Cracking the Olfactory Code (Olfactory)
An Ideas Lab Activity

PROGRAM SOLICITATION
NSF 15-547

National Science Foundation

Directorate for Biological Sciences
 Division of Integrative Organismal Systems
 Division of Biological Infrastructure
 Emerging Frontiers

Directorate for Mathematical & Physical Sciences
 Division of Physics
 Division of Mathematical Sciences

Preliminary Proposal Due Date(s) *(required)* (due by 5 p.m. proposer's local time)*:*

 May 01, 2015

   Due date for preliminary proposal

Full Proposal Deadline(s) (due by 5 p.m. proposer's local time):

 July 31, 2015

IMPORTANT INFORMATION AND REVISION NOTES

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised NSF Proposal & Award Policies & Procedures Guide (PAPPG) (NSF 15-1), which is effective for proposals submitted, or due, on or after December 26, 2014. The PAPPG is consistent with, and, implements the new Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (Uniform Guidance) (2 CFR § 200).

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

 Cracking the Olfactory Code (Olfactory)
 NSF Ideas Lab

Synopsis of Program:

 Olfaction is an evolutionarily primitive sense critical for survival across the animal kingdom – finding food, searching for mates, or avoiding predation all depend on detecting, identifying, and discriminating odors. Although early steps in olfactory processing are relatively well understood, significant gaps remain in our understanding of higher-order odor representations and processing during on-going behavior. Deciphering the operating principles of olfaction requires the development of innovative and integrative approaches that combine novel theoretical frameworks, improved mathematical models, and novel behavioral paradigms across the phylogenetic spectrum, experimental methodologies, and engineering principles.

 This solicitation describes an Ideas Lab on "Cracking the Olfactory Code." Ideas Labs are intensive workshops focused on finding innovative solutions to grand challenge problems. The ultimate aim of this Ideas Lab organized by the Biological Sciences (BIO) and the Mathematical and Physical Sciences (MPS) Directorates at the National Science Foundation (NSF) is to facilitate the generation and execution of innovative research projects aimed at understanding the nature of olfactory processing and sensory representations in the brain in general. The aspiration is that mixing researchers from diverse scientific backgrounds will engender fresh thinking and innovative approaches that will transform our understanding of olfactory processing in behavioral contexts while spawning new opportunities to elucidate the general nature of sensory representations in the brain.

 This multi-directorate program is one element of NSF's multi-year effort towards the goals of the Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative (http://www.nsf.gov/brain/). US researchers may submit preliminary proposals only *via* FastLane for participation in the Ideas Lab in which a set of multidisciplinary ideas will be developed. These multidisciplinary ideas will be submitted as full proposals.

Cognizant Program Officer(s):

Please note that the following information is current at the time of publishing. See program website for any updates to the points of contact.

- Edda Thiels, telephone: (703) 292-8421, email: ETHIELS@nsf.gov
- Krastan B. Blagoev, telephone: (703) 292-4666, email: kblagoev@nsf.gov
- Mary Ann Horn, telephone: (703) 292-4879, email: mhorn@nsf.gov
- Sridhar Raghavachari, telephone: (703) 292-4845, email: SRAGHAVA@nsf.gov
- Anne M. Maglia, telephone: (703) 292-8470, email: amaglia@nsf.gov

Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.049 --- Mathematical and Physical Sciences
- 47.074 --- Biological Sciences

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 4 to 6

Up to 6 awards will be made in FY 2015 and FY 2016 pending availability of funds and the type, scale, and variety of project ideas developed at the Ideas Lab.

Anticipated Funding Amount: $12,000,000 to $16,000,000

Approximately $12,000,000 to $16,000,000 will be available for US researchers in FY 2015-2016 for successful proposals through the Ideas Lab, pending availability of funds and compelling proposals.

Eligibility Information

Who May Submit Proposals:

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the Grant Proposal Guide, Chapter I, Section E.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI: 1

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not required
- **Preliminary Proposals:** Submission of Preliminary Proposals is required. Please see the full text of this solicitation for further information.
- **Full Proposals:**
  - Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
  - Full Proposals submitted via Grants.gov: NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide)

B. Budgetary Information

- **Cost Sharing Requirements:** Inclusion of voluntary committed cost sharing is prohibited.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Not Applicable

C. Due Dates

- **Preliminary Proposal Due Date(s)** *(required)* (due by 5 p.m. proposer's local time)*:*

  May 01, 2015

    Due date for preliminary proposal

- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):

  July 31, 2015

Proposal Review Information Criteria

Merit Review Criteria: National Science Board approved criteria. Additional merit review considerations apply. Please see the full text of this solicitation for further information.

Award Administration Information

Award Conditions: Standard NSF award conditions apply.

Reporting Requirements: Standard NSF reporting requirements apply.

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I. INTRODUCTION

The conceptual foundation of neuroscience rests on the idea that behavior derives from the emergent properties of a distributed collection of neural circuits. The collective activity of multiple neural circuits manifest at multiple timescales belies the relatively simple notion of the "spike code." Identification of relevant neural ensembles underlying complex behaviors requires advances in technology and concepts that include new experimental paradigms and methodologies, instrumentation, new modeling techniques and theoretical frameworks. Progress towards this problem demands an inter-disciplinary effort, involving neurobiologists working in concert with mathematicians, statisticians, physicists, engineers, cognitive scientists, and biologists.

The goal of this Ideas Lab is to stimulate innovative and transformative research proposals that leverage developments in phylogenetic approaches, neurotechnology, theory, and quantitative modeling to elucidate the neural representation of sensory information. Although neuroscientists have studied this problem since the late 19th century, the convergence of developments across multiple disciplines has brought sensory and systems neuroscience to a point at which a fundamental breakthrough is possible. The challenge is to combine expertise from diverse disciplines to understand how the brain interprets signals from the environment and transforms these interpretations to guide on-going behavior.

The key objective of this Ideas Lab is to bring together researchers from diverse scientific backgrounds in order to engender fresh thinking and new approaches that answer fundamental questions in olfactory processing in the brain, including but not limited to:

- How does the olfactory system encode complex, naturalistic stimuli?
- How are olfactory representations modified by behavioral state and on-going activity of the organism?
- How do innate and learned odor valence influence olfactory processing, and how do they become integrated in olfactory representations?
- How do performance limits of the system, such as resolution of natural odor "scenes" and detection across concentration fluctuations due to environmental variations, shape olfactory representations?

Participation in the Ideas Lab requires an invitation in response to a preliminary proposal. Submission of a full proposal derived from the Ideas Lab requires both participation in the Ideas Lab and an invitation to submit a full proposal.

Full proposals derived from the Ideas Lab must include ideas that can lead to a step-change, rather than incremental advances, in our knowledge. It is expected that these full proposals will be generated by multidisciplinary teams; the teams may include, in addition to scientists from traditional neuroscience backgrounds, researchers with expertise in physics, mathematical modeling, statistics, chemistry, engineering, computer science, or any other discipline suited to shed light on the topic. Given the likely complexity of the research required, specialists in other relevant areas of the biological sciences are encouraged strongly to participate as well.

II. PROGRAM DESCRIPTION

The Ideas Lab

The Ideas Lab is an interactive workshop on a focused problem and typically involves up to 30 participants. This Ideas Lab aims to stimulate thinking in promising new, or currently under-developed research areas relevant to olfaction and processing of olfactory information in the brain.

Participants will be expected to engage constructively in dialogue with one another, the facilitators, and the Director and Mentors to develop collaborative research proposals. Collaboration is an integral aspect of the activity.

The Ideas Lab is sponsored by the NSF. As such, only those eligible to apply for funding from the NSF will be eligible to apply to attend the Ideas Lab.

The Ideas Lab will run over five days starting mid-morning on Day One and finishing mid-afternoon on Day Five. At the outset, the participants will work collaboratively to identify and define the scope of the research challenges relating to olfaction and processing of olfactory information in the brain. As the Ideas Lab progresses, participants will dynamically develop and hone novel ideas about how the identified challenges may be addressed, and then use these ideas and approaches to develop research projects, which should contain genuinely innovative and potentially risk-taking investigations. The Ideas Lab will include inputs from a variety of sources and will aim to develop collaborative research projects. Following the Ideas Lab, proposals may be submitted by teams selected to submit a full proposal.

How will the Ideas Lab Work?

The Ideas Lab is an intensive, interactive and free-thinking environment, where a diverse group of participants from a range of disciplines and backgrounds gets together for five days - away from their everyday worlds - to immerse themselves in collaborative thinking processes in order to construct innovative approaches.

The nature of the Ideas Lab requires a high degree of trust between participants in order to make the required breakthroughs in scientific thinking. This trust extends to allowing the free and frank exchange of scientific ideas, some being in the very early stages of development. The aim of the Ideas Lab is not to discuss ideas that are already well-developed but not yet published. Rather, the goal is to bring individuals from different disciplines together to interact and engage in free thinking on first principles, to learn from one another and create an integrated vision for future research projects. It is expected that the sharing of these ideas would be encouraged within the Ideas Lab but their confidentiality would be respected outside the Ideas Lab.

The Ideas Lab will be led by a Director whose role will be to assist in defining the topics and help facilitate discussions at the event. The Director will be joined by a small number of Mentors. The Mentors will be selected by the NSF based on their intellectual standing, their impartiality and objectivity, and their broad understanding of, and enthusiasm for, the subject area. The Director and Mentors will take full part in the Ideas Lab, but will not be eligible to receive research funding under this collaborative activity. They will therefore act as impartial peer reviewers in the process, providing a function analogous to that of an NSF review panel.

The process can be broken down into several stages:

- Defining the scope of the challenges
- Evolving common languages and terminologies amongst people from a diverse range of backgrounds and disciplines
- Sharing perspectives and understanding of the scientific challenges, as well as the diverse expertise brought by the participants to the Ideas Lab
- Taking part in break-out sessions focused on the challenges, using creative thinking techniques
- Capturing the outputs in the form of highly innovative research projects
- Using "real-time" peer review to develop projects at the Ideas Lab

The Ideas Lab will be an intensive event. For the well-being of participants, the venue offers opportunities for relaxation, and the timetable will include networking and other activities as a break from the detailed technical discussions.

Who Should Apply to Participate?

Having the right mix of participants influences the success or failure of such an activity. Applications are encouraged from individuals representing diverse research areas across a range of disciplines. Contributions to this challenge could be made by researchers working in a variety of disciplines or research areas. These will include neuroscience, mathematics, physics, biology, chemistry, statistics, and engineering. However, we are not defining the disciplines that should be represented at this Ideas Lab; rather we are asking potential participants to indicate how their expertise can address the challenge of understanding neural representations of olfactory information.

The ability to develop and pursue a new approach will also be crucial. Expertise is required from a very broad range of disciplines, and applicants should not feel limited by conventional perceptions: the Ideas Lab approach is about bringing people together who would not normally interact. We actively encourage people to apply who are experts in their own research areas but have not yet applied it to this challenge.

This is an opportunity to share ideas and develop future collaborations. Participants are welcomed at any stage of their research career, however they must be eligible to apply for funding from the NSF.

Location and Date

This Ideas Lab will take place at the Janelia Farm Research Campus, in Ashburn, VA, from June 22nd to June 26th, 2015. Further details of this venue are available at http://www.janelia.org/. The environment will encourage free and open-minded thinking; vital for the purposes of this event. Additional information about the venue and meeting logistics will be provided to the selected participants. It should be noted that all travel to the Ideas Lab, accommodation, refreshments, breakfast, lunch and dinner costs will be covered by the NSF. However, all incidental costs incurred while at the event will be borne by the participant.

Applications for this Activity

In brief, any individual interested in participating in the Ideas Lab should respond to this solicitation by submitting a preliminary proposal application. Participation in the Ideas Lab is by invitation only from the pool of applicants who submitted a preliminary

proposal.

Submission of the preliminary proposal will be considered an indication of availability to attend and participate through the full course of the five-day residential workshop, which will be held at the Janelia Farm Research Campus, Ashburn, VA, from June 22nd to June 26th, 2015.

Participants will be selected on the basis of the interests, expertise, and other characteristics described in their submitted preliminary proposals. All participants should be willing to engage in frank disclosure and assessment of ideas in a collegial and professional fashion. The Director and Mentors will recommend a list of potential participants and NSF Program Staff will select the final list of participants from the submitted preliminary proposals.

Following the Ideas Lab, participants will be invited to submit full proposals to the NSF by the **July 31, 2015** deadline; these full proposals will reflect the outline developed at the workshop.

III. AWARD INFORMATION

Anticipated Type of Award: Continuing Grant or Standard Grant

Estimated Number of Awards: Between 2 and 3 awards will be made in each of FY 2015 and FY 2016 pending availability of funds and the type, scale, and variety of project ideas developed at the Ideas Lab.

Anticipated Funding Amount: Approximately $12,000,000 to $16,000,000 will be available for US researchers in FY 2015-2016 for successful proposals through the Ideas Lab, pending availability of funds and compelling proposals.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

> The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the Grant Proposal Guide, Chapter I, Section E.

Who May Serve as PI:

> There are no restrictions or limits.

Limit on Number of Proposals per Organization:

> There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI: 1

Additional Eligibility Info:

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Preliminary Proposals *(required):* Preliminary proposals are required and must be submitted via the NSF FastLane system, even if full proposals will be submitted via Grants.gov.

Submission of Preliminary Proposals is required for participation in the Ideas Lab. Please note, Preliminary Proposal must come from one individual and cannot include Co-PIs or collaborators. Participants in the Idea Lab will be selected on the basis of information submitted in the preliminary proposal. The applications are limited to **two pages of "Project Description,"** which should be submitted as a preliminary proposal in the NSF FastLane system **ONLY**, not through Grants.gov. Standard NSF formatting guidelines apply. See the NSF Grant Proposal Guide (GPG) for guidance.

The Project Description section of the preliminary proposal applications should conform to the following guidelines:

Page One:

- Provide a brief summary of your professional background (no more than one half page). Please note that if you are selected as a participant, information provided in answer to this question will be made available to the other participants to facilitate networking at the Ideas Lab workshop.
- What expertise do you bring that is relevant to realizing the goal of cracking the olfactory code? (no more than half a page).

Page Two:

Please spend some time considering your answers to the following questions. Your responses (no more than 150 words each) should demonstrate that you have suitable skills and aptitude to participate in the Ideas Lab (unrelated to your research track record).

What is your personal experience with working in teams?
- How would you describe your ability to explain your research to non-experts?
- The Ideas Lab environment is especially suited to individuals who are willing to step outside their particular area of interest or expertise, who are positively driven, who enjoy creative activity, who can think innovatively and who can settle in easily in the company of strangers. Please describe an experience you have had in a comparable environment.
- What would you personally and professionally gain from participating in this Ideas Lab?

Applicants must include a **Biographical Sketch** and a **Current and Pending Support** document (prepared in accordance with standard NSF formatting guidelines). All other elements of a "full proposal" are waived (Project Summary, References Cited, Budget, Budget Justification, Facilities, Equipment and Other Resources).

Applicants must include the Proposal Classification Form for all submissions to BIO; FastLane will not allow processing of the proposal without it.

No appendices or supplementary documents may be submitted.

Full Proposal Preparation Instructions: Proposers may opt to submit proposals in response to this Program Solicitation via Grants.gov or via the NSF FastLane system.

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via the NSF FastLane system. Chapter II, Section D.5 of the Grant Proposal Guide provides additional information on collaborative proposals.

See Chapter II.C.2 of the GPG for guidance on the required sections of a full research proposal submitted to NSF. Please note that the proposal preparation instructions provided in this program solicitation may deviate from the GPG instructions.

Full proposals based on project ideas developed through interactions at the Ideas lab should conform to the project outline developed at the conclusion of the workshop. If substantive changes are contemplated, an NSF& Program Director should be contacted for guidance.

All full proposals should include a single copy document that contains a list of all persons with conflicts of interest with the investigators involved in the project. See below for required format.

In **Single-Copy Documents**, upload a single, alphabetized table identifying conflicts of interest for all PIs, co-PIs, and Senior Personnel on the project. The table should list (by column): (A) full names (last, first), (B) institutional affiliations, (C) type of conflict, and (D) Name of PI/co-PI/senior personnel having the conflict. The table should be alphabetized on column (A). Conflicts to be identified are (1) Ph.D. dissertation advisors or advisees, (2) collaborators or co-authors, including postdoctoral researchers, for the past 48 months, (3) co-editors within the past 24 months, (4) spouse or other relative, and (5) any other individuals with whom, or institutions with which, the senior personnel (PI, co-PIs, and any named personnel) have financial ties, including advisory committees (specify type), boards of directors, or prospective employees.

Applicants must include the Proposal Classification Form for all submissions to BIO.

B. Budgetary Information

Cost Sharing: Inclusion of voluntary committed cost sharing is prohibited

C. Due Dates

- **Preliminary Proposal Due Date(s)** *(required)* (due by 5 p.m. proposer's local time)**:**

  May 01, 2015

     Due date for preliminary proposal

- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):

  July 31, 2015

D. FastLane/Grants.gov Requirements

For Proposals Submitted Via FastLane:

> To prepare and submit a proposal via FastLane, see detailed technical instructions available at: https://www.fastlane.nsf.gov/a1/newstan.htm. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov. The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

For Proposals Submitted Via Grants.gov:

> Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage: http://www.grants.gov/web/grants/applicants.html. In addition, the NSF Grants.gov Application Guide (see link in Section V.A) provides instructions regarding the technical preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

> ***Submitting the Proposal:*** Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

Proposers that submitted via FastLane are strongly encouraged to use FastLane to verify the status of their submission to NSF. For proposers that submitted via Grants.gov, until an application has been received and validated by NSF, the Authorized Organizational Representative may check the status of an application on Grants.gov. After proposers have received an e-mail notification from NSF, Research.gov should be used to check the status of an application.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program for acknowledgement and, if they meet NSF requirements, for review. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF either as *ad hoc* reviewers, panelists, or both, who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal. In addition, Program Officers may obtain comments from site visits before recommending final action on proposals. Senior NSF staff further review recommendations for awards. A flowchart that depicts the entire NSF proposal and award process (and associated timeline) is included in the GPG as Exhibit III-1.

A comprehensive description of the Foundation's merit review process is available on the NSF website at: http://nsf.gov/bfa/dias/policy/merit_review/.

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in *Investing in Science, Engineering, and Education for the Nation's Future: NSF Strategic Plan for 2014-2018*. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

One of the strategic objectives in support of NSF's mission is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions must recruit, train, and prepare a diverse STEM workforce to advance the frontiers of science and participate in the U.S. technology-based economy. NSF's contribution to the national innovation ecosystem is to provide cutting-edge research under the guidance of the Nation's most creative scientists and engineers. NSF also supports development of a strong science, technology, engineering, and mathematics (STEM) workforce by investing in building the knowledge that informs improvements in STEM teaching and learning.

NSF's mission calls for the broadening of opportunities and expanding participation of groups, institutions, and geographic regions that are underrepresented in STEM disciplines, which is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

A. Merit Review Principles and Criteria

The National Science Foundation strives to invest in a robust and diverse portfolio of projects that creates new knowledge and enables breakthroughs in understanding across all areas of science and engineering research and education. To identify which projects to support, NSF relies on a merit review process that incorporates consideration of both the technical aspects of a proposed project and its potential to contribute more broadly to advancing NSF's mission "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes." NSF makes every effort to conduct a fair, competitive, transparent merit review process for the selection of projects.

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These "Broader Impacts" may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities.

These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. **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. Therefore, proposers must fully address both criteria. (GPG Chapter II.C.2.d.i. contains additional information for use by proposers in development of the Project Description section of the proposal.) Reviewers are strongly encouraged to review the criteria, including GPG Chapter II.C.2.d.i., prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to
    a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
    b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. NSF values the advancement of scientific knowledge and activities that contribute to achievement of societally relevant outcomes. Such outcomes include, but are not limited to: full participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education and educator development at any level; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and others; improved national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education.

Proposers are reminded that reviewers will also be asked to review the Data Management Plan and the Postdoctoral Researcher Mentoring Plan, as appropriate.

Additional Solicitation Specific Review Criteria

This activity, particularly the Ideas Lab approach, is designed to foster the development and implementation of creative and innovative project ideas that have the potential to transform research paradigms and/or solve intractable problems. We anticipate that awards made through this solicitation will be high-risk/high-impact, as they represent new and unproven ideas, approaches and/or technologies. Projects that involve the application of novel, collaborative, or interdisciplinary approaches will therefore receive priority during the consideration process. In addition, full proposals derived from the Ideas Lab will be evaluated to determine whether the scientific themes/objectives in the proposal are congruent with the ideas presented at the Ideas Lab, and whether any significant changes in project scope or resources from those presented at the Ideas Lab have been justified.

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ideas Lab.

The competition will be consistent with the guidelines for an Ideas Lab described in the NSF Grant Proposal Guide, NSF15.1, Chapter III.D.3.

Stage 1: Selection of Participants:

Five to six qualified persons external to NSF will be selected to serve as the Mentors for the Ideas Lab.   These individuals will be subject matter experts from diverse disciplines pertinent to the topic of the Ideas Lab. The Mentors and professional facilitators, who

will be engaged in the Ideas Lab activities, will review the preliminary proposals submitted by applicants and will advise NSF on participant selection. Final selection decisions regarding participation in the Ideas Lab workshop will be made by the NSF.

Overall, the Mentors will seek to ensure that a balance of expertise and experience is present at the Ideas Lab workshop; their assessment will be based on the specific criteria outlined below:

- The ability to develop new and highly original research ideas;
- The potential to contribute to research between disciplines;
- The ability to work in interdisciplinary teams.

Individuals interested in participating in the Ideas Lab workshop will submit a preliminary proposal including information regarding the applicant's specific expertise and personal attributes that will enhance the success of the Ideas Lab workshop. Submission of the preliminary proposal will be considered an indication of commitment to attend and participate through the full course of the five-day residential Ideas Lab workshop on June 22-26, 2015, should the proposer be invited. The decisions of NSF about whom to invite will be final and binding.

Stage 2: Applicants selected by the NSF will participate in the Ideas Lab workshop, building collaborations and refining ideas. At the end of the workshop, the Mentors will evaluate each project idea. Based on the Mentors' advice, within seven to fourteen days of the workshop, NSF will invite select teams to submit a full proposal. These invited full proposals must be prepared according to standard NSF Grant Proposal Guide formatting guidelines.

It is anticipated that these full proposals developed through the Ideas Lab workshop will feature the following:

- Novel, highly multidisciplinary research projects, clearly reflecting the distinctive opportunity for creating such projects that the Ideas Lab mechanism provides;
- Clear evidence that the team has the capability to deliver its project as a high quality multidisciplinary activity; and
- Clear relevance and potential to make a distinctive and novel contribution to addressing the research challenges of understanding the olfactory code in the brain.

Stage 3: Invited full proposals resulting from the Ideas Lab workshop will be reviewed by a panel composed of the Ideas Lab Mentors, whose role is advisory to NSF. Mentors will provide a summary rating and accompanying narrative for each proposal and meet as a panel to evaluate and rank the proposals. Final funding decisions will be made by the NSF.

Reviewers will be asked to evaluate proposals using two National Science Board approved merit review criteria and, if applicable, additional program specific criteria. A summary rating and accompanying narrative will be completed and submitted by each reviewer. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF strives to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. Large or particularly complex proposals or proposals from new awardees may require additional review and processing time. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director acts upon the Program Officer's recommendation.

After programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications. After an administrative review has occurred, Grants and Agreements Officers perform the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

Once an award or declination decision has been made, Principal Investigators are provided feedback about their proposals. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers or any reviewer-identifying information, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See Section VI.B. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award notice, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award notice; (4) the applicable award conditions, such as Grant General Conditions (GC-1)*; or Research Terms and Conditions* and (5) any announcement or other NSF issuance that may be incorporated by reference in the award notice. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

*These documents may be accessed electronically on NSF's Website at http://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the NSF *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer at least 90 days prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). Within 90 days following expiration of a grant, the PI also is required to submit a final project report, and a project outcomes report for the general public.

Failure to provide the required annual or final project reports, or the project outcomes report, will delay NSF review and processing of any future funding increments as well as any pending proposals for all identified PIs and co-PIs on a given award. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project-reporting system, available through Research.gov, for preparation and submission of annual and final project reports. Such reports provide information on accomplishments, project participants (individual and organizational), publications, and other specific products and impacts of the project. Submission of the report via Research.gov constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report also must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.

More comprehensive information on NSF Reporting Requirements and other important information on the administration of NSF awards is contained in the NSF *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

VIII. AGENCY CONTACTS

Please note that the program contact information is current at the time of publishing. See program website for any updates to the points of contact.

General inquiries regarding this program should be made to:

- Edda Thiels, telephone: (703) 292-8421, email: ETHIELS@nsf.gov
- Krastan B. Blagoev, telephone: (703) 292-4666, email: kblagoev@nsf.gov
- Mary Ann Horn, telephone: (703) 292-4879, email: mhorn@nsf.gov
- Sridhar Raghavachari, telephone: (703) 292-4845, email: SRAGHAVA@nsf.gov
- Anne M. Maglia, telephone: (703) 292-8470, email: amaglia@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.

For questions relating to Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representatives (AOR) has not received a confirmation message from Grants.gov within 48 hours of submission of application, please contact via telephone: 1-800-518-4726; e-mail: support@grants.gov.

IX. OTHER INFORMATION

The NSF website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this website by potential proposers is strongly encouraged. In addition, "NSF Update" is an information-delivery system designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF Grants Conferences. Subscribers are informed through e-mail or the user's Web browser each time new publications are issued that match their identified interests. "NSF Update" also is available on NSF's website at https://public.govdelivery.com/accounts/USNSF/subscriber/new?topic_id=USNSF_179.

Grants.gov provides an additional electronic capability to search for Federal government-wide grant opportunities. NSF funding opportunities may be accessed via this mechanism. Further information on Grants.gov may be obtained at http://www.grants.gov.

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NSF funds research and education in most fields of science and engineering. It does this through grants and cooperative agreements to more than 2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the US. The Foundation accounts for about one-fourth of Federal support to academic institutions for basic research.

NSF receives approximately 55,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Arctic and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

Facilitation Awards for Scientists and Engineers with Disabilities provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See Grant Proposal Guide Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090 and (800) 281-8749, FIRS at (800) 877-8339.

The National Science Foundation Information Center may be reached at (703) 292-5111.

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