damming the Chagres River, creating Lake Gatun. Each ship passing through the Canal requires release of water from Lake Gatun, so reliable operation of the Canal requires reliable runoff from the Panama Canal watershed. This is particularly true during the extended dry season, when rainfall essentially stops. Furthermore, floods during the wet season can cause closure of the Canal. The Panama Canal is undergoing a significant expansion to allow passage by larger ships. Canal operations are a vital US interest. Approximately 20 percent of trade between the U.S. and Asia passes through the Panama Canal representing five percent of global trade, and the Canal enables a large number of US jobs. However, the Canal expansion will require more water despite the new high efficiency locks. Land management in the Panama Canal Watershed influences how much and when water drains into Lake Gatun and the Canal. Project PALM-TREES will map the flow of land use policy incentives from authorities like Panama Canal Authority, through landholder response, to changes in land use and cover, to the effects of flow into the Canal. This will help predict human and hydrological responses to policy and identify the least cost approach to providing hydrologic ecosystem services.

Preliminary results suggest that land management decisions alter paths available for water to flow from the land into the Canal. These "preferential flow paths" are created by soil cracking in the dry season, and by biological factors such as plants, animals, and microbes. Conversion of grazing lands to forest seems to increase the amount of water flowing through the soil. This may increase groundwater recharge, an important source of dry season river flows. Forest land cover may reduce flooding in the wet season. Project PALM-TREES will collect watershed-scale hydrologic data in different land uses and covers, and analyzes those data to quantify the roles of deforestation and grazing on hydrologic behavior. PALM-TREES researchers will measure the factors affecting participation in an existing land-use incentive system to implement land management systems that may improve the flow regime to the Canal. The findings from the physical and socio-economic studies will be merged into a hydro-socio-economic model to predict future water resources availability in the Panama Canal watershed, driven by different land-management and climate scenarios.

CASE STUDY ONE

REVISED TITLE *(ACCORDING TO NEW POLICY):*

WSC-Category 2 Collaborative Research: Hydrology and Land Management in Panama Canal Zone

REVISED ABSTRACT *(ACCORDING TO NEW POLICY):*

More frequent, severe droughts and floods in the tropics have the potential to interfere with operations of the Panama Canal. Given the strategic and economic importance of the Panama Canal, the need for predictive understanding of rainfall and runoff is great. This project will examine preferential runoff flow paths (e.g., cattle trails, etc.) in three watersheds and link hydrologic response to management decisions, water provisioning and incentive payments within the Panama Canal Watershed. As five percent of global trade uses the Panama Canal and U.S. naval vessels use the canal to rapidly move between the Atlantic and Pacific Oceans, the project serves the national interest by developing a context within which to manage development within the Panama Canal watershed. Training will be provided for managers and decision makers of the Panama Canal Authority and the Panama National Park System The project will support two post-doctoral researchers six graduate students, and several undergraduate students in hands-on research experiences Panamanian and U.S. students will have opportunities to exchange experiences, and mutually advance careers and multi-cultural learning.

Panama is part of the seasonal tropics with an extended dry season for which more frequent and severe droughts and floods have been predicted. The overarching research hypothesis is that differences in preferential flow paths (e.g., cattle trails, etc.) within a watershed will develop a two-way coupled linkage between hydrologic response of the watershed and the management decisions associated with incentive payments to ranchers in the watershed. The project will identify dominant flow paths in multiple catchments using hydrologic, geochemical and isotopic methods; they will additionally observe and model hillslope hydrologic flow and residence times; they will develop socio-economic model integrating land use and incentive payments for the Panama Canal Watershed. An overall hydrologic and decision making model will be constructed to evaluate the time scale of change and the response to changing land use as a result of rancher decisions in regard to incentive payments. The project will increase predictive understanding of the role of land use in creating/destroying preferential flow paths on runoff generation, groundwater recharge and plant transpiration in the mountainous seasonal tropics.

CHANGES BY PROGRAM MANAGER AND DEPUTY ASSISTANT DIRECTOR:

- Title adequately describes the purpose of the research in nontechnical terms to fullest possible extent. Cutesy acronym (PALM-TREES) removed from title and throughout abstract.
- First paragraph includes a nontechnical explanation of the project's broader significance and importance to society and science. Broader impacts included; both merit review criterion addressed. "Post doc" written out as post-doctoral researcher. U.S. standardized with periods.
- Second paragraph includes a technical description of the project, stating the problem to be studied, the goals and scope of the research including the hypothesis, and the methods and approaches to be used.

CASE STUDY TWO

TITLE *(AS SUBMITTED BY RESEARCHER):* Collaborative Research: Interrelations Between Foreland Deformation and Flat-slab Subduction: Integrated Analysis of the Sierras Pampeanas to Cordillera of the South-central Andes

ABSTRACT *(AS SUBMITTED BY RESEARCHER):*
First-order questions persist regarding fundamental controls of continental deformation along convergent plate margins, including causes and interactions of thin-skin upper crustal to thick-skin lower crustal deformation, influences of pre-existing crustal weaknesses, and relations to subduction dynamics. This project will integrate: (1) structural analysis of faults, folds, and fracture systems to estimate evolving stress/strain patterns; (2) anisotropy of magnetic susceptibility (AMS) analysis to characterize deformation fabrics; (3) paleomagnetic analysis to evaluate vertical-axis rotations; and (4) construction of crustal cross sections incorporating geophysical data. Studies will be focused along five transects that span normal to flat-slab subduction, and which cross the thick-skin Sierras Pampeanas, thin-skin Precordillera, and mixed mode Principal Cordillera belts of northwest Argentina. The project will: (1) quantify both vertical-axis rotations and spatial-temporal changes in stress/strain fields across a complex mountain system (thick-skin foreland, thin-skin fold-thrust belt, mixed mode belt); (2) provide a new model for the 3-D kinematic evolution of the region; (3) test geodynamic models that predict different along-strike variations in structural style, stress patterns, rotations, and intraplate shortening rates related to a transition from normal to flat-slab subduction; (4) evaluate effects of crustal rheology, basement weaknesses, and basin inversion on patterns of structural trend, stress refraction, and deformation partitioning; and (5) statistically compare stress/strain directions estimated from fault data, AMS fabrics, earthquake focal mechanisms, and available GPS data.

Results of this project will improve understanding of mountain building processes along convergent plate boundaries, providing expansive structural and paleomagnetic data sets of an active mountain system that can be compared with studies of other mountains, including the Sevier and Laramide belts of the western United States. This project will also be coordinated with geodynamic studies supported by CONICET (Argentina National Council of Scientific and Technical Research) to evaluate links between deep tectonic, upper crustal seismic, and surface processes during flat-slab subduction. Broader impacts will include: (1) enhanced education of students through high-impact undergraduate research experiences and through incorporation of results into courses and student field trips to Argentina; (2) increased participation of underrepresented groups, particularly young women geoscientists who will be active in all facets of research; (3) new international collaborations that enhance skills and learning through sharing of diverse geologic expertise and cultural backgrounds; and (4) improved understanding of seismic risks in the study region that has experienced multiple devastating historic earthquakes.

CASE STUDY TWO

REVISED TITLE *(ACCORDING TO NEW POLICY):* Collaborative Research: Foreland Deformation and Flat-slab Subduction Interrelations: Integrated Analysis to Understand Mountain Building Processes

REVISED ABSTRACT *(ACCORDING TO NEW POLICY):*

The modern-day topography of western South America results from the convergence and collision of two tectonic plates wherein the Nazca Plate is being shoved at a shallow angle beneath the South America plate in a process called subduction. This project will address the effects of flat-slab subduction in producing the continental deformation that has resulted in the dramatic uplift of the Andes along the western margin of South America. The researchers seek to provide better understanding of the geologic and geodynamic processes that have resulted in the growth of the Argentine Andes. Their results will have important implications for the understanding of ancient mountain building processes, such as the tectonic processes that formed the Rocky Mountains of the western United States during the Sevier and Laramide orogenies, or mountain-building events. The project also has the potential to improve understanding of seismic risks in the study region that has experienced multiple devastating historic earthquakes. The project involves a significant scientific collaboration with Argentinian geoscientists from the Argentina National Scientific and Technical Research Council, also known as CONICET, and their students, who will be involved in all facets of the project. The project will contribute to the training of undergraduate students through involvement of students in high-impact research projects and participation in cross-cultural international experiences, it will also contribute to the broadening of participation of underrepresented groups in STEM. Results of the research will be incorporated into research curricula and will be widely disseminated through presentations at meetings and publications.

First-order questions persist regarding fundamental controls of continental deformation along convergent plate margins, including causes and interactions of thin-skin upper crustal to thick-skin lower crustal deformation, influences of pre-existing crustal weaknesses, and relations to subduction dynamics. This project will integrate a variety of structural and rock magnetic techniques in order to better understand the spatial and temporal changes in deformation that have resulted from flat slab subduction of the Naza plate and its interaction with the overriding South American plate. The project will involve the measurement and analysis of faults, folds, and fracture systems; measurements of the anisotropy of magnetic susceptibility to characterize deformation fabrics; will utilize paleomagnetic analysis to understand how crustal blocks have rotated due to deformation; and will use construction of geological cross-sections utilizing geophysical data. The work will focus on five transects that span the effects of normal to flat-slab subduction, and which cross the thick-skin Sierras Pampeanas, thin-skin Precordillera, and mixed mode Principal Cordillera belts of northwest Argentina. The project will: quantify both vertical-axis rotations and spatial-temporal changes in stress/strain fields across a complex mountain system (thick-skin foreland, thin-skin fold-thrust belt, mixed mode belt); provide a new model for the 3-dimensional kinematic evolution of the region; test geodynamic models that predict different along-strike variations in structural style, stress patterns, rotations, and intraplate shortening rates related to a transition from normal to flat-slab subduction; evaluate effects of crustal rheology, basement weaknesses, and basin inversion on patterns of structural trend, stress refraction, and deformation partitioning; and statistically compare stress/strain directions estimated from fault data, magnetic fabric analysis, earthquake focal mechanisms, and available global positioning satellite data.

CHANGES BY PROGRAM OFFICER, WORKING GROUP MEMBER, AND DEPUTY ASSISTANT DIRECTOR:

- Changed title to reinforce purpose of the research in nontechnical terms.
- First paragraph includes a nontechnical explanation of the project's broader significance and importance to society and science. Broader impacts included; both merit review criterion addressed. PIs changed to researchers.
- Second paragraph includes a technical description of the project, stating the problem to be studied, the goals and scope of the research, and the methods and approaches to be used.

CASE STUDY THREE

TITLE *(AS SUBMITTED BY RESEARCHER):* Collaborative research: a multi-tracer approach (U, B, S, Sr) to fingerprint and quantify anthropogenic salinity sources in the semi-arid Rio Grande watershed

PROJECT SUMMARY *(AS SUBMITTED BY RESEARCHER):*

Overview: Elevated salinity in the Rio Grande River, a critical resource of irrigation water in the semi-arid southwestern U.S., has led to severe reductions in crop productivity and salt loading to soils. These pressing salinity problems have also been observed for other arid rivers worldwide. Despite previous investigations, the salinity contributions to the Rio Grande have not been adequately quantified, especially from agriculture, urban activities, and geological sources in regions where human activities are extensive. The goals of this proposed study are: 1) to fingerprint and quantify salinity sources in the lower Rio Grande in New Mexico and Texas using emerging isotopic (U), traditional isotopic (B, S, Sr), and elemental (major dissolved ions) tracers, with a concerted effort on understanding human impacts; and 2) to understand the controlling factors on U and S isotope variations in natural streams in the Jemez River Basin Critical Zone Observatory (JRB-CZO), a headwater region of the Rio Grande with limited human activities. This proposal will integrate expertise and resources in environmental isotope research from four institutions at both national and international levels: U. of Texas El Paso (UTEP; minority serving public university), U. of Arizona, U. of Tennessee, and Institut de Physique du Globe de Paris (France).

Intellectual Merit: We propose to revisit the important salinity issue in the semi-arid portion of the lower Rio Grande watershed in New Mexico and Texas. Our "multi-line evidence" approach is different from previous attempts in that our novel combination of the above isotopic and solute tracers has particular resolving powers in distinguishing salinity from agriculture, urban activities, and geologic sources. The gained insights will improve our understanding of human impacts on water quality and elemental cycles, one of the most pressing issues facing the Earth Sciences community.

Our study will also advance our understanding of the controlling factors on U and S isotope variations in headwater streams in the Jemez River Basin (JRB). Such information will provide an important natural baseline to understand human-impacted waters. In this regard, our study in the JRB is a natural analog to the lower Rio Grande watershed at a small scale with limited human impacts. The insights gained in the JRB will also allow us to better develop and utilize U isotopes as a novel tracer of water flow paths and transit times at Earth's surface. With our multi-tracer approach, we will achieve the following objectives: 1) to characterize the U, S, B and Sr isotope and major element signatures in anthropogenic and natural salinity sources in the Rio Grande watershed; 2) to establish both spatial and temporal variations of these tracers in the Rio Grande and to quantify the contributions from various salinity end members with mass balance constraints; 3) to link U and S isotope variations in natural streams to different water sources that have evolved via different flow paths controlled by climatic, geological and hydrologic conditions.

Broader Impacts: Our multi-tracer approach to identify salinity sources in the Rio Grande will have immediate broader impacts in the arid southwest U.S. and worldwide for many arid rivers experiencing pressures on fresh water resources. We will also advance understanding of the novel U isotopic tracer for near-surface/surface water systems in both natural and human impacted areas. Our project will impact minority students in the STEM fields as UTEP is one of the largest Ph.D.-granting Hispanic serving universities in the U.S. Our project will support 2 graduate students and 3 undergraduate students for 3 years to pursue their STEM degrees. At all the above four institutions, we are making a strong effort to provide valuable research and educational experiences to our UTEP students. This project will also support two early career scientists (Ma and Szynkiewicz) to start up environmental isotope research. In collaboration with the NSF GK-12 program (PI Velasco, UTEP), the NSF JRB-CZO (Lead PI Chorover, U. Arizona), the Kay Bailey Hutchison Desalination Plant, and the Earth Science Day (UTEP), our outreach activities will expose U.S. high school students/teachers and general public in the rapidly growing and diverse El Paso region to both cutting-edge Critical Zone research topics (e.g. water, soils, human and environments) and pressing environmental problems facing the local community.

CASE STUDY THREE

REVISED TITLE *(ACCORDING TO NEW POLICY):* Collaborative Research: A Multi-tracer Approach to Fingerprint and Quantify Anthropogenic Salinity Sources in the Rio Grande Watershed

ABSTRACT *(DEVELOPED ACCORDING TO NEW POLICY):*

Elevated salt content (salinity) in the Rio Grande River, which serves as a critical source of irrigation water in the semi-arid southwestern US, has led to severe reductions in crop productivity and an accumulation of salts in soils. These pressing salinity problems have also been observed for other arid rivers worldwide. In this study, the research team will determine the sources of salinity in the Rio Grande. This study has implications for informing land and water management practices, and as such can contribute to ensuring maintenance of US agriculture and the longevity of freshwater supplies. Notably, this work is applicable to understanding processes affecting salinity in related systems worldwide. In addition to the potential utility of this work for US agriculture and water resources, this has impact scientifically in that it focuses on the development of a new geochemical tool for understanding near-surface / surface water flow paths and transit times. This tool can potentially be applied to water systems across the US and beyond, again providing information that may assist in water resource management in both natural and managed systems.

This project will integrate expertise and resources in environmental isotope research from four institutions at both national and international levels: U. of Texas El Paso (UTEP; minority serving public university), U. of Arizona, U. of Tennessee, and the Institut de Physique du Globe de Paris (IPGP). By training two graduate and three undergraduate students, the project will contribute to the training of a future US STEM workforce. Notably, a UTEP student will also gain international professional experience by working with the IPGP in France with a highly-regarded top research group in isotope geochemistry. In addition to this international experience, the student will receive training in isotope geochemistry methods and will bring this knowledge back to the US research team. This international collaborative component of the work will be supported by NSF International Science and Engineering. Outreach activities will also bring cutting edge research topics such as interactions between human and water, soils, and environments, as well as local pressing environmental problems to the attention of US high school students, teachers and the general public in the rapidly growing and diverse El Paso region.

The research will revisit an important salinity issue in the semi-arid portion of the lower Rio Grande watershed in New Mexico and Texas. The goals of this project are: 1) to fingerprint and quantify salinity sources in the lower Rio Grande in New Mexico and Texas using emerging isotopic (uranium (u)), traditional isotopic (boron (b), sulfur (s), strontium (sr)), and elemental (major dissolved ions) tracers, with a concerted effort on understanding impacts related to human activities; and 2) to understand the controlling factors on uranium and sulfur isotope variations in natural streams in the Jemez River Basin Critical Zone Observatory (JRB-CZO), a headwater region of the Rio Grande with limited human activities. The combination of the above isotopic and solute tracers has particular resolving powers in distinguishing salinity from agriculture, urban activities, and geologic sources. The gained insights will improve understanding of anthropogenic (human impacts) on water quality and elemental cycles, one of the most pressing issues facing the Earth Sciences community. This study will also advance the understanding of the controlling factors on uranium and sulfur isotope variations in headwater streams in the Jemez River Basin. Such information will provide an important natural baseline to understand human-impacted waters. With the multi-tracer approach, the researchers will achieve the following objectives: 1) to characterize the U, S, B and Sr isotope and major element signatures in anthropogenic and natural salinity sources in the Rio Grande watershed; 2) to establish both spatial and temporal variations of these tracers in the Rio Grande and to quantify the contributions from various salinity end members with mass balance constraints; 3) to link U and S isotope variations in natural streams to different water sources that have evolved via different flow paths controlled by climatic, geological and hydrologic conditions.

CHANGES BY PROGRAM OFFICER:

- Removed technical abbreviations from title.
- First paragraph includes a nontechnical explanation of the project's broader significance and importance to society and science. Broader impacts included; both merit review criterion addressed. Changed to third-person narrative, e.g., no "ours" and "we"s. US standardized throughout without periods.
- Second paragraph includes a technical description of the project, stating the problem to be studied, the goals and scope of the research, and the methods and approaches to be used. Abbreviations (U, B, S, Sr) spelled out in abstract. Other technical terms paraphrased.

REFERENCE DOCUMENTS

- NSF Official Issuance OD 14-10, Award Abstract and Title Policy Clarification (March 20, 2014) https://inside.nsf.gov/tools/toolsdocuments/Inside NSF Documents/od1410.pdf

- NSF Staff Memorandum OD 13-26, Portfolio Framework (November 19, 2013) https://inside.nsf.gov/tools/toolsdocuments/Inside NSF Documents/od1326.pdf

- Important Notice to Presidents of Universities and Colleges and Heads of Other National Science Foundation Awardee Organizations: Transparency and Accountability at NSF https://inside.nsf.gov/tools/toolsdocuments/Inside NSF Documents/in135.pdf

- Excerpt on "NSF Abstracts" from NSF Proposal and Award Manual Chapter VI.B.1 (February 2014, NSF Manual #10, pps. VI-4-5.) https://inside2.nsf.gov/pubs/pam/pamfeb14/6.htm#VIB1

- Excerpt on "Titles of NSF-Supported Projects" from NSF Proposal and Award Manual Chapter VII.K (February 2014, NSF Manual #10, pps. VII-41-42.) https://inside2.nsf.gov/pubs/pam/pamfeb14/6.htm#VIB1

NOTE: For the purposes of the Transparency and Accountability Working Group Report, these references are not included in the Appendix.

C. Portfolio Analysis Tools

This Appendix contains information on several tools that can be used in Portfolio Analysis. The tools in this appendix were compiled by the Portfolio Analysis and Tools Taskforce, chaired by NSF Evaluation and Assessment Capability. By including this information we hope individuals and units will begin experimenting with these tools and provide feedback to the individuals listed under Additional Information. There are four sections in this Appendix

- NSF in-house clustering tools
- NSF Enterprise Data Warehouse and Business Intelligence Tool
- EHR's Latent Semantic Indexing
- Deep Insights Anytime, Anywhere (DIA2)

NSF in-house clustering tools

Data about NSF projects are represented by large repositories of unstructured data, proposal text and structured meta-data (institutional, NSF organization, PI, etc.).
The tool-chain which currently forms the basis of our NSF in-house text mining and clustering capabilities consists of the following discrete components:

1) The Apache SOLR search engine https://lucene.apache.org/solr/
2) The Affinity Propagation algorithm http://genes.toronto.edu/index.php?q=affinity%20propagation
3) The Carrot2/Lingo3G clustering tool http://carrotsearch.com/lingo3g-overview.html

Apache SOLR Search Engine: SOLR is considered to be the powerful unstructured text search framework available, and is in use by a number of Federal agencies as well as forming the basis for text analytics searches on a number of commercial ecommerce sites including Google. The SOLR framework offers a rich search syntax which allows fuzzy, proximity and wildcard searching of key words in unstructured text, with a response time of typically under 1 second for indexes of up to 3 billion documents. NSF's SOLR index contains approximately 5 million documents, consisting of all proposals dating back to 2006 as well as annual, interim and final reports. The reports associated with all NSF awards are available from 1999 to the present. Each section of the proposal is individually searchable, and the PDF text is combined with key metadata fields (such as PI Name, Institution, Program, Directorate, Division, etc.) to provide a rich faceted search environment. New proposals are added to the index at each DIS maintenance weekend, and metadata relating to old proposals is also refreshed as part of the same maintenance process.
Functionality: The SOLR search engine provides real-time document similarity matching, and reports a quantitative similarity score between sets of documents using the "More Like This" algorithm (https://wiki.apache.org/solr/MoreLikeThis). SOLR's "More Like This" algorithm allows the identification of related research proposals submitted to NSF as well as providing a tool for plagiarism and duplication of proposal submissions. The SOLR framework is maintained by the Open-Source Apache Software Foundation, which provides free (no cost) software tools and languages for public usage.
Access: The NSF portal is accessed via the URL http://dis-checker-p01/solr/browse. Analysis of the search engine logs suggest thousands of queries a day are being sent to the search engine by NSF staff

The Affinity Propagation algorithm: is based on the concept of message passing between data points. Unlike clustering algorithms such as k-means or k-medoids, Affinity Propagation does not require the number of clusters to be determined or estimated before running the algorithm. The algorithm operates on large, non-symmetrical, highly sparse matrices of SOLR "More Like This' document scores. The algorithm has benefits over other clustering algorithms as it is less sensitive to outliers and the similarity scores can be non-metric and non-reciprocal. Affinity Propagation is a publically available algorithm (Clustering by Passing Messages Between Data Points. Brendan J. Frey and Delbert Dueck, University of Toronto Science 315, 972–976, February 2007) and can be coded into a number of programming languages at no cost.

Carrot2/lingo3G document clustering tool: The Carrot2 algorithm is available as part of the Open-Source SOLR framework and can provide conceptually aware clustering of searches performed on the NSF index of proposals and annual reports. The Carrot2 algorithm generates "conceptually aware" cluster labels using the Latent Semantic Indexing approach (http://en.wikipedia.org/wiki/Latent_semantic_indexing) and can generate hierarchical clusters of similar documents. The Open-Source Carrot2 clustering algorithm is augmented by a commercial version which provides refinements to the clustering approach as well as an enhanced visualization library. The Lingo3G framework was purchased by NSF in 2013 at a one-off cost of $5,000.
Access: the prototype document clustering web-application is available at the URL http://dis-checker-acl:8080/Clustering/search. The proposal clustering tool is only available to very small number of testers at the moment (less than 30 people) but has received over 10,000 individual proposal clustering queries since January 2014

In addition to these described activities, **a semantic search engine for NSF proposals** is currently being developed within Apache SOLR, and it is currently being tested.

Additional Information

For additional information on any of the above NSF-in-house tools, contact Dr. Paul Morris, OIIA at pmorris@nsf.gov

NSF's Enterprise Data Warehouse and Business Intelligence Tool

Features

NSF's enterprise data warehouse and business intelligence platform provides access to authoritative data about NSF's portfolio of awards (structured data found in proposals and awards). The reports built on this platform provide a single access point to formerly inaccessible multi-sourced data in easy-to-comprehend formats so staff can make quick informed business decisions. Through rich visualizations, reports, and enhanced analytic capabilities, users can effectively manage their award portfolios, spot portfolio outliers, and apply drill-down capabilities to view detailed award information. The platform is expanding to incorporate all operational and management data across the entire grants lifecycle, ad hoc reporting capabilities, and additional enterprise-level reports.

Functionality
Three reports are currently available to all NSF Staff: *Award Manager Dashboard*; *Project Reports Due/Overdue*; and *Project Reports Submitted But Not Approved* Each report allows the user to narrow the results displayed through a host of filters including Directorate/Division, Program Manager, Program Element, Award Type, and PI/Co-PI. Users are also able to drill into the aggregate graphical displays to view additional details about the awards and/or project reports, and they are able to export these details for their own use.

- *Award Manager* – This serves as the landing page for all reports and presents users with graphical information about the NSF portfolio along four measures: open awards by type; open awards with co-funding; open awards by institution (top 10 displayed); and open awards by spending rate. Users drill-down to get detailed award-level details such as principal investigator, award title, institution, funds obligated to date, etc.

- *Project Reports Due/Overdue* – Provides a current snapshot of project reports that are due or overdue. The drill-down view displays useful details to aid NSF staff in identifying awardee compliance issues with project reporting requirements.

- *Project Reports Submitted But Not Approved* – Provides data on project reports submitted by the principal investigator to NSF but that have not yet been approved by the NSF program officer. This report provides NSF staff with information to help identify pending work and processing bottlenecks.

Function-specific reports have also been developed for use by the Office of Budget, Finance and Award Management to improve award processing and post-award monitoring. These reports identify awards that require manual close-out; award actions that are blocked because of overdue project reports; and summary data about an institution's open awards, pending proposals, cumulative obligations, and expenditures.

Access and Usage
The business intelligence tool is available to all NSF staff and authorized contractors through www.research.gov. Once logged in through the NSF Staff login, click the Award Manager link on the Left Navigation Bar to view the Award Manager Dashboard Landing Page. The other reports mentioned above are available as tabs across the top of the landing page, along with an Award Search function. Average monthly usage is approximately 145 unique users and 1000 page views.

Additional Information
For additional information on any of the above NSF-in-house tools, contact Erika Rissi, BFA/DIAS at erissi@nsf.gov or Carlton Sapp, DIS at csapp@nsf.gov

EHR's Latent Semantic Indexing

Features: In the absence of a categorical structure for identifying the content of proposals, text analysis tools have been utilized in several EHR applications to aid in identifying the content of

submitted proposals by methods other than open ended word searching. These applications treat text in a conceptual fashion based on a machine-learning technique. The process is based, in part, on the use of Latent Semantic Indexing (LSI) of the text and single value decomposition to develop indexes of target text. A primary goal of LSI is to improve recall when different terms are used to refer to the same information.

Functionality: As with many text analysis tool, this type of indexing can be used in either an "unsupervised" or "supervised" fashion. Unsupervised applications are those that are direct output of the application as finding items in a document repository that are conceptually related to broader topics than one would find if searching for single words. In this use, the repository can be searched either using a series of terms or whole text without using a particular term or terms. To find documents related to Cyberlearning for instance, the user enters a sentence, paragraph or an entire document that the user identifies as relating contextually to the concept of Cyberlearning, without using that term. This is potentially one step in identifying a group of awards or proposals that represent particular topic areas. The other unsupervised process is clustering in which documents in a repository are grouped dynamically based on their contextual similarity. For instance, a group of incoming proposals can be clustered as a way of identifying potential panel groupings. A set of awarded proposals can be categorized to identify those with similar content.

These same indexes can be used in a "supervised" function in which a user creates a structure against which the application will identify items in the repository that relate to the structure definition. Categories are created by the user along with contextual examples for each category which the application uses to match items in the target repository. For example a user can create a taxonomy of a particular disciplinary area or sub area with relevant textual examples which the application matches to items in a repository, either awarded or pending proposals in this case, as a way of assessing the coverage in particular areas of interest. The function can be adjusted for coherence or "fit" of the categorization results based on the output statistics of the process itself or allow individual projects to be categorized in more than one topic for the identification of multiple topics. This approach requires the identification of categories and appropriate textual examples, either from the target repository or other text sources such as journals, papers or proceedings. Once created, a taxonomy can be used to track items across time and organizational units. It can be updated with new categories or topics, or adjusted with new examples in existing categories. The advantage of this approach is the creation of repeatable and consistent results.

These methods of identifying textual content can be used to identify various components of a portfolio. When added with metadata, they can demonstrate levels of activity by topical and functional areas across the organization. Creating a closer investigation of what research or development smaller groups of awards or proposals intend to do can be done with a refined taxonomy or thesaurus, limiting the number of items that can undergo closer assessment by program staff Tools are currently being used by several EHR programs to identify groups of awards

Access and Usage

The search applications can be found here. http://inside.ehr.nsf.gov/EHR_HomePage/

The dynamic clustering function can be found here:

http://ehr-app-01:8180/CAClust/faces/query.xhtml Categorization applications are customized and cannot be run from the open interface.

NIH's Fingerprinting Pilot

EHR is also testing the approach used by NIH to "fingerprint" each incoming grant application with terms in a curated thesaurus within disciplinary or topical areas. This approach, used by NIH across all of its institutes, involves creating lists of terms which are then dynamically compared against incoming grant applications with matches identified as project fingerprints. Each institute creates a thesaurus specific to its area. Using the thesaurus approach enables terms to be weighted to account for currency or frequency of occurrence. The process results in that ability of NIH to report on their investment in particular topic areas represented by items in the taxonomy. The process uses a sophisticated reporting interface similar to EJacket, utilizing the fingerprints to identify similar efforts across investigators. EHR has indexed 8 years of awarded proposal summaries in the NIH system and is creating thesauri of terms in a number of education research specific areas. A publicly available view of how these results are used can be found at the following hyperlink: Research Condition and Disease Categorization

Additional Information

For additional information on any of the above tools housed at EHR, contact William Neufeld, EHR at wneufeld@nsf.gov

Deep Insights Anytime, Anywhere (DIA2)

What is DIA2?

DIA2 is a web-based knowledge mining and interactive visualization platform for non-experts in data mining and visualization. It is a project funded by EHR to Purdue University to create a central resource for the community of researchers, educators, and learners. DIA2 is a user-centered product for non-experts in data mining and visualization. The DIA2 design, build, and deployment focus on the users and their needs. The guiding design paradigm is ***No Manuals, No Training***. DIA2 is currently in Alpha Version.

DIA2 is built on more than 50 hours of in-depth conversations and focus groups with NSF program officers (mainly in EHR), science assistants, IT staff, and administrators. Additionally, the DIA2 team conducted in-depth user experience analyses of the DIA2 interface and is incorporating appropriate changes to DIA2 with the primary goal of increasing productivity and speeding the transition from data to actionable insights.

Functionality and Features

DIA2 provides a range of widgets that have a variety of functionalities and features. Widgets can be easily added to DIA2 without ever having to restart the software stack. Users are provided an initial set of 6 widgets with several more in development. We provide a brief summary of each widget and its functionalities below. All widgets can switch between All Awards and Active Awards Only mode.

1. NSF Org Structure Explorer

This widget uses a treemap algorithm to present the entire NSF funding portfolio as a single field, where size of blocks represent number of awards and color indicates amount of funding. The widget allows users to go from NSF Wide to Directorate to Division to Program level with a

few clicks of the mouse. Clicking on a program will open up a full program profile (Figure 2) of funded projects that includes the following sub-explorer tabs. Specific features of this widget include:

1. Interactive social network graphs of PI/Co-PIs awarded through the program. (Includes searchable table view).
2. List of awards with ability to quickly bring up award abstracts.
3. List of Program Officers supporting awards in the program. Clicking on the any PO in the list launches sub-profiles.
4. Institutions supported by the program and ability to launch further exploration of the institution receiving awards under the program.
5. Geographical view. Clicking on the map constraints the entire exploration only by a specific state.

2. Thesaurus Concepts Explorer

Through this widget users can define any taxonomy/thesaurus and quickly convert that in highly interactive visuals. The thesaurus widget uses a tree-view map to allow quick exploration for users. Widget features include:

1. Interactive social network graph of PI/Co-PIs funded to work within a specific concept. This graph is completely interactive. Includes a table view.
2. Yearly breakdown of awards and award amounts. Interactive graph allows constraining exploration to a certain year.
3. List of awards with ability to quickly bring up award abstracts.
4. List of Program Officers supporting awards in the program. Clicking on the any PO in the list launches sub-profiles.
5. Treemap visualization of programs supporting awards related to a specific concept (includes all features listed under NSF Org Structure Explorer). Rapid constraining and program level views.
6. Institutions receiving awards related to a specific concept with ability to launch further exploration of the institution constrained by the concept.
7. Sub-concepts explorer. These are sub-concepts related to the main high-level construct as defined in the taxonomy hierarchy. N-level exploration with no upper limit for concept nesting.
8. Geographical view. Clicking on the map constraints the entire exploration only by a specific state.

3. People Explorer

Allows for exploration by searching for any PI/Co-PI or Program Officer at NSF. DIA2 automatically recognizes the various roles a person has in the NSF system and automatically generates appropriate profiles. Widget features include:

1. Auto detection and fast discovery of person names based on recommendation and complete disambiguation. Contextualized with institutional history.
2. Auto role detection.
3. Ego-centric interactive social networks to collaborators and collaborators-of-collaborators. DIA2 can provide collaboration networks for 6 levels of separation constrained to 2 levels. Completely interactive explorer.

4. Awards received and Awards Managed lists depending on roles. Completely interactive explorer with ability to bring up awards abstract.
5. Program Officers assigned to PI (role dependent) list. Full explorer.
6. Programs funding the PI (role dependent) treemap explorer. Includes all features from widget 1.
7. Awards managed (role dependent). Ability to bring up abstracts.
8. Interactive collaboration network of all PI/Co-PIs managed by PO (role dependent). Searchable table view also available.
9. Interactive bar graph of awards managed.
10. Programs managed by PO (role dependent) treeview. Includes all features from widget 1.

4. Institution Explorer

Full profile of awards received by any awardee institution. DIA2 automatically disambiguates all institutions and all campuses of institutions as long they are listed as separate awardee entity. Widget features include:

1. Auto detection and fast discovery of institution names based on recommendation and complete disambiguation.
2. Interactive social network graph of PI/Co-PIs funded to work within a specific concept. This graph is completely interactive. Includes a table view.
3. Yearly breakdown of awards. Interactive graph allows constraining exploration to a certain year.
4. List of awards with ability to quickly bring up award abstracts.
5. List of Program Officers supporting awards in the institution. Clicking on the any PO in the list launches sub-profiles.

5. Program Explorer

Simple search of program code or program name (or well-known abbreviation) provides program level exploration. Widget features include:

1. Auto detection and fast discovery of program names based on recommendation and complete disambiguation.
2. Ability to recover a cluster of programs.
3. Please refer to widget 1 for a complete list of features available through this widget.

6. Topic Explorer

Search for any concept such as *cyberlearning, K-12 physics education* to generate a full portfolio view. Widget features include all features in widget 1.

7. Additional Features

1. 3 workspaces for better workflow management.
2. Ability to name, save, and modify workspaces.
3. Completely mobile devices friendly interfaces.
4. Share workspaces with other DIA2 users (social feature in development).
5. Ability to switch between any treemap visual to a fully featured table view. (In development).
6. Ability to export any visual as raw data to Excel. (In development).
7. Grouped folksonomy creation (define term vectors). Define once, use anytime. (In development).

8. Social Taxonomy Mapper widget (ability to merge one user's taxonomy at various granularity – in development).
9. Topic derivation from given document set (In development).
10. Direct raw data access via JSON/RPC (Currently available and testing).
11. Connections to patent database (In development).
12. Connections to project outputs (partially available).
13. Connections to publications from awards (In development).
14. Connections to outcomes report via research.gov (In development).

Access:

External NSF Access (public access)
Available at http://www.dia2.org (select Launch Alpha).

Internal NSF Access (including declined and other status proposals)
The Internal URL for NSF access is under development and is planned at 128.150.141.101/DIA2/pages/index.php – DIA2 already has a full hardware stack deployed inside NSF.

Current Utilization
Numerous NSF users on DIA2 external site. The alpha version is available only to friendly users (about 80 to 100 users). DIA2 has served over 15,000 full profile views. DIA2 already has provided highly tailored analyses to several Education and Human Resources (EHR) programs.

Additional Information
For additional information on any of the above tools, contact Dr. Don Millard, EHR at dmillard@nsf.gov or the Project PI, Prof. Krishna Madhavan, Purdue University at cm@purdue.edu

D. Merit Review Process

A proposal to the NSF passes through many hands conducting a number of review and oversight functions both before and after it is acted upon. The pathway described below is fairly typical in its broad strokes but may vary in detail across the NSF. At any stage in the process, NSF staff has input to ensure adherence and accountability to the Agency's standards for review and recommendation.

The Life of an NSF Proposal (Pre-Decision)

The pre-decision pathway described below is fairly typical in its broad strokes but may vary in detail across the NSF.

Merit Review

A Principal Investigator (PI) or team of investigators (e.g., in a collaborative proposal or project) submits a proposal to the NSF.

This proposal is assigned to a particular Program Director (PD) based on the subject matter in the proposal and in response to a specific research solicitation (call for proposal or request for proposals).

Once received by the cognizant PD, the proposal is subjected to Compliance Review.

If the proposal passes Compliance Review, it may be reassigned to another PD in an effort to ensure a match in terms of topic area. It will also be reassigned should the PD have a Conflict of Interest with the proposal.

It is then evaluated for possible reviewer assignments in preparation for external Merit Review.

Potential Reviewers are screened for Conflicts-of-Interest (COI) according to criteria established under federal statute and by guidance from the NSF Office of General Counsel (OGC). If a reviewer is flagged for a possible COI, the PD assesses the potential conflict, based upon established NSF COI rules. If any questions exist surrounding the COI and the use of a specific reviewer, the PD consults with his/her divisional or directorate COI official, who in turn may consult with the Office of General Counsel (OGC) for a final ruling on the potential COI.

The Merit Review process (sometimes called peer review) for proposals submitted to the NSF may include the use of ad hoc reviewers and/or review panelists who meet, discuss the proposals, and make recommendations to the cognizant PD(s). In all cases, the reviewers assess a given proposal on the basis of the two NSF review criteria established by the National Science Board (NSB) – Intellectual Merit and Broader Impacts – as well as any additional program- or solicitation-specific review criteria specified in the original program announcement or solicitation.

Consider the following process, using a two-staged combination of ad hoc and panel review, as an illustrative example.

In Stage 1, proposals are sent out to several[19] external experts for merit review (mail review) based on the two NSF review criteria established by the National Science Board -- Intellectual Merit and Broader Impacts. This stage takes about 2-3 months.

Next comes Stage 2 wherein the proposal and its external expert reviews (mail reviews) are taken to a 8-10 person external expert panel (depending on number of proposals to be reviewed) and evaluated over a multi-day period called panel review (could be 4 days in duration depending on proposal load). Panel members are not the same persons as the mail reviewers.

In Stage 1, the external reviewers only see individual proposals and rate them on a 5 point scale in descending order from Excellent, Very Good, Good, Fair, and Poor.

In Stage 2, the entire panel (except those in conflict with the proposal) see all the proposals in the competition and rate them based on the same two NSF criteria on the same rating scale. Panel members evaluate how each proposal compares to all of the other proposals that were submitted and how it fits within the stated goals of the solicitation or program announcement.

The Program Director(s) take(s) all of these reviews under advisement and recommends an award or decline based on the review criteria and also programmatic balance and other NSF criteria, as appropriate. Usually, a dialogue takes place among PDs and an effective practice includes a dialog between PDs and Division Directors/Deputy Division Directors prior to the formal electronic recommendation of an award or decline.

- ✓ Releases reviews;
- ✓ Uploads Review Analysis (Form 7 RA) laying out evaluation of all reviews (ad hoc and panel) to the electronic jacket (EJ) as the official Agency record;
- ✓ Uploads any Diary notes;
- ✓ Uploads all relevant Correspondence (external and internal to NSF); and
- ✓ Constructs award Abstract.

Internal NSF Review

Once an award or decline recommendation is made by the PD, the proposal is then subjected to Administrative Review, as described below:

All Proposals:

- ✓ Add or check for Context Statement;
- ✓ Check various internal administrative and financial codes;

[19] Policy normally requires that proposals must be reviewed by three to eight reviewers, which could be a combination of "mail review" and "panel review". [PAM V. Merit Review Process, B. Use of External Reviewers, 4. Number of External Reviewers To Be Used.]

- ✓ Provide any necessary Form 7 updates;
- ✓ Check panel documents and summary;
- ✓ Check if reviews/panel summary are released;

For awards:

- ✓ Check if new awardee and, if needed, supply package to PI and NSF DGA;
- ✓ Check Abstract;
- ✓ Deal with overdue reports;
- ✓ Prepare award budgets, including sub-awards;
- ✓ Check Human Subjects and Vertebrate Animals involvement; and
- ✓ Consider any International collaboration.

Once an award recommendation passes Administrative Review, the proposal is subjected to Financial Review, as described below:

- ✓ Check budgets, check for subawards, contracts, Budget details, personnel counts, impact statement, Justification for >2 months salary; compliance with other NSF financial requirements;
- ✓ Check funding codes and program reference codes;
- ✓ Check international implications;
- ✓ Check Recommended Award Instrument; and
- ✓ Check recommended start date.

Once a proposal passes Administrative Review, it is routed to Section Heads (SH) or Deputy Division Directors[20], as the case may be, for Review which has two paths – award or decline, as described below:

All Proposals:

- ✓ Review RA for completeness and clarity of justification for PD recommendation;
- ✓ Review Budgets;
- ✓ Examine ad hoc and panel reviews;
- ✓ Review possible COIs;
- ✓ Review Abstract;
- ✓ Review Correspondence; and
- ✓ Review EJ for completeness.

If the SH or DDD finds errors or has questions about any aspect of the proposal recommendation process, the issues are discussed with the cognizant PD for resolution. Where programs are organized into clusters, NSF Divisions have a cluster discussion of the potential recommendations prior to final funding recommendations.

Once the Review by the SH or DDD is complete, all decline recommendations are routed to the Division Director (DD) for concurrence. At DD Concur, all proposals are reviewed for completeness including review and evaluation of the RA and reviewer COIs. When satisfied with

[20] In some parts of NSF recommendations are routed directly to the Division Director.

the proposal record, the DD signifies agreement with the Merit Review Process and outcome by signing-off and executing the DD Concur.

For awards less than $250,000 per year, the SH or DDD conducts the DD Concur process (unless delegated this role by DD).

For larger awards, the DD executes the DD Concur after the SH or DDD has reviewed the proposal record as described above.

The entire Merit Review process takes about 6 months.

The rate of funding for the program varies but is typically about 20%.

Additional Review and Oversight Opportunities (pre- and post-decision)

Beyond the typical pathway of review discussed above, an NSF proposal or project is subject to additional layers of oversight and evaluation depending on circumstances as discussed below.

Cross-NSF Solicitations

In some instances and depending on the scale of a proposal or project, the Directorate Front Offices (AD, DAD) may provide a layer of oversight above the DD. This most often occurs when funds for a multi-directorate research competition are held in the Directorate Office and not in the Divisions or Programs. In such an instance, the PDs, who are running the competition, will often discuss funding recommendations with either the AD or DAD or, alternately, with the Executive Team of the Directorate (AD, DAD, and DDs).

Co-funding of Proposals

Some variations in the Merit Review and Division Review processes occur across the NSF as a result of differing external community research practices and needs. This sometimes results in proposals being subject to multiple sets of oversight practices. This commonly occurs when PDs seek financial support from other PDs across NSF Directorates or from other federal agencies. In these cases, multiple strategies for evaluation and oversight are active. This provides another layer of oversight and checks and balances to NSF recommendations.

Annual Oversight

Each proposal that is funded is subject to an annual research progress review by the Program Director who is handling it (usually the PD who shepherded the proposal through the merit review process) and is also subject to a final review at the end of the award period.

Reconsideration

A researcher may request an initial reconsideration of a declined proposal. Such a re-evaluation of the review and recommendation process is conducted outside of the original recommending

unit. A second reconsideration may be requested by a researcher's institution and the review is conducted by the NSF Office of the Director.

Independent Oversight by NSF Committee of Visitors

An additional, independent level of oversight is provided by Committee of Visitors (COV). Every three years a Committee of Visitors, composed of a panel of external experts, is convened, under the authority of the Directorate Head, to examine and evaluate the quality of programmatic management, especially the thoroughness and appropriateness of the merit review process, employed by the specific Program under review. The COV is a subcommittee of the Directorate Advisory and it issues a report on its findings, and the NSF response to its findings, that is public and posted on the NSF website. The COV report has a life of three years during which annual updates to the issues raised by the COV must be addressed and made public by posting on the NSF website.

Independent Oversight by NSF Office of the Inspector General

If the NSF suspects any wrongdoing by the researcher or the institution or if a researcher or institution suspects improper actions on the part of the NSF staff, or if a third party suspects improper behavior, these concerns are forwarded to the NSF Inspector General (OIG) for evaluation independent of the Program or Agency. The OIG also regularly conducts financial audits of a subset of NSF awards.

E. Members of the Working Group

Members of the Working Group include:

- Erwin Gianchandani, CNS/CISE
- Lawrence Goldberg, ENG
- Brian D. Humes, SES/SBE
- Bradley D. Keister, PHY/MPS
- Carter Kimsey, DBI/BIO and Local 3403, American Federation of Government Employees
- Alexandra Medina-Borja, OIIA/OD
- Don L. Millard, DUE/EHR
- Saran Twombly, DEB/BIO
- David J. Verardo, AGS/GEO
- Mark Weiss, SBE/BCS, co-chair
- Peter Arzberger, OD, co-chair

F. OD Memos and Important Notices

In this section we replicate the text of three OD Staff Memos and two Important Notices to the Community:

- OD 13-26. Portfolio Framework. November 19, 2013.
- OD 14-01. Transparency and Accountability Working Group charge and membership. January 14, 2014.
- OD 14-10. Award Abstract and Title Policy Clarification. March 20, 2014.
- Important Note 135: Transparency and Accountability at NSF. December 11, 2013.
- OD Important Notice No. 136: NSF abstracts and Titles. March 28, 2014.

OD 13-26. Portfolio Framework. November 19, 2013.

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

OD 14-01. Transparency and Accountability Working Group charge and membership. January 14, 2014.

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

OD 14-10. Award Abstract and Title Policy Clarification. March 20, 2014.

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. Our faithful discharge of this obligation will advance our mission while strengthening ties with the scientific community, the public, and other stakeholders.

On November 19, 2013, I shared our transparency and accountability initiative (O/D 13-26). Since then, we have made substantial progress toward an implementation plan. Today, I am pleased to announce a key part of that plan: a heightened focus on clarity in our research titles and abstracts as a means to communicate our investment decisions to the public.

Our award abstracts, along with their titles, are official NSF documents representing a public record of active and expired awards. Abstracts not only describe the research project. They justify the federal funds spent to support the project.

To emphasize this important function, **effective immediately**, award actions that have not yet been recommended by Program Officers must adhere to the relevant sections in the NSF Proposal and Award Manual, dated February 24, 2014. Please see Chapter VI.B.1 for NSF Abstracts, and Chapter VII.K for Titles of NSF-Supported Projects.

Chapter VI.B.1, in particular, clarifies the format of NSF abstracts. Specifically:

All abstracts (for new awards) will consist of two components, **in the following order**:

- a nontechnical explanation of the project's broader significance and importance, that serves as a public justification for NSF funding. This part should be understandable to an educated reader who is not a scientist or engineer; and
- a technical description of the project, that states the problem to be studied, the goals and scope of the research, and the methods and approaches to be used. In many cases, the technical project description may be a modified version of the project summary submitted with the proposal. As the project summary is prepared and submitted for consideration by reviewers, the abstract should reflect the project's goals as they may have been modified subsequent to the review process.

This clarification will be added to the next issuance of the PAM.

Compliance with this policy requires that:

- Program Officers are responsible for reviewing abstracts, ensuring that they clearly describe how the project addresses both merit review criteria, and approving the contents;

- Program Officers should ensure that recommended award titles adequately describe the purpose of the research in nontechnical terms to the fullest possible extent; and
- Division Directors should concur on all new and renewal awards only when they are satisfied that the abstract and title are in compliance with policy.

On March 26, we will launch a series of one-hour workshops that focus on writing clear abstracts and titles. These classes will be offered to all staff, and I ask program staff, in particular, to participate. The workshops will also be incorporated into the NSF Academy's quarterly Merit Review Training for new program officers. Please check future editions of the Weekly Wire for information about the writing workshops.

Thank you for your help in implementing this important policy. If you have any questions or comments, you may direct them to me, to your Division's or Directorate's senior management, or to a member of the Transparency and Accountability Working Group (TAWG). Staff memorandum O/D 14-01 includes a roster of TAWG members.

As the nation's prime mover for fundamental scientific research, it is imperative that we continually improve our operations to justify the projects we support. By increasing the transparency of our funding decisions, we increase our accountability to the community and to the public. This, in turn, increases our ability to support groundbreaking research and fulfill our mission.

Cora B. Marrett
Acting Director

Distribution: All Staff

Important Note 135: Transparency and Accountability at NSF. 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

OD Important Notice No. 136: NSF abstracts and Titles. 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

Strengthening Transparency and Accountability at NSF:
Division Directors' Roles and Responsibilities
Report of an NSF Working Group
November 26, 2014

Members of the Working Group

- Charlene Arrieti, OIRM
- Margaret Cavanaugh, GEO
- James Deshler, BIO
- Jean Feldman, BFA
- Samir El-Ghazaly, ENG
- Erwin Gianchandani, CISE
- Bradley Keister, MPS
- Carter Kimsey, Local 3403, American Federation of Government Employees
- Jeffrey Mantz, SBE
- Susan Singer, EHR
- Mark Weiss, SBE, co-chair
- Peter Arzberger, OD, co-chair

Table of Content

Executive Summary

The role of the Program Director in the Merit Review Process has been well documented in the Proposal and Award Manual (PAM), and the need for Program Directors to understand the process to ensure its integrity is the basis for their required attendance at Merit Review Basics courses. Division Directors also have a critical role to play in this process, yet little is stated in the PAM "beyond an under-defined 'DD concur' action of all award and decline actions."[1]

This report follows that of an earlier Transparency and Accountability Working Group in May 2014 that recommended the need to better document the roles of Division Directors in the Merit Review process. The three recommendations include to:

- Elaborate on the role of the Division Director in merit review beyond the functional definition of "DD concur" currently provided in the PAM;
- Propose a policy for resolving and documenting the rare instance in which a Division Director chooses not to "DD concur" a program recommendation to return without review, award, or decline a proposal; and
- Recommend effective practices for introducing new Division Directors to their roles and responsibilities.

With these recommendations in mind, this report emphasizes that Division Directors and Program Directors have different roles in merit review, with both roles being important and interdependent: Program Directors are recognized as subject matter experts in their program areas, whereas Division Directors are executives and managers who must maintain a balanced and coordinated alignment of Foundation, directorate and divisional priorities while providing meaningful oversight and accountability of the merit review process.

Specific revised language for the PAM and revision of the current graphic illustrating proposal processing are contained in the appendices, as is a proposed task order for developing onboarding materials for Division Directors.

[1] *Strengthening Transparency and Accountability at the National Science Foundation: Policy and Practice Recommendations for a Path Forward* Report from the Transparency and Accountability Working Group Final Submission May 12, 2014 https://collaboration.inside.nsf.gov /od/tawg/tawg_outreach

1. Introduction

Strengthening Transparency and Accountability at NSF: Policy and Practice Recommendations for a Path Forward[2] is the report of the first Transparency and Accountability Working Group (TAWG 1). The report noted (emphasis added):

> *The National Science Foundation is the only federal agency whose mission is to promote the progress of science and basic research in all fields of science and engineering. The Merit Review Process (described below) is the basis upon which NSF makes decisions to fulfill this mission.*
>
> *Rapid changes in science and society as well as demands of good stewardship require ongoing examination of our processes and procedures, reaffirming a core principle of continuous improvement*[3]. ***As a public agency, the NSF is responsible for building and sustaining the public trust through the transparency of our processes and the accountability of our organization.***[4]

The report's immediate impact was its emphasis on, and recommendations regarding, policy and practice for NSF award abstracts and titles, raising the awareness of their importance and making clear NSF's responsibilities. The key recommendations, which underscored the need for the clear and more explicit justification of NSF's investments of public funds, were adopted.[5] These included changing the order of the two award abstract components (putting the non-technical description prior to the technical one), clarifying the NSF responsibility for creating award abstracts and titles, and developing materials and conducting workshops to promulgate effective practices for writing abstracts and titles.

TAWG 1 also made the following observation and recommendations:

> *Since its inception in 1951, NSF Program Directors (PDs*[6]*) have been central to NSF's mission and operations. Their role in promoting science, engineering, and education is unquestioned and well documented, and workshops to assist in understanding the merit review process are well established. Less well-documented is the role of Division Directors (DDs), not extending in the PAM beyond an under-defined "DD concur" action of all award and decline actions. TAWG recommends*
>
> - *Defining the important term "DD concur" in the PAM;*
> - *Developing mechanisms to inform better DDs, and their designees, of their role, especially for the large number of "rotators" who serve in these capacities; and*
> - *Establishing a mechanism to document decisions that ... a PD proposal recommendation (is not accepted).*

[2] See https://collaboration.inside.nsf.gov/od/tawg/tawg outreach for the report and its summary version
[3] NSF Strategic Plan for 2014-2018: Investing in Science, Engineering, and Education for the Nation's Future, page 7 (http://www.nsf.gov/pubs/2014/nsf14043/nsf14043.pdf)
[4] *Strengthening Transparency and Accountability at NSF: Policy and Practice Recommendations for a Path Forward*, Report of the Transparency and Accountability Working Group (1), May 12, 2014
[5] See Staff Memorandum O/D 14-10, released on March 20 2014 (LINK)
[6] Program Director, used in this document, is used interchangeably with Program Officer, the term used in PAM.

The starting point for this second Transparency and Accountability Working Group (TAWG 2) is that set of recommendations, with our charge being to address them, namely to: clarify the roles and responsibilities of the Division Director around the merit review process; clarify what is intended by "DD Concur[7]"; and develop recommended procedures and documentation for when DDs do not concur with a specific PD recommendation. Moreover, TAWG 2 was directed to make recommendations for "onboarding" Division Directors into the culture and management of NSF. Our approach has been to work as a group, meeting weekly from July to November 2014, and engage both NSF management and staff in providing input on issues central to this group's focus.

For the purpose of this report, the merit review process is based on the merit review principles as articulated by the National Science Board[8] (NSB) and uses the merit review criteria specified by NSB, and adopted by NSF in its *Grant Proposal Guide*[9] (GPG). The merit review process normally[10] consists of external review by experts in the community as input into recommendations made by Program Directors. In preparing their final recommendations, PDs engage in dialogue with other PDs and division leadership regarding programmatic portfolio while considering other factors as well.[11] The Division Director's concurrence ("DD concur") on recommendations is a prerequisite for final actions (see next section on Roles and Responsibilities of DDs; see also Appendix B for a graphical depiction of the DD Concur function in the Proposal Review and Award & Declination Process). For purposes of this report, the NSF "merit review process" consists of external review; ongoing and/or specifically timed discussions between program directors and section or division leadership, framed within the programmatic portfolio context; and DD concurrence.

2. Roles and Responsibilities of Division Directors

The DD is the senior leader of a given division. As such, DDs have responsibility for ensuring that there is continual discussion and consideration of the goals of both the division and its constituent programs. Interchange between PDs and DDs is ongoing and may take place in both formal and informal settings. With this in mind, the DD functions, and interacts with PDs, within an atmosphere of ongoing examination of each program's goals and the larger amalgamation that constitutes that of the division. Division management must be broadly familiar with programs across the division, both to allow articulation and understanding of the division's research portfolio, and to bring this critical knowledge and broader perspective to the

[7] Per PAM (February 2014) p VI-2: The 'DD concur' indicates that, to the best of his/her knowledge, the proposal is in compliance with NSF policies and the information is accurate, as well as commits funds in the (Foundation's accounting system).

[8] National Science Foundation's Merit Review Criteria: Review and Revisions (NSB/MR-11-22, December 14, 2011). http://www.nsf.gov/nsb/publications/2011/meritreviewcriteria.pdf

[9] Most recent GPG is NSF 14-1, Effective February 24, 2014, http://www.nsf.gov/pubs/policydocs/pappguide/nsf14001/gpgprint.pdf, Chapter III

[10] There are exceptions to external review, e.g., case of some workshops, supplements, EAGERs, RAPIDs. The intent of the statement is to say what happens for most proposals.

[11] PAM, Chapter VI. Processing Proposals at Program, Divisional, and Directorate Levels, B. Documentation in Proposal Files, 3. Review Record, d. Responsibilities (page VI-10, PAM Feb 24, 2014)

fulfillment of responsibilities with respect to the merit review process. For the merit review process the responsibilities include:

- DDs communicate expectations within their divisions with respect to merit review;
- DDs must understand and oversee work flow and work load to maximize the effectiveness of all division staff associated with proposal processing, which may include pilot programs or emerging approaches for continuous improvement;
- DDs complete the divisional recommendation process for both non-award and award actions via the DD concur function in eJacket that ensures adherence to policy, consistency and accuracy of documentation of recommendations, and in the case of awards, that ensures each abstract and title justifies the expenditure of Federal funds within the context of NSF's mission and clearly convey the major objective of the award; and
- DDs provide a broader perspective to both the individual recommendation and the portfolio of recommendations, in particular with respect to risk assessment[12] associated with DD concurrence.

For the last two sub-bullets above, DDs have a **shared responsibility** with their PD despite the difference in authority, in ensuring that all proposals are appropriately considered and processed.

The "DD concur" (see Appendix B for the position of DD concur in the review and award & declination process) is the action that either (1) finalizes the decision to return without review or not to fund a proposal or (2) commits Federal funds to the pending award. This action serves two functions. First, it provides a higher-level assurance that the recommendation is in compliance with all NSF policies and that the information is accurate, to the best of the division director's knowledge. For this function, "DD concur" conveys acceptance of the potential described in the proposal to advance research or education or to having no objection; it does not require whole-hearted support for the specific recommendation, but conveys support for the integrity of the process and an assessment of risks associated with the recommendation. The second function served by the DD concur is a fiscal one, committing funds in the NSF accounting system, so that NSF's Division of Grants and Agreements[13] (DGA) can later obligate the funds for the recommended purpose. These two functions are captured in the PAM statement:

> *The 'DD concur' indicates that, to the best of his/her knowledge, the proposal is in compliance with NSF policies and the information is accurate, as well as commits funds in the (Foundation's accounting system).*[14]

DDs and PDs may need to discuss a specific recommendation at length to ensure that the documentation is adequate to justify the recommendation. In all but the rarest circumstances, it

[12] Risks associated with a recommendation include clarity of documentation to justify the recommendation and assurance that in the case of an award the recommended action fits into a program portfolio that aligns with NSF's mission.

[13] Technically, this statement applied to grants, which are processed by DGA. Major Research Equipment and Facility Construction Awards and contracts are processed by the Division of Acquisition and Cooperative Support (DACS). See Appendix B.

[14] PAM (February 24, 2014), Chapter VI, A. Processing Proposals.

is expected that agreement on a recommendation will be reached. Implicit in these discussions, however, is that it is *not* the DD's job to conduct the external review executed by the PD, but rather to ensure that the reasons for a recommendation are clear and well-justified.

However, there are instances when PDs and DDs exhaust all options for coming to common agreement on a recommendation. The PAM is silent on such an **impasse**, an event in which the subject matter expert, the PD, and the person responsible for broader oversight, the DD, cannot reach resolution on a proposal action. In a well-managed division, with ample communication and clear expectations, this situation should constitute a rare event. Nevertheless, TAWG 2 agrees with the earlier TAWG 1 that guidance should be provided in the PAM (see Appendix A), following the principles that the impasse should be **documented** in eJacket for the sake of transparency and accountability and that the Deputy Assistant Director (DAD) should be **notified** to determine the best course of action for resolution. That is, the DAD will determine the process by which the impasse is to be resolved, consistent with Directorate practice. This need not mean that the DAD will resolve the impasses him/her-self. This guidance allows directorates to retain **flexibility** on resolution specifics, subject to NSF's goal of processing proposals in a **timely** manner.

Recommendations: DD Roles and Responsibilities, and an Impasse

- Appendix A contains specific recommended wording to expand the understanding of DD roles and responsibilities around the Merit Review Process (Chapter 5, PAM), and to document the above process for handling impasses (Chapter 6, PAM).

- Directorate leadership should discuss options for resolution of such an impasse, to be prepared before one develops. The resolution process should be designed such that the individual who is responsible for the ultimate decision takes the action to decline or to commit funds for the proposal.

3. Revised Flowchart of the Proposal Review and Award & Declination Process

The flowchart of the proposal review and award & decline process is a visual depiction of a process; it is meant to capture the flow of a "typical" proposal. There are special cases that deviate from this typical process and all eventualities are, therefore, not depicted.

TAWG 1 noted that the PAM's Exhibit I-1 does not convey the dynamic, interactive relationship between PD and DD and recommended modifying the exhibit[15]. The WG has created a revised flowchart to indicate communication and pre-decisional dialog between the PD and DD (see Appendix B). Even with this revision, the iterative dialog between the PD and DD does not just occur within the context of the illustrated process, but is a robust, on-going set of discussions about portfolio structure and all the considerations that go along with that.

As noted before, there are several points of interaction between DDs and PDs in the merit review process (e.g., setting expectations on aspects of portfolios, conduct of review (panels),

[15] TAWG 1, p. 14

documentation, as well as understanding portfolio and DD concur). We also note that constant dialog and communications to build a **trusted partnership** is a recurring theme for an efficient practice in the overall review process, based on feedback from NSF staff and management.

Recommendation: Flowcharts

- Appendix B contains the recommended replacement to the PAM's current Exhibit I-1, along with more extensive text describing the flowchart.

4. Onboarding of Division Leadership in the Merit Review Process

Merit review process is the signature activity by which NSF achieves its mission, with leadership[16] at the division level being essential for the effective coordination of the efforts of all division staff in the review process (see Section 2). Ensuring the integrity and excellence of the merit review process is a **shared responsibility**[17] between DDs and PDs, and it is imperative that all parties understand and value the responsibilities that go with each of these roles and how they are implemented so as to produce strong working relationships. The merit review process includes attention to the overall portfolio at the program and division level, being mindful of a range of contexts, including: Is the proposed award strong scientifically? Is it a wise expenditure of taxpayer dollars? Does it raise any "red flag" and are those adequately addressed in the documentation? Does it fit within NSF's mission? Adequately preparing and supporting new DDs in leading the merit review process in a division is important for assuring the overall quality of the NSF merit review process.

Division Directors throughout the Foundation, along with Deputy Division Directors (DDDs) and Section Heads, provide the leadership described in this report. Between FY2005 and FY2013, a significant percentage of DDs have been IPAs. New DDs, particularly those new to NSF, encounter challenges because, as a Federal agency, NSF is often more hierarchical and regulated than academia, with more authority and accountability to a variety of Federal authorities inherent in that hierarchy. Thus, effective onboarding of rotating DDs is essential if NSF is to **maximize the DDs' contributions** and ensure they have the **understanding to fulfill their responsibility** to ensure the integrity of the merit review process.

Current approaches to DD onboarding

DD onboarding varies substantially across directorates. While PDs are required to take Merit Review Basics I and II, there is no formal equivalent for DDs. Indeed, although directorates have a range of written and online onboarding materials available for PDs before or when they arrive at NSF, a much more limited and varied set of resources is offered to DDs and there is little consistency in onboarding practices across directorates. Individual directorate-specific examples of offered onboarding resources are offered here.

[16] Division Director (DD) is used as a proxy for all division-level leaders in this document.
[17] PAM, V.A.3 Quality and Transparency of the Merit Review Process. See also Appendix A, recommended changes.

Checklists for the DD concur process. Items relate to reviewing a recommendation, e.g., rating, reviews, review analysis (addressing topics such as large rating discrepancies, abstracts and titles) and include:

- Overall, the review analysis should address issues raised in review in a convincing way;
- For declines, view the jacket through the lens of informing the PI about the basis for the recommendation and providing feedback on future submissions, thereby precluding a reconsideration; and
- For awards, view the jacket through the lens of portfolio composition and an inquisitive public interested in understanding how taxpayer dollars are used.

Some directorates also share questions for the Committee of Visitors (COV) about the Quality and Effectiveness of the Merit Review Process as part of their onboarding documentation.

Materials/handbooks. Collections of materials on the work of a DD are provided in some cases, and one directorate has an onboarding book for the AD that could be useful, in part for DDs. Elements of the PD onboarding manuals may also be useful. Making new DDs aware of both the PAM and the Proposal and Award Policies and Procedures Guide (PAPPG) is essential. InsideNSF maintains materials as well (https://inside.nsf.gov/aboutyou/yourtrainingdevelopment/professionaldevelopment/executivedevelopmentresources/Pages/default.aspx); however, this site is only accessible once a DD has begun his/her appointment.

Mentoring structures. A broad range of primarily informal mentoring infrastructure is in place. DDD and AO mentoring, pairing a new DD with an experienced DD in another division or directorate, and regular meetings with the DAD and/or AD are common. Senior staff meetings and DD lunches (formal as well as informal) provide some support. There is untapped potential in the DD Roundtable. A formal mechanism is available through the Executive Coaching option. Executive Coaching in general helps to develop a skill set that is broadly useful for manager in areas such as decision making and communication.

Courses. The Executive Leadership Retreat (ExLR) supports new DDs, as do a series of Executive Seminars, but the focus is not specifically on the merit review process. For a new IPA with no prior PD experience, several directorates recommend attendance at the Merit Review Basics.

Other approaches. Divisional retreats can familiarize the DD with the roles the entire staff play in merit review. When possible, some directorates bring on a new DD as an "expert" to overlap with the outgoing DD to provide onboarding expertise. Offering an honest overview during recruitment of the roles and responsibilities of DDs enables new DDs to have realistic starts within their directorates.

Recommendations: Onboarding

Ensuring DDs are properly brought on board with all the tools needed for success and properly acculturated is the responsibility of the corresponding OAD. The roles and responsibilities should be clarified as early as the recruitment process. Ideally, rigorous onboarding would begin before the DD arrives, with online materials. Appendix C provides a proposed task order statement for the development of such materials under contract. These online materials could be maintained and updated by the NSF Academy, but in cooperation with the NSF Transparency and Accountability Coordinator or appointee. They can be used in a variety of ways, and by PDs as well as DDs. The intent is to integrate them into the ExLR as well as onboarding prior to arrival at NSF and as "just-in-time" resources.

In addition to the online onboarding materials, several effective practices are recommended in the following three categories.

Immediate, easily instituted and high importance recommendations:

- Accurately represent the position responsibilities during the recruitment and interview process and continue with onboarding prior to the official start date;
- Use the DD's performance plan to clearly establish expectations;
- Support new DDs in developing an Executive Development Plan in their first 30 days;
- Encourage participation in the Merit Review Basics course and the ExLR; and
- Overlap outgoing and incoming DDs, using expert appointments when possible.

Longer term recommendations:

- Create an onboarding manual for DDs, to augment the interactive resource (described above), which would include the PAM and PAPPG as required reading material, along with select directorate materials that all DDs could benefit from, e.g., Title and Abstract Resource Guides, ensuring these are consistent with Policy.
- Establish an eJacket mentor, aka a "Jacket buddy" (could be a PD, DDD, or AO) to guide the DD through proposal processing, etc.; and
- Invigorate the DD Roundtable as a way to support an effective leadership and mentoring culture.

Implementation:

- A final recommendation is that NSF leadership assign Deputy Assistant Directors with the responsibility to determine how to implement these onboarding recommendations, including which ones all directorates will adopt, in order to provide a uniform level of onboarding, with flexibility to align implementation with directorate-specific practices.

5. Final Comments

In formulating this report, several principles affected our approach and recommendations:

- We sought to find a minimal set of principles that would universally apply to drive our recommendations as indicated by **boldface** above.
- We refrained from making specific implementation recommendations. We understand that there are different cultures within the organization, and there are often many effective ways to implement policy.

- We stayed focused on DDs in and around the merit review process. There are many other DD roles and responsibilities that are not covered in this report.
- We realized that DDDs and Section Heads play an important role in the merit review process and in divisional management. Many of the recommendations we make about DDs also can be applied to DDDs and/or Section Heads.

Finally, the following Appendices contain recommended specific language changes to the current Proposal and Award Manual (PAM). They provide current language and the specific location for insertions.

Appendix A. Roles and Responsibilities of Division Directors: Recommended Changes to the PAM

In this section, we provide both the current language and section headings from the Proposal and Award Manual (PAM) (effective February 24, 2014) along with recommended changes to clarify the roles and responsibilities of the Division Director in the merit review process (highlighted in yellow). Included in the new language is a recommendation of how to handle the extremely rare case when there is an impasse between the DD and PD on a recommendation.

In addition, we have two specific recommendations, both involving Chapter VI. Section G. Delegation of Authority:

- Include a policy statement about Delegation of Authority, to provide context for the intent of delegation, e.g., to reflect the principle that delegation should be to the lowest level appropriate for achieving programmatic goals while considering effects on workload.
- Review the policy reflected in subsections VI.G.2.a.2 and 3, on delegation to levels higher than program officer, and to program officer, respectively. In addition, assess alignment of systems (e.g., eJacket) with policy. We make this recommendation in part since $250,000, the limit for delegation of authority to a DDD, is no longer an exceptional level and is below that of many awards; in part to re-examine the cases of delegation of authority to program officers, to ensure current policy is relevant to today's costs.

CHAPTER V - MERIT REVIEW PROCESS

A. NSF Merit Review Criteria

1. Policy

Acceptable proposals shall receive proper consideration in accordance with the general criteria established by the National Science Board (NSB). In addition, the proposal will be reviewed in accordance with any supplemental Program-specific Criteria that have been made publicly available in relevant proposal-generating documents. Program Officers, however, may return without further review previously declined proposals that, in their judgment, have not been substantially revised to address comments of previous reviewers. In such instances, the proposal should be assigned the "Returned without Review Not revised after prior decline" category.

2. Principles and Criteria for Proposal Review

All NSF proposals are evaluated through use of the two NSB-approved merit review criteria. The text of the criteria, as well as the core strategies and principles that provide the basis for the merit review criteria, can be found in the introduction to GPG Chapter II and in GPG Chapter III.A. In addition, the NSF Merit Review Website serves as a further source of information on the Foundation's merit review process for NSF staff and the public. The website contains a timeline covering three distinct stages - Proposal Preparation and Submission, Proposal Review and Processing, and Award Processing. The Website can be accessed at: http://www.nsf.gov/bfa/dias/policy/merit_review/index.jsp.

Program officers should ensure that reviewers evaluate the mentoring activities provided to postdoctoral researchers funded on a project, as described in the Supplementary Documentation section of the proposal. The mentoring activities should be evaluated under the Broader Impacts criterion. Program officers also should ensure that reviewers evaluate the Data Management Plan as presented in the proposal. Because of the wide variation in practices across different research fields, the Data Management Plan can be assessed as part of Intellectual Merit, or Broader Impacts, or both, as appropriate to the project and as evaluated by the reviewers and the Program Officer.

Reviewers are asked to provide an overall rating, as shown on the review format, as well as separate statements addressing each of the two criteria. Both criteria are to be given full consideration during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient.

3. Quality and Transparency of the Merit Review Process

NSF's task of identifying and funding work at the frontiers of science and engineering is not a "top-down" process. NSF operates from the "bottom up," meaning it is the job of the NSF program officer to protect the integrity of the process, keep close track of research around the United States and the world, maintain constant contact with the research community to identify ever-moving horizons of inquiry, monitor the areas most likely to result in spectacular progress and choose the most promising people to conduct the research.

Nearly every proposal, whether solicited or unsolicited, receives the same rigorous and objective treatment and it is the program officer's role to ensure that this takes place. Proposals are evaluated by independent reviewers consisting of scientists, engineers and educators, who do not work at NSF or for the institution that employs the proposing researchers. NSF selects the reviewers from among a pool of experts in each field and their evaluations are anonymous. On average, about 50,000 experts now give their time to serve on review panels each year.

The reviewer's job is to provide advice on which projects are the very highest priorities. This competitive process, called "merit review," ensures that many voices are heard and that only the best projects make it to the funding stage. An enormous amount of research, deliberation, thought and discussion goes into the final recommendations of the independent reviewers.

The Program Officer's role is to provide an accurate summary of how a decision was reached to either fund or decline a given proposal and justify the expenditure of Federal funds.

The NSF program officer is responsible for shaping the nation's science and engineering (S&E) enterprise, developing the S&E workforce, development of scientific infrastructure, and ensuring that underrepresented groups and diverse institutions across all geographic regions are included in the scientific enterprise of the nation. NSF Program Officers are the heart and soul of this process and it is essential that they understand that their role is to protect the integrity of the merit review process while at the same time contribute to its quality and transparency.

The Division Director (DD) must ensure that programmatic priorities align well with the strategic goals of the division, directorate and Foundation overall. To do this, the DD must create an atmosphere of collegiality in the division that fosters open communication about standards and "best or effective practices" of the merit review process and the challenges and opportunities for the science and broader impacts supported through programs that reside in the division. The DD is an executive and manager of people who through leadership must provide support and proper guidance to POs without directly managing the review process itself. In this role, it is imperative that the DD understand and oversee the work flow and work load in all aspects of merit review to maximize the effectiveness of all Division staff associated with proposal processing. There are rare events where the subject matter expert, the PO, and the person responsible for broader oversight, the DD, cannot reach resolution on a proposal action. This PO, DD impasse is addressed in Processing of Proposals (Chapter VI.A).

Together, POs and DDs share responsibility for the public face of the NSF awards from their division as represented by the award titles and abstracts. They also share responsibility to establish and maintain the highest standards of integrity and quality of the merit review process. Their roles are different and both are important.

CHAPTER VI -- PROCESSING OF PROPOSALS AT THE PROGRAM, DIVISION AND DIRECTORATE LEVELS

A. Processing of Proposals

...

The 'DD concur for award', also within eJacket, occurs when the cognizant division director electronically signs the award recommendation. The 'DD concur' indicates that, to the best of his/her knowledge, the proposal is in compliance with NSF policies and the information is accurate, as well as commits funds in the Financial Accounting System. All signatures and approvals for awards by the program offices are electronic in eJacket. There is no need for hardcopy forms or signatures. 'DD concur' is the final step before the proposal is logged into the Awards System for BFA's business review. The Delegation of Authority section (PAM Chapter VI.G below) outlines policy regarding the commitment of funds.

In the rare event that the DD and the PO cannot agree on a recommendation (i.e., reach an impasse), then the deputy assistant director must be notified of the impasse, with a statement describing the nature of the impasse uploaded into eJacket. The deputy assistant director will determine the best process for reaching final disposition for any proposal that falls into this category. A description of the process, as well as all relevant documents, must be included in the permanent record of the proposal. Note: If an assistant director explicitly signs off on a declination, then any future reconsideration request for that proposal must be referred to the NSF Deputy Director.

G. Delegation of Authority

1. Scope

The provisions of this section apply to all NSF grant, fellowship, interagency agreement, and cooperative agreement recommendations except Intergovernmental Personnel Act agreements and reimbursable details.

2. Responsibilities and Procedures

a. Delegation of Authority for Programmatic Approval of Award Recommendations

Assistant Directors, Office Heads, and persons acting in these capacities are authorized to review and give final programmatic approval to award recommendations not requiring Director's Review Board (DRB) and/or National Science Board (NSB) review and approval.

Delegations can be performed electronically via the NSF eJacket system. Delegations performed in the eJacket capture the electronic signature of the person performing the delegation. The eJacket system maintains an electronic record of all delegations of authority, which serves as an audit trail of these actions.

Recommendations made under this authority must conform to the applicable NSF policies and administrative requirements in effect at the time of approval.

This authority may be redelegated by the cognizant Assistant Director, or equivalent, to the following positions or persons acting in those positions as follows:

(1) Authority may be redelegated to Division Directors for award recommendations not requiring NSB or DRB review and approval.

(2) Authority may be redelegated to a level higher than the cognizant Program Officer (e.g., Deputy Division Director, Section Head, unit or cluster leader) for award recommendations up to $250,000 per year.

(3) Authority may be redelegated to cognizant Program Officers for the following award recommendations:

• REU (Research Experiences for Undergraduates), ROA (Research Opportunity Awards) and Facilitation supplements;
• other supplements up to 10 percent of the total intended award amount;
• group travel awards up to $25,000;
• doctoral dissertation awards;
• conference, symposia and workshop proposals up to $50,000; and
• additional NSF-wide categories of supplements or small awards as identified by the Director.

(Note: Program Officers have authority to recommend no-cost extensions, PI changes [including transfers], continuing grant and other increments up to 120 percent of the level promised in the

original award, and other administrative changes with appropriate documentation and without further programmatic review and approval.)

Additional redelegations may be made by the cognizant Assistant Director, or equivalent, after consulting with the Chief Financial Officer and obtaining the written authorization of the NSF Director.

3. Cases Involving Policy Questions or Unusual Circumstances

Declinations involving questions of policy or unusual circumstances, including an impasse between the program officer and the division director on a recommendation to decline a proposal, warranting consideration at higher levels are forwarded to the appropriate Deputy Assistant Director/Office Head or designee for review. In addition, whenever they consider it appropriate, officials may refer cases to higher levels for approval. Cases with policy questions or other factors that cannot be resolved at the Assistant Director level are referred to the Office of the Director by the Assistant Director concerned. Cases involving allegations of research misconduct should be referred to the Office of the Inspector General.

Appendix B. Exhibit I-1. Flowchart of the Proposal Review and Award & Declination Process: Recommended Changes to PAM

Following the pattern of the previous appendix, this appendix includes recommended changes to the PAM, around the Flowchart Exhibit I-1, Proposal Review and Award Process. Also included are revised flowcharts that provide greater emphasis on the interactive nature of the merit review process, in particular in the discussion between Program Directors and Division management.

Suggested edits to PAM Chapter I.A (Introduction – Roadmap of Process; page I-1):

The flowchart in Exhibit I-1 depicts the general NSF proposal review and award process, whereby a submitted proposal is returned without review, declined or awarded, including standard timelines. Detailed descriptions of all relevant activities and decision points are provided in the remaining sections of the PAM, arranged to provide guidance for NSF staff at critical steps along the path.

Emphasis in Exhibit I-1 is placed upon the roles and responsibilities of the Program Officer following proposal submission. Specifically, for a given proposal, one or more Program Officer(s) is (are) responsible for conducting external review. Following input from *ad hoc* and/or panel reviewers, and in some cases with the benefit of additional discussion between the Program Officers(s) and proposing PIs seeking clarification or involving budget negotiation, the Program Officers(s) recommend(s) the proposal for award or declination to the Division Director. There may be discussion between the Program Officer(s) and Division Director before and/or after the formal recommendation in eJacket. For example, in some divisions/offices, conversations between Program Officers and Division Directors prior to recommendation in eJacket enable communication of additional context, such as how a given recommendation fits in the overall portfolio of awards. Following DD concurrence, notices for those proposals that are returned without review or declined are immediately sent to the proposing organizations, while

award recommendations are forwarded to DGA/DACS for processing. As illustrated in Exhibit I-1A, recommendations for funding that exceed certain budgetary thresholds must go through the Director's Review Board (DRB) and, in some cases, the National Science Board (NSB), following DD concurrence and prior to being forwarded to DGA/DACS.

Various sections of the PAM provide step-by-step guidelines as derived from:

- NSF internal directives and procedures;
- Source documents (such as Office of Management and Budget [OMB] circulars); and
- Public laws, regulations, and Executive Orders that influence the processing of proposals.

Suggested captions for the associated Exhibits:

Exhibit I-1. Flowchart of the Proposal Review and Award & Declination Process. This exhibit depicts the general processing for a proposal submitted to NSF, including standard timelines where appropriate. Particular attention should be paid to the roles and responsibilities of the Program Office in conducting merit review, including interactions between Program Officers and Division Directors around the DD concurrence process. Variations may exist in certain divisions/offices and in special circumstances.

Exhibit I-1A. Expanded View of the Director's Review Board and National Science Board Process for the Flowchart in Exhibit I-1. This exhibit depicts the general processing for a proposal being recommended for funding that exceeds certain budgetary thresholds [more than 2.5 percent of the recommending division's prior-year Current Plan]. Such proposals are forwarded to the Director's Review Board (DRB) and, in some cases, the National Science Board (NSB), as illustrated in the flowchart.

Exhibit I-1 (Modified)

Flowchart of the Proposal Review and Award & Declination Process

*(*Letters of Intent and Preliminary Proposals are processed as described in Chapter III*)*
*(**Division of Grants & Agreements (DGA) or Division of Acquisition and Cooperative Support (DACS) have the ability to decline a proposal for financial or administrative reasons. See Chapter II, Section F.)*

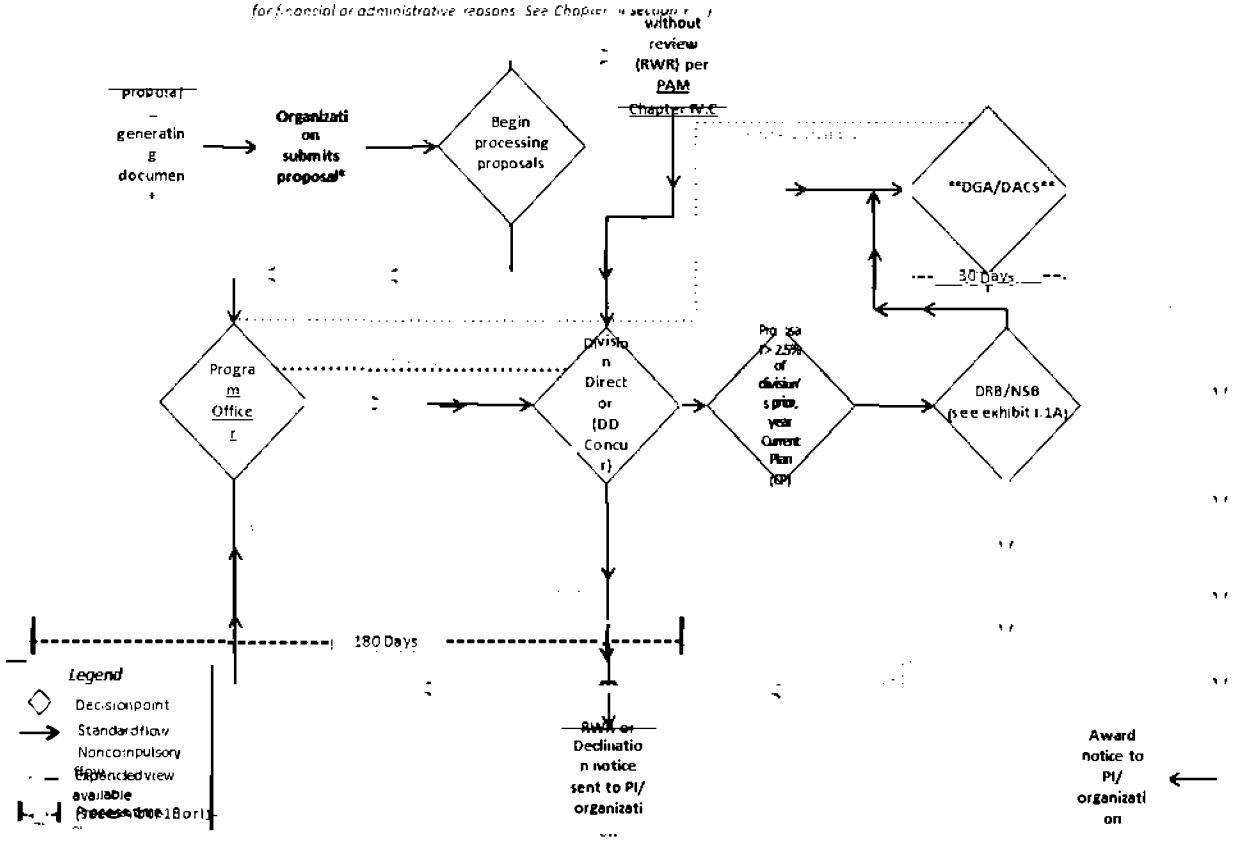
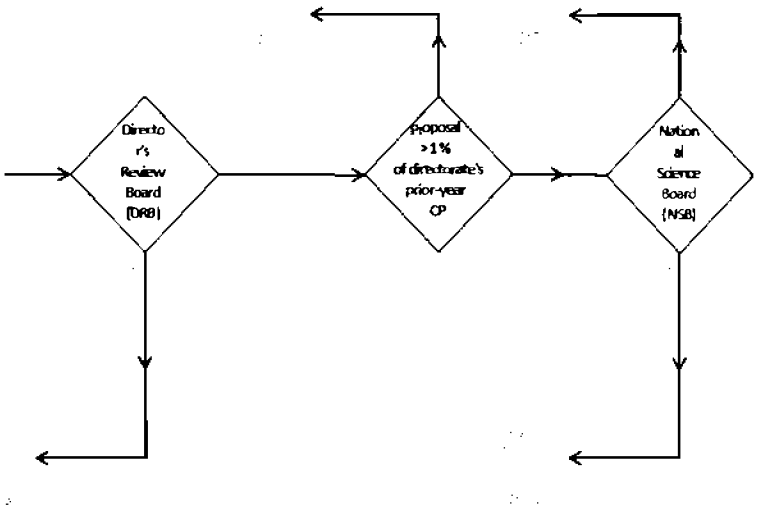


Exhibit I-1A (Expanded)

Expanded View of the Director's Review Board and National Science Board Process



Appendix C: Onboarding Proposed Task Order Statement

Below is a proposed task order statement for the creation of an interactive resource, to be maintained by the Academy, and to be developed in concert with members of the Transparency and Accountability Working Group. This resource will be used by new DDs and is envisioned to have broader audience through other training venues.

Division Director Onboarding Materials – Technical Approach

Technical Approach

Phase I: Conduct Kickoff Meeting

- Meet with the Division Leadership (DD[18]) Merit Review Onboarding Group to conduct a project kickoff meeting. Meeting objectives include:
  - Review the proposed onboarding materials to identify materials for inclusion in the onboarding resource
  - Establish a timeline and key milestones for all desired onboarding materials; identify SMEs for the development/review of draft materials
  - Discuss preliminary ideas for housing onboarding materials
  - Review the Executive Resources Website, created as part of the New Executive Transition Program (NExT), as a potential model for the DL materials
- Conduct 1-2 focus groups with division leaders to (1) identify merit review, onboarding materials of interest; (2) critical institutional knowledge for incoming executives; and (3) request participation in the review process
- Meet with Academy stakeholders to incorporate any existing Academy efforts into the onboarding group initiative
- FMP to draft an onboarding materials project plan summarizing the technical approach and milestones for review and approval by NSF

Deliverable: Kickoff meeting; summary of Division Leadership focus group notes and findings; onboarding materials project plan

Phase II: Develop draft onboarding materials and review with NSF

- Develop draft merit review, onboarding resource for Division Leadership to promote an effective transition into a NSF DD role, which may include:
- Developing guidance and tools on the merit review process
  - Revised 'proposal process diagram' that allows for interactivity and expands upon the DD role in the proposal process
  - High level overview of the roles and responsibilities of various parties in the review process (e.g., program assistants, program specialists, program analysts, AOs)
  - Links to the relevant sections of the PAM (e.g., information about using both PAM and PAPPG)
  - Links to search tools available for the portfolio analysis (e.g. DIA2, NIH tool, others)
  - Applied case study scenarios outlining different funding decision outcomes (e.g., DD concurs with PO recommendations; DD does not concur with the PO recommendations)
- Develop general onboarding learning aids and reference materials:
  - Onboarding checklist: Guidelines for what to expect at the 30, 60, and 90 day mark (e.g., finding a "jacket buddy;" learning how awards and declines are processed before arriving in DD concur;

[18] DD, the abbreviation for Division Director, is used as a proxy for all Division-level leaders in this task statement.

suggestions on finding a mentor)
    - Frequently asked questions (FAQs)
    - List of relevant courses with suggestions about developing an EDP
- Review draft materials with NSF stakeholders, incorporate feedback, and finalize
- Coordinate with DIS, as necessary, to create the medium for storing content and updating content

Deliverable: Final onboarding materials

Phase III: Communicate onboarding materials to the workforce

- Develop a communication plan and supporting materials for alerting new and existing Division leaders to onboarding resources
- Develop draft briefing materials for NSF senior leadership
- Create a standard process for informing incoming DDs of the available resources

Deliverables: Division Director onboarding materials communication plan and supporting communications
Cost Estimate: $41,291*

* The cost represents an initial estimate and will be refined after a kickoff meeting with the group to define specific deliverables and processes.