HANOVER RESEARCH

TURNING GOOD IDEAS INTO FUNDABLE PROPOSALS

Prepared for Thomas Jefferson University | January 21, 2021


HANOVER RESEARCH
AND
THOMAS JEFFERSON UNIVERSITY

JEFFERSON TEAM

Ron Kander, PhD Ron.Kander@Jefferson.edu
Associate Provost for Applied Research
Founding Dean, Kanbar College
Manages Applied Research activities across the university and provides faculty and students with applied research opportunities in federally funded applied research projects and curricular industry engagement projects. Teaches and researches areas of materials selection & design, systems dynamics modeling, complex data visualization, and integrative design thinking.

Brian Squilla, MBA Brian.Squilla@Jefferson.edu
Senior Vice President, Administration
Chief of Staff to Provost & Dean, Sidney Kimmel Medical College
Works directly with senior-level management involving operations, strategic planning and implementation, information technology, human resources, institutional research, and budget preparation, cultivates collaborative relationships with deans, faculty, and other stakeholders across TJU.

Andrea Echeverri Amaya Andrea.Echeverri@Jefferson.edu
Applied Research Operations Manager, Kanbar College

HANOVER RESEARCH

JEFFERSON AND HANOVER

Types of support available to faculty:

Pre-Proposal Support

Proposal Development

Proposal Review

Proposal Revision

Step 1: Complete a Project Request Form

Submit your project request to Jefferson.

Step 2: Project Selection

Projects are selected based on current project volume, anticipated grant request ($), funding sponsor, and proposal submission deadline

Contact the Office of Applied Research:

appliedresearchoffice@jefferson.edu

Note: All grants and research services are available to Jefferson in an unlimited amount, within the confines of Hanover working on one project at a time ("a queue") for the duration of the contract period.

Jefferson
Thomas Jefferson University
HOME OF SIDNEY KIMMEL MEDICAL COLLEGE

HANOVER TEAM

Melissa A. Cornish

Grants Consultant

Master of Science in Public Health-Health Policy, University of North Carolina Chapel Hill, Bachelor of Art, Sociology and Interdisciplinary Studies, Emory University

Extensive experience in developing and refining proposals across a broad spectrum of federal and non-federal sponsors. Previously worked in academia for 15+ years in project management, business development, and proposal writing. Examples of achievements: Awards from NIH, NSF, PCORI, research foundations, and private organizations

Audrey Ngeow

Content Director

Master of Art, Museum and Galleries in Education, University College of London Institute of Education; Bachelor of Art, Art History, Skidmore College

Advocate for responsive and accessible programming, navigator of the grants landscape, and provider of strategic plans for increased funding. Oversees a client pool of healthcare and higher education institutions. Has helped Hanover partners secure >$30M in funding for programming, strategic partnerships, and capital improvement needs.

OUR GRANTS TEAM

ABOUT OUR TEAM

- Deep and diverse set of skills and expertise areas
- Direct and relevant experience supporting grant development across all types of institutions
- All members gain access to our in-house team of grants consultants, content directors, and research analysts
- Combined brain trust
- Committed to success

TOTAL WINS

$600+ MILLION

in total grant funding since 2012, and growing

EXTENSIVE GRANTS EXPERIENCE

Career grant writers and consultants with expansive range of expertise and a strong track record of success.

TARGETED FUNDER EXPERTISE

Relevant experience approaching funders and programs aligned to the needs and priorities of members.

GRANTS LANDSCAPE KNOW-HOW

Nuanced understanding of how to navigate the funding landscape to find the right-fit grant opportunities.

DYNAMIC PROJECT MANAGEMENT

Strategic and nimble execution of member projects ensuring sound communication and high-quality results.

MEMBER-CENTERED SERVICE

Dedication to the mission of each Hanover member and the satisfaction of its stakeholders with our support.

TODAY'S AGENDA

1. BE PRODUCTIVE & STRATEGIC
2. CONCEPT PAPERS, PEER REVIEW, REFINEMENT
3. PRE-PROPOSAL: PROSPECTING, ALIGNMENT, PROJECT SUMMARY, AND PO CONTACT
4. PROPOSAL DEVELOPMENT
5. Q&A

WEBINAR 2

TODAY'S LEARNING OBJECTIVES

1. Identify strategies and techniques to position oneself for success as a grantseeker.
2. Prepare a great idea into a concept paper for outreach
3. Establish an iterative process for a comprehensive proposal development plan

QUICK POLLS

1. *Do you think about pursuing an area of interest that you think is a good idea?* (Yes/No)

2. *Have you pursued an external funding opportunity because you thought you had a good idea?* (Yes/No)


LET'S GET STARTED!
BE PRODUCTIVE & STRATEGIC

INVESTMENTS IN YOUR WORK AND CAREER

- Significant funding to advance professional goals and career
  1. Fund early-stage and promising implementation efforts
  2. Advance scholarship, research, education, etc.
     - **Increase research independence (promotion and tenure)**
  3. Career-defining (e.g., NSF CAREER, NIH R15, NSF EAGER)

- A track record gives you competitive advantages
  1. Experience with research, research design, project implementation
  2. **Original and contributions to your field(s)**
  3. Publications and citations
  4. Enhanced grantsmanship
  5. Overhead to your university

BE STRATEGIC

- PI Strategy
  1. Pursue opportunities to make significant contributions
  2. Publish results in high-impact journals
  3. Establish rationale and track record
  4. Apply and reapply—an iterative process

- University Strategy
  1. University initiatives, e.g., LabArchives
     - Research Resources
  2. Jefferson is committed to strengthening its grants portfolio
     - Jefferson's Offices of Research Support Services

CONTEXTUALIZE YOUR WORK

Convey the project in context of field and beneficiaries/stakeholders

- Gap in knowledge and how you will contribute *(i.e., intellectual merit)*
- Expected outcomes and impacts *(i.e., broader impacts)*

Describe theoretical basis and rationale for your work

- Literature review/evidence base (state of field, rationale)
- Your preliminary evidence (further rationale & PI productivity)

Articulate research/program goals in context of your career

- Describe how will you achieve what results in short-term? = project results
- How that will will advance field and your efforts? = *merits*

Show how your work advances your career and funder priorities!

KNOW WHAT IS BEING FUNDED

Research who and what is being funded

- Consult funder websites and search tools
- Read abstracts of funded proposals
  - NSF Award Search: https://nsf.gov/awardsearch
- Gain insights into current projects and funder/funding portfolio
- Contact and collaborate with funded PIs

Glean opportunities to advance your field/work

- Strengths and weaknesses of previous studies/projects
  - Rigor and reproducibility (NIH)

  https://www.nih.gov/research-training/rigor-reproducibility

CONSULT WITH COLLEAGUES AND MENTORS

Make effort to network with funded PI/PDs

- Consult broadly
  - Subject matter experts (SMEs)
  - Statisticians and evaluators
  - Collaborators

- Request critique of your work
  - Analyze significance and integrity of your work and project design
  - Assess value of the work within the context of the field(s)

Feedback can enhance significance and project design!

COLLABORATE WITH FUNDED PI/PD

Working with colleagues increases capabilities and opportunities

- Work with funded PIs/PDs
  - In your discipline and beyond (e.g., interdisciplinary/convergence)
  - Leverage/advance their research and interventions

- Collaborate on each other's proposal(s)
  - Get parts of your research funded in their grants
  - Preliminary data
  - Contribute to publications

- Leverage their subject matter expertise for draft proposal and agency panel reviews

Mentoring and collaboration are keys to success!

PUBLISH STRATEGICALLY AND SHARE BROADLY

Publications (and citations) are good indication of capabilities

- Develop a publication strategy
- Tailor publications to your career (and grant) goals
  - Develop or co-develop *preliminary results* applicable to the proposed work
  - Establish *progression* in your field
  - Peer-reviewed *publication* is gold standard for preliminary results and capabilities
- Present beyond publications and conferences
  - **Think citizen science** (i.e., podcasts, NPR stories, intergenerational activities, museum exhibits, periodicals)

Aim for high-impact publications!

SERVE AS GRANT REVIEWER

Benefits

- Service to funder and scientific community
- Gain firsthand knowledge of the review process
- Learn about common problems with proposals
- Meet colleagues in related fields
- Meet program officers in your field of interest

Volunteer to review

- Agency/division that funds work in your field
- Email program officer

Gain insights into writing and reviewing proposals!

LEVERAGE NEW AND EARLY-STAGE INVESTIGATOR STATUS

National Science Foundation (NSF)

- Faculty Early Career Development (CAREER)

National Institutes of Health (NIH)

- Mentored Research Scientist Development Award (K01)
- Director's Pioneer and New Innovator (DP1 and DP2) awards
- NIH SuRE-First

Department of Defense (DoD)

- Navy Young Investigator Program (YIP)
- Air Force Young Investigator Research Program (YIP)
- DARPA Young Faculty Awards (YFA)

PLAN FOR MULTIPLE SUBMISSIONS

Grants are a competitive and iterative process

- Most not funded on first submission (~10-20% success rate)
  - Expectation of resubmission is built into the process
  - Success rates go up with resubmissions!
- Learn as much as you can from each review
  - Comments often valuable (not always)
  - Address all of them
- Consult your PO regarding your revision approach (confirm alignment)

A decline can be opportunity to improve project design and increase success!

CONCEPT PAPER, PEER FEEDBACK, REFINEMENT

PROPOSAL DEVELOPMENT LIFECYCLE

Pre–proposal: Be productive, conceptualize your work in context of field, prospect funders, consult colleagues, refine project, contact program officers to confirm alignment

Proposal: Write narrative, assemble proposal, edit and rewrite, edit and rewrite, edit and rewrite, submit and resubmit

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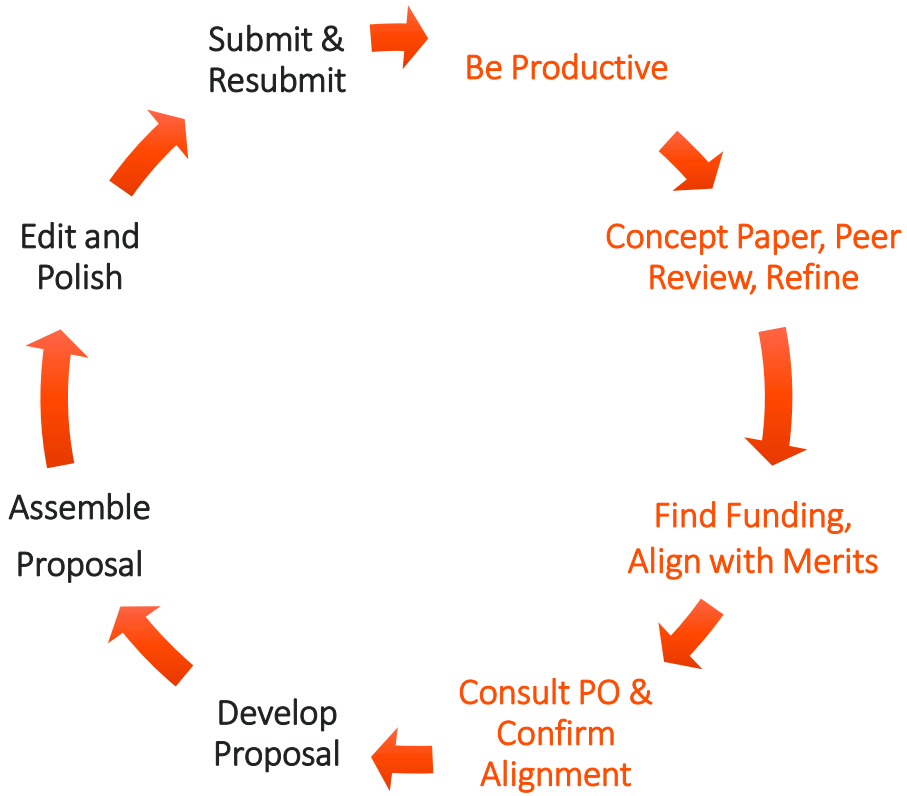


THE CONCEPT PAPER

STORYTELLING ILLUSTRATED

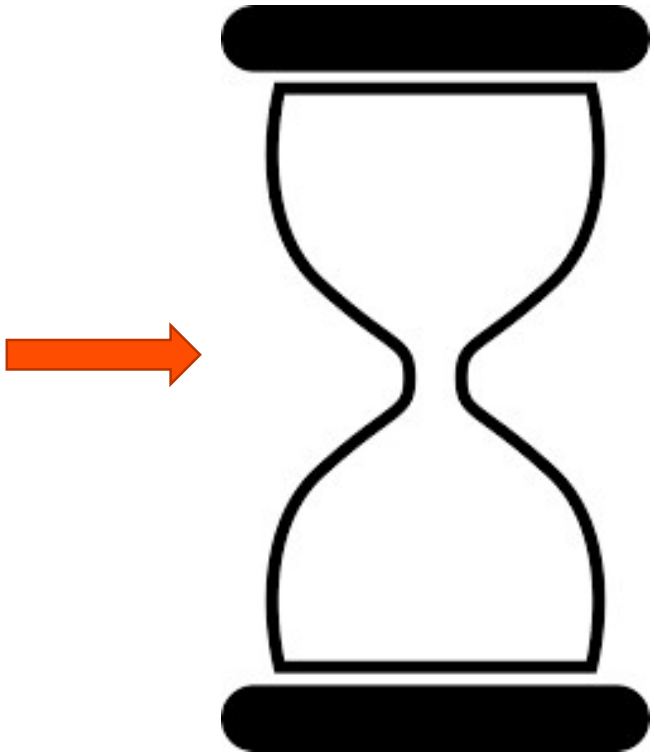
Context and opportunity

State of the field (gaps)
Literature review
Preliminary evidence

Research plan

Assessment plan
Impacts and merits
Project timeline

Overall impact(s)



CONCEPT PAPER

Develop 2-3 page concept paper to facilitate project design

- Focus on the problem—**why** you are doing/solving
- Present your solution—**what** you plan to do
- Show methodology and process—**how** you will do it
- Evaluation and dissemination—how **know if successful** and how share
- State impacts—the **results** and/or **impacts** of your work on your field and society

A *DETAILED* CONCEPT PAPER

For a Federal agency, follow the outline of the funder's requirements or their usual proposal or abstract/summary structure.

If no structure is provided, consider the following key components:

1. Introduction
2. Purpose/Need
3. Project Description
4. Goals/Objectives/Aims/Research Questions
5. Methods
6. Timeline
7. Expected Outcomes/Benefits (may include Evaluation)
8. Budget/Needs & Requested Support
9. Contact Information

ANATOMY OF A SPECIFIC AIMS PAGE

Organize bullet points in *four* distinct categories that will become four paragraphs

1. Introductory paragraph—Define the problem/critical need
2. Proposed idea/solution paragraph—Provide objective(s) and rationale (who, what, why)
3. Specific Aims listing—Brief (1 sentence) and identify "product" over "process" to meet the project's objectives.
4. Significance paragraph—Conclude with the novelty of the work, expectations, and anticipated impact

Sources: Colson (2009); Dresbeck (2013); Giddings (n.d.); Jelinski (n.d.); NIH (November 25, 2015); Univ. of Washington (n.d.)

CONCEPT PAPER TECHNICAL TIPS

A concept paper should follow any technical specifications provided by the funder. If no specifications are provided, we recommend the following:

- Match the formatting of the funder's full proposal specifications

OR

- 1-inch margins, single-spaced
- 11-point Arial
- 0.25 inch left indented, fully justified paragraphs
- Bold headings where appropriate


A CASE STUDY

1. INTRODUCTION

- ❑ Introduce your idea and identify the program or opportunity you *think* is a good fit.
- ❑ Demonstrate that you understand the mission of the funding agency and the types of projects that they support.
- ❑ Identify how your project meets the goals of the funder.
- ❑ Identify any other funders that will be involved and their interest in the project where appropriate.
- ❑ Introduce the question, problem, or need to be addressed.

Example:

In response to RFA-1234, *Studies to Enhance the Texture of Peanut Butter*, we propose a cross-over randomized controlled trial to compare consumer preference for fluffy versus powdered peanut butter among school-age children in urban communities. This project will address the USDA's goal of understanding consumer preferences in this difficult-to-please group and may provide critical insights into understanding how and why these preferences often fail to persist into adulthood. Although the RFA allows for industry support, we are electing to forego Skippy's funding to reduce the risk of unintended bias.

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2. PURPOSE/NEED

- ✓ Briefly provide supporting documentation for the importance of addressing this question, problem, or need.
- ❑ If you have statistical data, use it.
- ❑ Cite significant and compelling sources. Why does this project matter?
- ❑ Make sure you cite or refer to what others have accomplished relative to your project.

Example:

More than 18 million children eat peanut butter every day, with peak annual consumption at age 11.7 years. Peanut butter consumption gradually declines through the remaining public school years and remains at about 0.6 jars per person per year throughout adulthood. The USDA and the peanut industry have identified low peanut butter consumption as a major risk for multiple chronic conditions in adulthood such as full-time employment, mortgage payments (sometimes extending as long as 30 years), and the birth of children. Pan et al. (2012) hypothesized that age-related changes in texture perception and texture-mediated pleasure responses are responsible for the widespread reduction…

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3. PROJECT DESCRIPTION

- ❑ Concisely describe what you plan to do, your approach, who benefits and potential impacts.

Example:

We propose to compare consumer responses to fluffy versus powdered peanut butter in 420 school-aged children recruited from 6 urban schools in Detroit… [Additional but brief detail]

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4. GOALS AND OBJECTIVES

Outline your **goals and objectives**:

- **Goals** are simply a statement of the vision, specifying the accomplishments to be achieved if the vision is to become real.
- Your target **objectives** are clearer statements of the specific activities required to achieve the goals.
  - Your objectives will describe the action or intent to achieve measurable outcomes that relate to the goal.

Example:

Our **short-term goal** is to improve our understanding of peanut butter texture preferences in school-aged children. Our **long-term goal** is to develop peanut butter products with textures that appeal to adults and thereby increase adult peanut butter consumption and reduce chronic conditions associated with low consumption. To achieve these goals, we propose the following objectives:

Objective 1. Conduct a randomized controlled trial comparing texture preferences for fluffy vs. powdered peanut butter in 420 school-age…

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5. METHODS AND TIMELINE

- ❑ Briefly describe how the project be carried out, providing sufficient detail to allow the reader to assess feasibility and likely impact but not so much detail that the reader is overwhelmed.

- ❑ Make sure the methods and timeline are explicitly related to the goals and objectives.

Example:

In partnership with our local public school district, we have identified 6 schools serving a diverse population of children in grades K-12 who will be available for recruitment. In Year 1, we will recruit 420 children across all grades, and they will be randomly assigned to receive fluffy or powdered peanut butter in sandwich form once per week during school lunch for 3 months. After a one-month break, groups will be switched to receive the other form of peanut butter in sandwich form once per week during school lunch for 3 months. Throughout the administration, research staff will assess sandwich waste. At baseline and 3, 4, 7, and 8 months, we will administer multiple measures to assess…

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6. NEEDS & REQUESTED SUPPORT

If appropriate:

- Indicate the overall budget for the project;
- Identify other contributors and the amounts pledged; and
- State your request of the funder.

This is usually only included with foundation-type funders, and then usually only with formal Letters of Inquiry (LOIs).

Since we are electing not to accept Skippy's support to reduce the risk of bias in this study, we are requesting $250,000 direct costs per year for three years for this study.

7. YOUR CONTACT INFO

Don't forget to:

- ✓ Include your name, credentials, position, institutional affiliation
  - ✓ Phone, email

Contact Information:

Peter Pan, PhD
Assistant Professor
University of Somewhere
Phone:
Email:

PEER FEEDBACK

CONSULT COLLEAGUES

Share with mentors and colleagues for vital feedback

- Share context and project design
- Involve SMEs (e.g., statistician, evaluator)
  - **Give them <u>time</u>!**
- There is no substitute for a colleague who asks good questions while you are in design mode
- Also show it to non-SMEs, e.g., friends and family
  - Scientifically literate lay reader
  - If they can't understand your work, revise it until they do

Take all feedback objectively!

REFINEMENT

1. Refine your hypothesis

- Make clear the hypothesis and how generation and analysis of new data will be subjected to statistical analysis and how results confirm the hypothesis

2. Enhance literature review

- Detail *how* current state of the field plus preliminary evidence provide the **scientific rationale** for your proposed project
- Discuss strengths and weaknesses of previous studies you will address

3. Strengthen the project design

- Incorporate all design inputs (e.g., SME, statistical, evaluation, etc.)
- Make clear the causal connections between intervention and outcome
- Identify key points regarding generalizability/applicability

PROSPECTING, ALIGNMENT, & PROGRAM OFFICER

PROSPECTING

WHO WILL FUND YOUR WORK?

Good prospective funders have:

- A mission that aligns with your mission
- A history of funding similar or related projects
- Stated priorities that encompass your focus area

However, be aware of whom is funding the identified projects

- Funding history not always good predictor of future funding
- Priorities evolve quickly
- Need to gain insights regarding alignment and competitiveness

Gain insights into alignment and competitiveness!

WHICH FUNDERS PRIORITIZE THIS WORK?

Use databases and search engines to find funders with relevant priorities

- Use multiple databases and search tools
  - Grants.gov
  - Research.gov
  - Jefferson's Pivot® and Research Professional-pivot.proquest.com
- Search for keywords that relate to your mission and project
- Search by funder type, funding type, and funding region
- Note funding restrictions
- Note typical funding amounts
- Note key deadlines and other timing constraints

Funders' stated priorities provide insights into identifying prospects!

WORK WITH PIVOT-RP

Unique database for access to federal, state, private and nonprofit funding

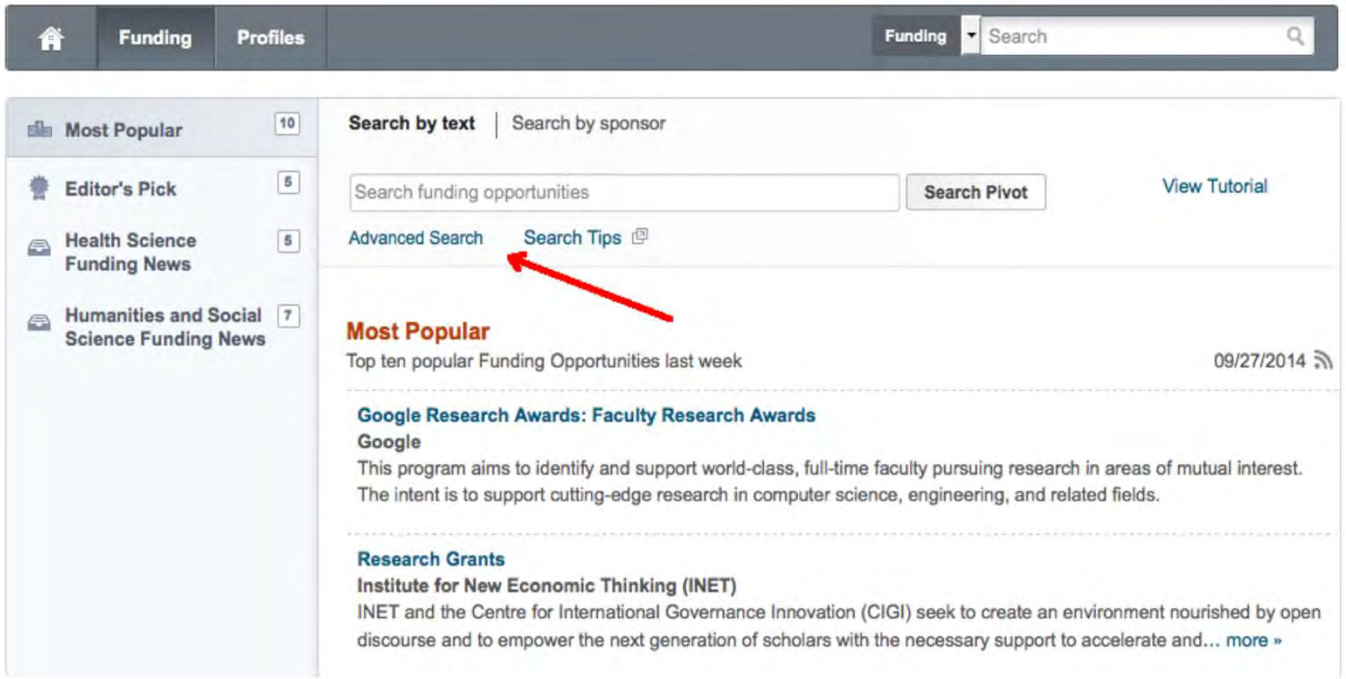
- Available to Jefferson faculty: https://pivot.proquest.com/dashboard
- Search funding opportunities related to all academic areas, including the arts, humanities, business, education, social and physical sciences
- Identifies other researchers with similar research interests, both within Jefferson and worldwide
  - *Resource for finding collaborators!*

To find out more about the Pivot tool including a "How to Video" on the TJU research website under "Extramural" at:
https://research.jefferson.edu/resources/funding-opportunities.html

PIVOT SEARCH FUNCTIONS

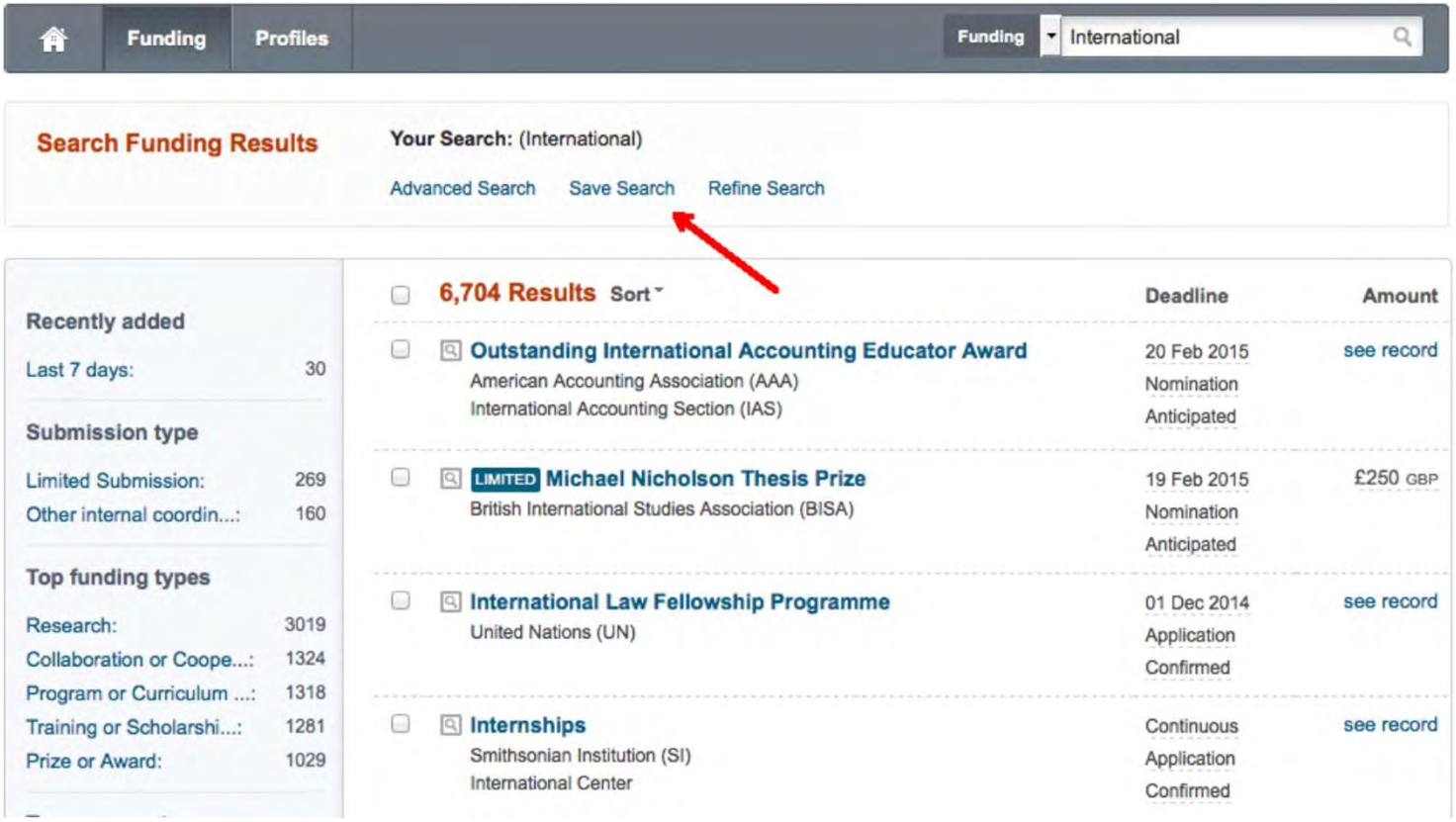
Conduct a search by clicking on the "Funding" button in the tool bar

- Advanced search option
- Add multiple search terms and exclude specific criteria



SAVE SEARCH FOR UPDATES

Save your search and PIVOT will email you new results weekly!



DETERMINE ALIGNMENT

Digest the funding announcement

- Analyze the funding opportunity—the key first step
  - Serves as a context for your work
  - Reflects a portfolio of similar work
- Leverage analysis to improve the proposal
  - **Select opportunities that align with your goals**
- Go beyond the announcement to talk with PIs/PDs and funder staff

Prioritize by

- Mission alignment
  - **i.e., your project + their money = alignment**
- Your competitiveness >> alignment with merit/review criteria
- Scope >> project period and budget

NATIONAL SCIENCE FOUNDATION AS AN EXAMPLE

Use agency website to review

- Funder mission
- Trends and priorities
- History and opportunities
- Contact information

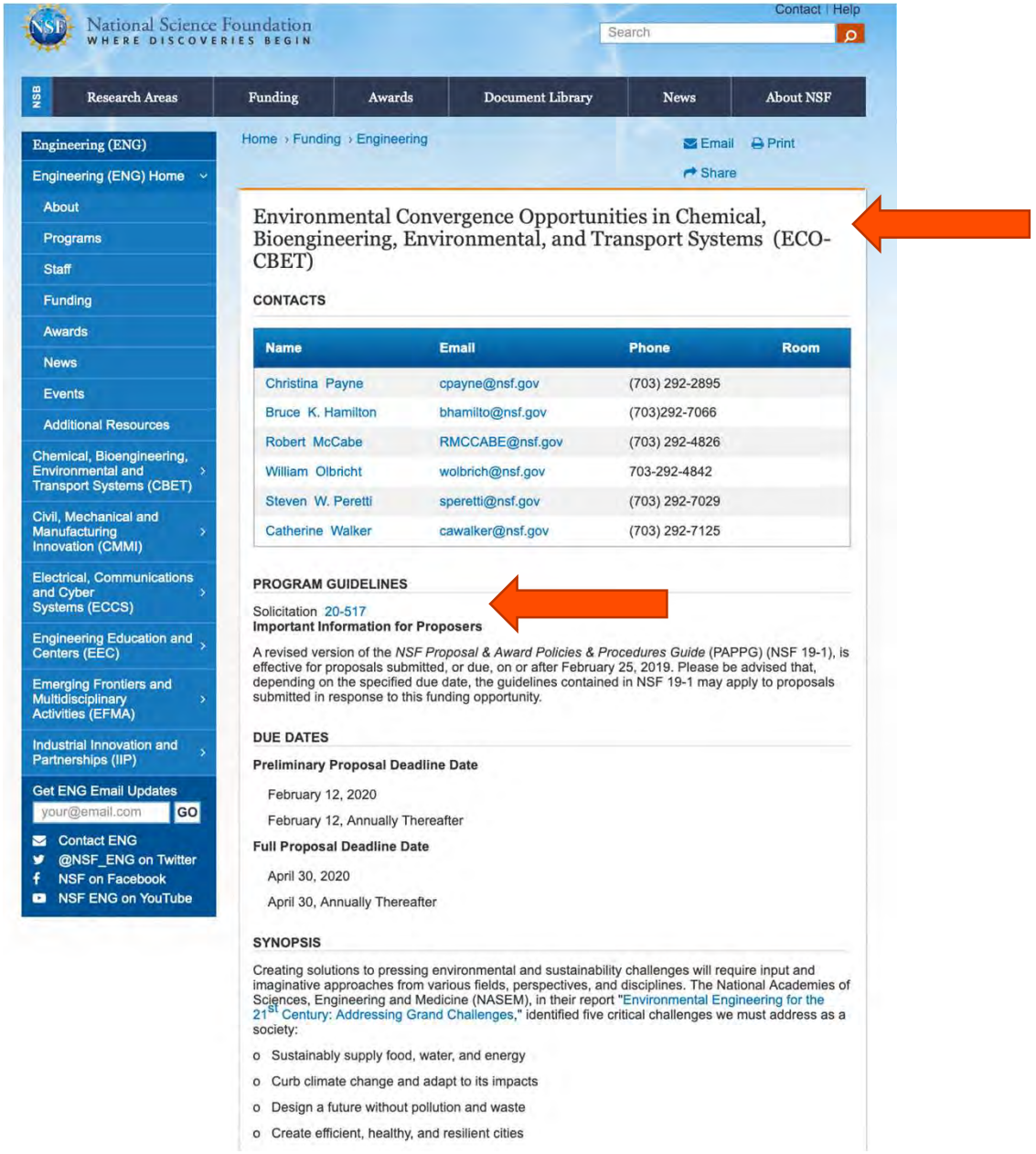
Review specific funding notices

- Sponsor / Directorate priorities
- Eligibility, funding levels, and duration
- Proposal instructions
  - Requirements
  - Narrative and budget components
  - **Review criteria**

ENG DIVISIONS AND PROGRAMS

More at https://www.nsf.gov/funding/programs.jsp?org=ENG

ENG ECO-CBET FUNDING MECHANISM WEBPAGE



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Environmental Convergence Opportunities in Chemical, Bioengineering, Environmental, and Transport Systems (ECO-CBET)

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PROGRAM GUIDELINES

Solicitation 20-517
Important Information for Proposers

A revised version of the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) (NSF 19-1), is effective for proposals submitted, or due, on or after February 25, 2019. Please be advised that, depending on the specified due date, the guidelines contained in NSF 19-1 may apply to proposals submitted in response to this funding opportunity.

DUE DATES

Preliminary Proposal Deadline Date

February 12, 2020

February 12, Annually Thereafter

Full Proposal Deadline Date

April 30, 2020

April 30, Annually Thereafter

SYNOPSIS

Creating solutions to pressing environmental and sustainability challenges will require input and imaginative approaches from various fields, perspectives, and disciplines. The National Academies of Sciences, Engineering and Medicine (NASEM), in their report "Environmental Engineering for the 21st Century: Addressing Grand Challenges," identified five critical challenges we must address as a society:

- Sustainably supply food, water, and energy
- Curb climate change and adapt to its impacts
- Design a future without pollution and waste
- Create efficient, healthy, and resilient cities

ECO-CBET SOLICITATION

Environmental Convergence Opportunities in Chemical, Bioengineering, Environmental, and Transport Systems (ECO-CBET)

PROGRAM SOLICITATION
NSF 20-517

National Science Foundation

Directorate for Engineering
Division of Chemical, Bioengineering, Environmental and Transport Systems

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

February 12, 2020

February 12, Annually Thereafter

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

April 30, 2020

April 30, Annually Thereafter

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 19-1), which is effective for proposals submitted, or due, on or after February 25, 2019.

SUMMARY OF PROGRAM REQUIREMENTS

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Environmental Convergence Opportunities in Chemical, Bioengineering, Environmental, and Transport Systems (ECO-CBET)

Synopsis of Program:

Creating solutions to pressing environmental and sustainability challenges will require input and imaginative approaches from various fields, perspectives, and disciplines. The National Academies of Sciences, Engineering and Medicine (NASEM), in their report "Environmental Engineering for the 21st Century: Addressing Grand Challenges," identified five critical challenges we must address as a society:

- Sustainably supply food, water, and energy
- Curb climate change and adapt to its impacts
- Design a future without pollution and waste
- Create efficient, healthy, and resilient cities
- Foster informed decisions and actions

The report further states, "The challenges provide focal points for evolving environmental engineering education, research, and practice toward increased contributions and a greater impact. Implementing this new model will require modifications in educational curriculum and creative approaches to foster interdisciplinary research on complex social and environmental problems." This solicitation aims to address these grand challenges by supporting a collaborative research model that seamlessly integrates sustainability, environmental engineering, and process science and engineering.

Accordingly, the Environmental Convergence Opportunities in Chemical, Bioengineering, Environmental, and Transport Systems (ECO-CBET) solicitation will support activities that confront vexing environmental engineering and sustainability problems by uncovering and incorporating fundamental knowledge to design new processes, materials, and devices from a systems-level perspective. Projects should be compelling and reflect sustained, coordinated efforts from interdisciplinary research teams. A key objective of the solicitation is to encourage conversations and robust collaborations amongst the chemical process, transport phenomena, bioengineering, and environmental and sustainability research communities such that unanticipated solutions may arise. Furthermore, training the future workforce to actively engage and be successful in interdisciplinary research will be necessary to continually innovate given the scope of the environmental problems faced by our global community.

PROGRAM DESCRIPTION

II. PROGRAM DESCRIPTION

The Environmental Convergence Opportunities in Chemical, Bioengineering, Environmental, and Transport Systems (ECO-CBET) solicitation will support activities that substantially advance our capabilities to address environmental and sustainability grand challenges by integrating the expertise and fundamental advancements of chemical processes, transport phenomena, and bioengineering. The proposed research is expected to be compelling and broad reaching, going well beyond that typically supported by any single CBET core program. This solicitation is an opportunity to build and sustain collaborative bridges with research communities across the programmatic clusters of CBET, which include - Chemical Process Systems, Engineering Biology and Health, Environmental Engineering and Sustainability, and Transport Phenomena. Teams are expected to work cooperatively over the life of the project to understand and address the proposed challenge. Sustained open dialogue will be necessary to fully benefit from the unique skills and perspective each member brings to the table. Teams are also encouraged to apply, and further develop, advanced research tools required to address problems of the magnitude represented by global environmental and sustainability challenges. Training the future workforce to step outside the bounds of their discipline to solve a pressing engineering problem is also integral to the objectives of the solicitation.

We anticipate that the intentional and coordinated integration of fundamental knowledge from the chemical process, transport, and bioengineering communities with that of the environmental engineering and sustainability communities will engender creative approaches to long-standing challenges. To achieve this integration, this solicitation will support projects that leverage techniques, tools, theories, and approaches relevant to the disparate CBET research communities to address an environmental or sustainability challenge. Integration of manufacturing research and/or social science considerations, where appropriate, may contribute to the overall impact of the project. Again, a primary goal of the solicitation is to provide sustained research funding in support of truly collaborative teams working at the forefront of solving environmental and sustainability grand challenges in an effort that is more than the sum of individual contributions. Successful applicants will take a holistic, systems-level approach driven by strong interdisciplinary collaborations.

We envision supporting projects that are more than a "patch" or incremental advance to an existing technology and encourage investigators to approach environmental engineering and sustainability problems with fresh perspectives. For example, novel approaches to process design and control may lead to improved manufacturing efficiency and reduced environmental impact. Fundamental understanding of thermal transport processes could result in waste heat reduction, management, or re-use. Understanding catalytic materials and adsorption processes will be valuable in improving the overall energy balance of alternative energy production, carbon capture and sequestration processes, and improved recyclability or biodegradability of waste. Similarly, cellular and biochemical engineering insights could lead to improvements in sustainable crop production or improved monitoring of human impacts on the environment. In other words, there are seemingly endless opportunities for engaging the chemical process, transport, and bioengineering communities in the study and solution of environmental and sustainability challenges. Investigators should describe a clear vision for how the project outcomes will promote or facilitate solutions to an environmental challenge; as an innovative process design that can be applied at scale; or as a controllable, engineered system that can be deployed in the field.

Proposals that address one of the two strategic challenges described below are particularly encouraged (though not required) for this competition. However, any creative and transformative ideas that couple the process, bioengineering, and transport sciences to other environmental and sustainability challenges, as described above, are welcome.

Greenhouse Gas Mitigation – Transformative, high-risk/high-reward approaches are sought to economically and sustainably capture, contain, and/or convert greenhouse gases, such as CO_2, methane, nitrous oxide, and chlorofluorocarbons, from industrial process streams or directly from air.

Managing the Nitrogen Cycle – Transformative, high-risk/high-reward approaches are sought to prevent runoff and leaching of nitrates into drinking water reservoirs or into the ecosystems of receiving waters; to prevent denitrification of soil nitrogen by microorganisms and release of nitrous oxide (N_2O) into the atmosphere; or to economically and more sustainably synthesize ammonia than current processes.

In addition to innovative research, projects are expected to engage and train students to step outside the bounds of their discipline to conduct collaborative and convergent research. Educational and outreach activities targeting any educational level are welcome. The outcome of the activities should be students who are prepared to enter the workforce and work collaboratively to solve environmental and sustainability challenges of global concern.

PROPOSAL DEVELOPMENT INSTRUCTIONS

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.

Preliminary proposals should provide a brief overview of the project focusing on its transformative aspects. They should include sufficient information to allow assessment of the main ideas and approaches and of the responsiveness of the project to the solicitation goals. As appropriate, rudimentary assessment of the ultimate technological feasibility of the project (consistent with factors such as thermodynamic and kinetic limitations, materials synthesizability and stability, and overall energy balance) is encouraged. Review of the preliminary proposals will emphasize the potential transformative impact of the proposed idea and the application of fundamental principles and concepts to solve a pressing environmental engineering/sustainability challenge.

Preliminary Proposal Preparation Instructions:

Preliminary proposals must be submitted via FastLane in accordance with the instructions below. Preliminary proposals that are not compliant with this solicitation will be returned without review. It is the submitting institution's responsibility to ensure that the proposal is compliant with all applicable requirements. Preliminary proposals should not include separate subaward budgets but should include planned levels for subawards on the budget justification page. Preliminary proposals must contain the items listed below and must strictly adhere to the specified page limitations. No additional information may be provided as an appendix or by links to web pages. Figures and tables must be included within the applicable page limit. All elements of the proposal, including legends and tables, must meet all formatting requirements for font size and characters per inch as specified in the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG).

Preliminary proposals must include the following items:

Cover Sheet: Select the solicitation number from the pull-down list. Check the box indicated for preliminary proposal. Entries on the Cover Sheet are limited to the principal investigator and a maximum of four co-principal investigators. A minimum of two co-principal investigators must be identified. Additional project leaders or senior personnel can be listed on the project summary page and entered into FastLane as senior personnel. At the preliminary proposal stage, avoid the inclusion of individuals without a substantive project role.

Title of Proposed Project: The title for the proposed project must begin with "ECO-CBET Preliminary Proposal:". The title must state clearly and succinctly the major theme(s) of the project.

Project Summary: The project summary may not exceed one page in length and must consist of three parts:

1. In the Overview section, include the title of the project, the name of the PI, the lead institution, and a list of co-PIs and senior personnel together with their institutions;
2. Provide a succinct summary of the *intellectual merit* of the proposed project. This should include the transformative nature of the proposed research and the significant leap or paradigm shift in fundamental engineering knowledge it will provide; and
3. Describe the *broader impacts* of the proposed work, including the potential long-term impact on national needs or a grand challenge.

Preliminary proposals that do not separately address in the project summary both intellectual merit and broader impacts will be returned without review.

Project Description: The project description of the preliminary proposal is limited to five pages and should include the following three sections:

1. **Vision and Goals** – Describe the vision and specific goals of the proposed research;
2. **Approach and Methodology** – Describe the approach and methodology that will be used to achieve the vision and goals; and
3. **Transformative Impact** – Describe the transformative aspects of the project, including how the collaboration of experts from different disciplines will enable a significant advancement of fundamental engineering knowledge and will have strong potential for long-term impact on a national need or grand challenge. Include a succinct statement of your anticipated Broader Impacts.

MERIT REVIEW CRITERIA

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. (PAPPG 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 PAPPG 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.

DESIGN TO FUNDER PRIORITIES/MERITS

All research proposals are evaluated using merit review criteria

- Each has its own specific subject matter priorities
- Review websites and funding notices to stay current
- Conduct assessments of need and deficiencies in field
- Build programs and research designed specifically to address key issues in the field
  - **Articulate how applicable to priorities and merits**
- Develop rigorous plans to show causality between the intervention and expected outcomes
- Include strong evaluation plan to assess and share results

Designing to the funder priorities and merits is essential to proposal success!

CONTACT PROGRAM OFFICER

Program staff influence and guide funding decisions

- Peers in your field
- Portfolio of investments
- Investments in the field through your work
- Guide applicants to more suitable division or funding opportunity
- Definitive resource for information on alignment and competitiveness
- Make funding recommendations and decisions

Evidence suggests that the majority of funded proposals involved early and substantial contact with the program staff!

PREPARING TO CONTACT PROGRAM OFFICER

Know the agency and opportunity

- Know the goals and focus of the agency, directorate, and mechanism
  - **Don't ask simple/basic questions**
- Articulate how your project will advance those goals

Contact the PO (email or phone)

- Email should summarize proposed research to facilitate PO feedback
  - **Attach required concept paper/project summary/aims statement**
- Solicit feedback regarding alignment and competitiveness
- Critical to project refinement and pre-proposal development
- Convey merits of research *and* institutional support for your project
- Establish rapport, gain insights, familiarize PO with the project

SAMPLE EMAIL

Subject: Request for call to discuss XXX due on DATE

Dear Dr. X:

I am interested in submitting a proposal for RFA #XXX "RFA Title" and would like to schedule a call with you to discuss whether my research is appropriate for this opportunity. [If your request is urgent, indicate that here and explain why.]

[Briefly describe your proposed work and why you think it is a good fit.] If it would be helpful, I can provide a [brief concept paper / project summary / specific aims] for you to review prior to our call. [If you have specific questions that you want the PO to consider, include them here.]

[Provide possible days/times *or* indicate that you can be available at the PO's convenience.]

Thank you in advance for your assistance. I look forward to talking with you soon.

Sincerely,

Your name and contact Information

COMMON QUESTIONS FOR PROGRAM OFFICER

Start with questions about alignment of your work with the funding mechanism

- Does my project represent a good fit / competitive for this opportunity / advance your funding priorities?
- Are there other mechanisms that would be a better fit?

Turn to questions that solicit PO insights and feedback

- What are your recommendations for improving the fit / competitiveness?
- What are the most common causes for proposals being declined for this opportunity?

Finish with summary questions

- What are the usual success rates for this program?
- What is preferred method for contact should I have additional questions?

Remember: Let them do most of the talking!

AFTER THE CALL

Always follow up afterward

- Follow up with an email thanking the PO for their time and summarizing the key points you took away from the call
- In any future communication about this opportunity, reference your call
- Use the subject line of your email to reflect the purpose and urgency of the request

ADDITIONAL RESOURCES

“How to Contact Program Officers” (B. Keithly)

- https://research.utdallas.edu/blog/how-to-contact-program-officers

“Can We Talk? Contacting Grant Program Officers” (R. Porter)

- https://www.okhighered.org/grant-opps/docs/can-we-talk-contacting-program-officers.pdf

“What to Say – and Not Say – to Program Officers” (M. Spires)

- https://www.chronicle.com/article/What-to-Say-and-Not-Say-to/131282

PROPOSAL DEVELOPMENT

PROPOSAL LIFECYCLE

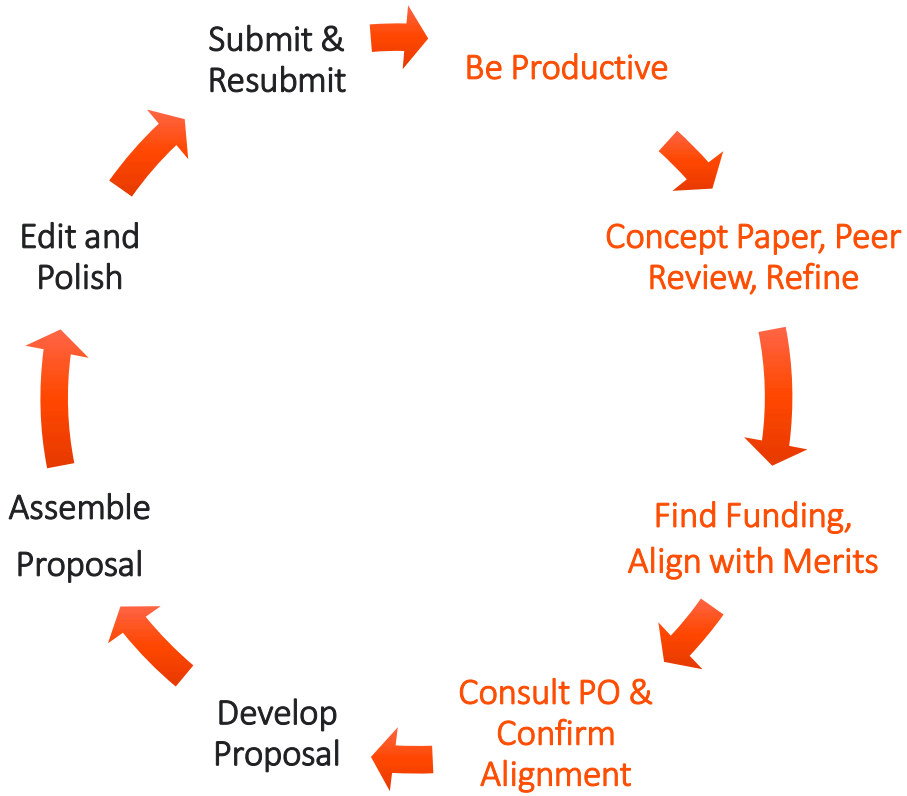
A. *Pre-proposal* Conceptualize your work in context of field, prospect funders, consult colleagues, refine project and budget, contact program officers

B. ***Proposal*** – Write narrative, assemble proposal, edit and rewrite, polish, submit and resubmit

PROPOSAL DEVELOPMENT LIFECYCLE

Pre-proposal: Be productive, conceptualize your work in context of field, prospect funders, consult colleagues, refine project, contact program officers to confirm alignment

Proposal: Write narrative, assemble proposal, edit and rewrite, edit and rewrite, edit and rewrite, submit and resubmit



PROJECT MANAGEMENT

1. Connect with your research office

- Coordinate proposal submission
- Determine your time in Hanover queue (as applicable)
- Schedule with other external resources (e.g., collaborators, colleagues, evaluators, statisticians, etc.)

2. Develop a realistic proposal development timeline

- Use clear tasks and dates to drive proposal and narrative production, review, and polish

3. Use the funding notice and instructions to develop a narrative template

- Use proposal requirements and scoring criteria to develop the template

Crosswalk the requirements and review criteria!

PROJECT SUMMARY

Revise and enhance the project summary

- Revise the summary to reflect the enhanced project design
- Use it and the funding notice to to develop the narrative template
- Sync the Project Summary and Project Description documents!
  - Executive summary that leads to unpacking of all sections
  - Pique reviewers' interest in getting more details
  - Set reviewers up to "see" details in the full proposal
    - "Tell them what you're going to tell them, tell them, tell them what you told them."

Assigned reviewers use it to triage proposals

- Other panelists use it to orient to your proposal before discussion and scoring

PROJECT NARRATIVE

Provide a clear statement of the work to be undertaken

- Project rationale and evidence-base (and preliminary evidence)
- Objectives for the period of the proposed work and expected significance

Outline the general plan of work, including the broad design of activities to be undertaken

- Provide a clear description of experimental methods and procedures

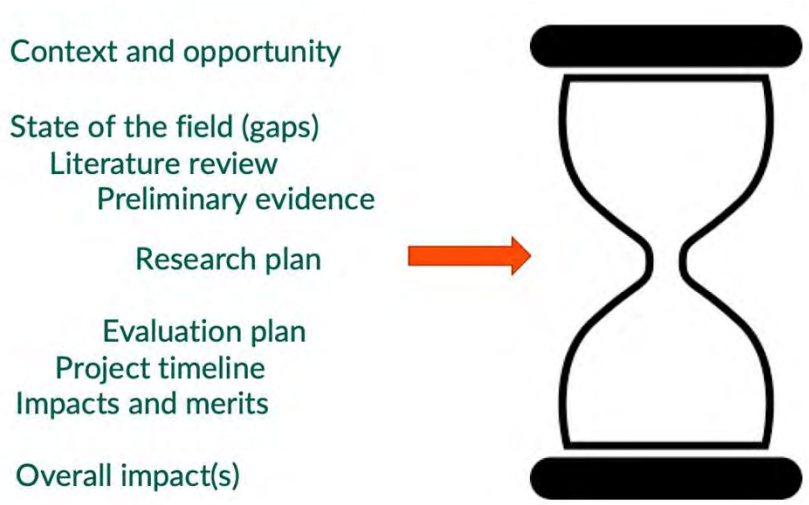
Address what you want to do, why you want to do it, how you plan to do it, how you will know if you succeed, and what benefits could accrue?

- The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified
- These issues apply to both the technical aspects of the proposal and the way in which the project may make broader contributions

NARRATIVE STRUCTURE

If no template, Hanover recommends the following general structure:

1. Introduction
2. Significance of the proposed project
   - *Evidence base and literature review*
3. Preliminary data
4. Implementation plan
5. Outreach/Educational plan
6. Merits
7. Evaluation and dissemination
8. Project timeline
9. Impacts



RESPONSIVE AND COMPETITIVE

Compliance with instructions ("responsiveness")

- Application must be in compliance with myriad rules and regulations
- Do this early during your project and proposal development process
- Use agency specific portals for submission (e.g., NSF FastLane, NIH eRA Commons)

Merit and grantsmanship ("competitiveness")

- Provide exceptional context and evidence base to show how your project will advance the field and their priorities
- Talk to the merit review criteria – be specific, be confident
- Tell a compelling story (why, who, what, how, when) and provide a robust specific work plan
- Show how you will control and measure the project impacts and share results

MERIT REVIEW CRITERIA

Researchers have identified key questions that manifest in the review criteria used by most federal agencies:

1. Why does it matter?
2. How is it new?
3. How will it be done?
4. In what context will it be done?
5. What is special about the people involved?
6. What is the impact/return on investment?
7. How effectively will the financial resources be managed?
8. How will success be determined?

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4892374

LEVERAGE YOUR RESOURCES

- Jefferson's Offices of Research Support Services
  - ORA offers trainings, e.g., pre-award, clinical research, PI-specific.
  - Research at Jefferson (www.Jefferson.edu/research)
- Mentors, colleagues
- Funding Announcements and Opportunities
- Funder conferences
- Program officers
- Peers who have been funded in your competition of interest
- Consultants
- Abstracts of recent awards (funder awards databases)
- Review funded proposals, if available

RESOURCES FOR PROPOSAL DEVELOPMENT

- **PIVOT** – a FREE program offered to all Jefferson faculty to tailor funding opportunity searches to personal needs. https://research.jefferson.edu/resources/funding-opportunities.html

- The **National Organization for Research Development Professionals (NORDP)** maintains a Writing a Grant 101 page, which includes links to many useful guides, as well as a more general Resources page.

- The **Foundation Center** (now known as ***Candid***) provides a Proposal Writing Short Course tutorial, focused on foundation and private grants.

- The **NSF** Proposal and Award Policy and Procedures Guide is indispensable, particularly Part I, the Grant Proposal Guide.

- The **NIH Office of Extramural Research** (OER) offers guidance for Writing the Application and the **NIAID** offers excellent application samples.

HANOVER ALERTS

Hanover Research is excited to share news of the recently released HR Digital Grants Portal, allowing members to securely access tools and assets that our Grants team has developed and maintains outside of custom work, as a "value-added" part of the Hanover partnership.

GRANT ALERTS & PROJECTIONS

Members can view the latest programmatic and research funding opportunities for higher education, as well as a searchable archive of previous opportunities in the Grant Alerts Dashboard.

GRANTS CALENDARS

MONTHLY

Under the Calendars section of the Portal, members can access funding calendars from the past year, including opportunities for Minority-Serving Institutions, Arts and Humanities, STEM Programming, STEM Research, Health Research, and Early Career Faculty.

GRANTS WEBINARS

Under the Webinars section of the Portal, members can access our previous funding webinar recordings to help grow grantsmanship skills and insights.

CLOSING POLL

QUESTIONS

HANOVER RESEARCH

Thank you.

CONTACT

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hanoverresearch.com