Research Development & Grant Writing News

Volume 9, Issue 2: October 15, 2018

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About the co-publishers

MIKE CRONAN, PE (Texas 063512, inactive) has 23 years of experience developing and writing successful team proposals at Texas A&M University. He was named a **Texas A&M University System *Regents Fellow*** (2001-2010) for developing and writing A&M System-wide grants funded at over $100 million by NSF and other funding agencies. He developed and directed two research development and grant writing offices, one for Texas A&M's VPR and the other for the Texas A&M Engineering Experiment Station (15 research divisions state-wide), including the Texas A&M College of Engineering.

LUCY DECKARD (BS/MS Materials) worked in research development and grant writing at Texas A&M University and across the A&M System for nine years. She directed A&M's *New Faculty Research Initiative (2004-09)*, helping junior faculty System-wide jumpstart their research careers with federal agency funding. She served as associate director of two research development and grant writing offices. She founded **ARFS** in 2010.

About the Editor

KATHERINE E. KELLY, Ph.D., is a retired English professor from Texas A&M University. She is the author of several books and numerous articles and served as a contributing editor for an academic journal for five years. She provides **editorial services** to *RD&GW News* and to ARFS clients on proposals, journal articles, and manuscripts.

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Big Changes in the NSF BIO Directorate

By Lucy Deckard, co-publisher

There have been numerous administrative and organizational changes at NSF, and a lot of recent changes have been in the Biological Sciences Directorate (BIO). If you're planning to pursue funding from BIO, it's critical that you keep track of these changes. Below is an overview of biggest changes in BIO over the last year or so.

No Deadlines for Core Programs: Following the example of several divisions in the Engineering Directorate, BIO is eliminating deadlines for full proposals to core programs in the Divisions of Environmental Biology (DEB), Integrated Organismal Systems (IOS), the Division of Molecular and Cellular Biosciences (MCB), and to the programs in the Research Resources Cluster of the Division of Biological Infrastructure (DBI). This means that proposals can be submitted at any time, and reviews will be conducted on a rolling basis. You can find answers to FAQs related to this change, with follow-up FAQs here.

No Preliminary Proposals: Related to the elimination of deadlines, the IOS and DEB divisions in BIO have also eliminated the preliminary proposal stage for core programs (MCB never implemented preliminary proposals). The preliminary proposal process was an experiment. NSF reports that, while the process did reduce time spent on writing full proposals, having only one deadline per year and an increased workload for NSF and other logistical concerns were considerable drawbacks.

Some (non-core) programs still have deadlines: The include IOS' Enabling Discovery through Genomic Tools (EDGE); Ecology and Evolution of Infectious Diseases (EEID), DEB's Dimensions of Biodiversity, Postdoctoral Fellowship in Biology, as well as Research Coordination Networks – Undergraduate Biology Education (RCN-UBE).

Rules of Life (ROL) Track: BIO has introduced a new "Rules of Life Track" to support proposals that integrate across the scales in biological sciences, e.g., from the population, species, community and ecosystem scales to organismal, cellular and molecular scales. Since these kinds of proposals don't fit neatly in one BIO division, the new track provides review and funding mechanisms outside the usual constraints that require a project to fit neatly within one core program. However, ROL proposals must be submitted to a specific BIO Division. Understanding the Rules of Life is one of NSF's 10 Big Ideas for Future Investments. You can find recent awards made in support of this initiative here.

Limits on BIO Proposal Submissions:. Because there is no longer a deadline, BIO needs to prevent PIs from churning proposals—submitting one proposal after the other—thereby greatly increasing proposal pressure while reducing proposal quality. To prevent this, each BIO core program, except for some in DBI, have placed a limit of *one proposal per year* that an individual may submit *as either PI or co-PI*. BIO also allows one submission per year as PI or co-PI to the Rules of Life track. This new policy has resulted in a great deal of consternation among the research community. Many researchers point out that, since the policy applies both to PI and

co-PI roles, it discourages collaboration. NSF's answer to this is that collaborations are encouraged through the Rules of Life Track. Stay tuned – this policy may still be adjusted. See the FAQ on this policy here.

URoL: Epigenetics: Also in support of the Understanding the Rules of Life initiative, the Understanding the Rules of Life (URoL): Epigenetics Program is an NSF-wide program to support projects that integrate perspectives and research approaches from more than one research discipline (e.g., biology, chemistry, computer science, engineering, geology, mathematics, physics, social and behavioral sciences). This program, which has two tracks (Track 1 for projects up to $500K and Track 2 for projects up to $3M) does have a deadline; the next deadline is February 1, 2019.

Understanding the Rules of Life: Building a Synthetic Cell *(An Ideas Lab Activity)*: This solicitation announces an Ideas Lab opportunity focused on innovative research projects aimed at designing, fabricating, and validating synthetic cells that express specified phenotypes. Ideas Labs bring together a diverse, interdisciplinary group of researchers to develop innovative ideas. Each participant applies as an individual and commits to participate in the 5-day process. Projects results from this process can then be the basis for full proposals to NSF. See the solicitation for details.

Realigned DBI Programs: DBI has released two new solicitations: Infrastructure Capacity for Biology: Core Programs and Infrastructure Innovation for Biological Research. As described above, these programs have no deadlines. These programs replace: Advances in Biological Informatics; Collections in Support of Biological Research; Improvements in Facilities, Communications and Equipment at Biological Field Stations and Marine Laboratories; and Instrument Development for Biological Research.

More Resources:
MCB Investigator- Initiated Research Changes (MCBBLOG)
MCB Investigator-initiated research projects
DEB Core Programs
IOS Core Programs
Update on DBI Research Resources Solicitations

Defining the Future in Research and Innovation

By Mike Cronan, co-publisher
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The September 12 NSF Dear Colleague Letter: *Seeking Community Input for Topic Ideas for Emerging Frontiers in Research and Innovation* (EFRI) *Program* invites the research community to submit suggestions by October 31 for **Topic Ideas** to be considered for the FY 2020 Emerging Frontiers in Research and Innovation (EFRI) Program. This solicitation warrants serious consideration for several reasons: you may already have a Topic Idea in mind, or you may be discussing possible Topic Ideas, or, equally importantly, you see in the NSF Topic Idea process a model to be *used by research offices for creating a strategic plan for research and proposal development services and for an institutional road map to increase federal agency funding*.

In this context it is good to keep in mind Lewis Carroll's oft quoted observation "*If you don't know where you are going, any road will get you there*." This NSF process will not only help you better understand your unique institutional advantages and strengths vis-à-vis achieving funding success at NSF but also it will increase the likelihood that your research objectives are better aligned with NSF's 2020 and following funding allocations, something you might think of as the "sweet spot" of the research

The purpose of the EFRI Program is to identify, evaluate, recommend, and fund interdisciplinary initiatives at the emerging frontiers of engineering research and innovation. The goal is to engage the engineering community in new research directions that will play a significant goal in advancing a recognized national or societal need, or grand challenge. The EFRI Program is directed by the Office of Emerging Frontiers and Multidisciplinary Activities (EFMA) in the Directorate for Engineering.

Similar to mission objectives at DARPA and ARPA-E, *EFRI invests in high-risk multidisciplinary opportunities with high-potential payoff*. Its role is to support research areas that would not fit within the scope of an existing program. As noted by NSF, "These frontier ideas cannot be pursued by one researcher or within one field of expertise. They are *frontier* because they not only push the limits of knowledge of one field, but are actually at the convergence of multiple fields. The EFRI funding process is designed to both inspire and enable a group of researchers with diverse technical expertise to work together on a single frontier idea."

Similarly, NSF's **Got an idea for science and engineering research? Send it to the NSF 2026 Idea Machine** is accepting entries through October 26 for its "first-ever NSF 2026 Idea Machine, a competition that gives entrants a chance to help inform the agenda for basic research, through the Nation's 250th anniversary in 2026 and beyond." For this program, NSF is looking for "*fresh ideas -- large in scope and different from what the foundation already does*. These ideas should address compelling challenges in science, technology, engineering and mathematics (STEM)." See What is the NSF 2026 Idea Machine?

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Moreover, NSF is not alone in looking at engaging the research community to define future directions of research and innovation. NIFA Listens: Investing in Science to Transform Lives: A Stakeholder Input Opportunity is accepting input from stakeholders regarding research, extension, and education priorities in food and agriculture. A series of four in-person listening sessions hosted in different regions across the country and submission of written comments will offer two ways to share your thoughts and ideas. Stakeholder input received from both methods will be treated equally (NIFA Listens Fact Sheet).

As noted by NIFA, "A series of four in-person listening sessions hosted in different regions across the country and submission of written comments will offer two ways to share your thoughts and ideas. Stakeholder input received from both methods will be treated equally. This 2018 listening opportunity allows stakeholders to provide feedback on the following questions:

- ***When considering all of agriculture, what is the greatest challenge that should be addressed through NIFA's research, education, and extension programs?***
- ***In your field, what is the most-needed breakthrough in science/technology that would advance your agricultural enterprise? Breakthroughs result in transformative changes in knowledge, technology, or behavior.***
- ***What is your top priority in food and agricultural research, extension, or education that NIFA should address***?

NIFA wants to hear from you about priorities and opportunities in agricultural sciences. This will help inform NIFA on prioritizing science emphasis areas, identifying gaps in programming, and determining which programs are redundant or underperforming. Along with input from NIFA employees, your feedback gathered throughout the initiative will be used, in the context of NIFA's current science emphasis areas, to identify gaps in current portfolios and potential investment opportunities."

The bottom line here for research offices, regardless of your level of engagement in determining future research funding directions in partnership with funding agencies, is that ***change is on the horizon***, not just at NSF but other federal funding agencies as well, and new directions in research and innovation will come out of these stakeholder engagement processes and will be the focus of future funding solicitations. ***It will be important to have a strategy to track these changes and the resulting solicitations closely*** so that the faculty with whom you work can benefit from a timely heads up about what the funding landscape will look like in the coming years, ***particularly the research areas that will be given priority funding in upcoming agency budgets in 2020 and beyond***.

Other Types of NSF Proposals

By Mike Cronan, co-publisher
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In addition to standard research proposals that follow the proposal preparation instructions provided by NSF in its funding solicitations and program announcements, other types of proposals may be submitted to NSF under the guidelines of the Proposal & Award Policies & Procedures Guide (PAPPG), January 2018. Some of these are described below. *These funding mechanisms represent important information that research offices can communicate to faculty*, particularly new and more junior faculty trying to define the scope and scale of their funding universe.

The funding opportunities **summarized** and described below in the 181-page PAPPG are often unknown to most faculty, particularly opportunities such as these, buried deeply in this important document. This lack of awareness is akin to faculty having only a tenuous understanding of the possibilities and process for submitting unsolicited proposals to NSF, or of how the NSF Core Programs differ from specific program announcements, e.g., the Dear Colleague Letter: Announcing a Core Program within the Division of Computing and Communication Foundations or the Dear Colleague Letter: Transforming the CMMI Advanced Manufacturing Core Programs to Revitalize the Nation's Strategic Industries. *The bottom line here is that the funding universe is often much more expansive than faculty realize* and potential opportunities beyond what is posted to Grants.gov often exist "out of sight and out of mind," not only at NSF but at NIH and other research agencies as well.

"Rapid Response Research (RAPID) Proposal

RAPID is a type of proposal used in **conditions of severe urgency** with regard to the availability of, or access to, data, facilities or specialized equipment, including quick-response research on natural or anthropogenic disasters and similar unanticipated events. **PI(s) must contact the NSF Program Officer(s)** whose expertise is most germane to the proposal topic before submitting a RAPID proposal. This will facilitate determining whether the proposed work is appropriate for RAPID funding. (see **Dear Colleague Letter: NSF ENG, GEO, and SBE Directorates Accepting Proposals for Research Related to the 2018 Hurricane Season**)

The Project Description is expected to be **brief and must be no more than five pages**. It must include clear statements describing **why** the proposed research is of an urgent nature and **why** RAPID is the most appropriate type of proposal for supporting the proposed work. Note this proposal preparation instruction *deviates from the standard proposal preparation instructions contained in this Guide*; RAPID proposals must otherwise comply with the proposal preparation requirements specified in **Part I of the PAPPG**.

Internal merit review is the sole requirement for RAPID proposals. Under rare circumstances, Program Officers may elect to obtain external reviews to inform their decision. If external review is to be obtained, then the PI will be informed in the interest of maintaining the transparency of the review and recommendation process. The two standard NSB-approved merit review criteria will apply (Intellectual Merit and Broader Impacts). **Requests may be for up to $200K and up to one year in duration**."

"EArly-concept Grants for Exploratory Research (EAGER) Proposal

EAGER is a type of **proposal used to support exploratory work in its <u>early stages</u> on untested, but potentially transformative, research ideas or approaches**. This work may be considered especially 'high risk-high payoff' in the sense that it, for example, **involves radically different approaches, applies new expertise, or engages novel disciplinary or interdisciplinary perspectives**. These exploratory proposals also may be submitted directly to an NSF program, but the EAGER proposal type should not be used for projects that are appropriate for submission as 'regular' (i.e., non-EAGER) NSF proposals.

PI(s) must contact the NSF Program Officer(s) whose expertise is most germane to the proposal topic prior to submission of an EAGER proposal. This will aid in determining the appropriateness of the work for consideration under the EAGER proposal type; this suitability must be assessed early in the process

The Project Description is expected to be brief and must be no more than eight pages. It must include clear statements as to why this project is appropriate for EAGER funding, **including why it does not fit into existing programs and why it is a good fit for EAGER**. Note this **proposal preparation instruction deviates from the standard proposal preparation instructions contained in this Guide**; EAGER proposals must otherwise be compliant with the proposal preparation requirements specified in Part I of the PAPPG.

Only internal merit review is required for EAGER proposals. Under rare circumstances, Program Officers may elect to obtain external reviews to inform their decision. If external review is to be obtained, then the PI will be informed in the interest of maintaining the transparency of the review and recommendation process. The two standard NSB-approved merit review criteria will apply. **Requests may be for up to $300K and up to two years in duration**."

"[Dear Colleague Letter: Enabling Early-Stage Secure and Trustworthy Cyberspace (SaTC) Socio-Technical Interdisciplinary Collaborations](#)

The National Science Foundation's (NSF) Secure and Trustworthy Cyberspace (SaTC) program aims to promote research on the fundamentals of security and privacy as a multidisciplinary subject that will lead to new ways to design, build, and operate cyber systems, protect existing infrastructure, and motivate and educate individuals about cybersecurity. **With this DCL, NSF is announcing its intention to encourage the submission of EArly-Concept Grants for Exploratory Research (EAGER) proposals that foster excellent interdisciplinary research in the SaTC domain** to be carried out in early-stage collaborations between one or more Computer and Information Science and Engineering (CISE) researchers and one or more Social, Behavioral, and Economic Sciences (SBE) researchers. Note that this DCL is focused on collaborations of principal investigators (PIs) who have not previously jointly received a SaTC award.

Many scientific and practical challenges of security, privacy, and trust have sociotechnical dimensions, making it important to encourage interdisciplinary collaborations among researchers from the disciplines represented in NSF's CISE and SBE directorates on topics that draw on the strengths of each researcher. Some of these topics are suggested in the most recent SaTC program solicitation ([NSF 18-572](#)), but other topics relevant to the SaTC program are also welcome.

NSF anticipates funding up to 10 EAGER awards pursuant to this DCL, subject to the availability of funds and quality of proposals received. Proposals in response to this DCL are due December 12, 2018"

"Research Advanced by Interdisciplinary Science and Engineering (RAISE) Proposal
       RAISE is a type of proposal that may be used to **support bold, interdisciplinary proj**ects whose:

- Scientific advances lie in great part outside the scope of a single program or discipline, such that substantial funding support from more than one program or discipline is necessary.
- Lines of research promise transformational advances.
- Prospective discoveries reside at the interfaces of disciplinary boundaries that may not be recognized through traditional review or co-review.

       To receive funding as a RAISE-appropriate project, **all three criteria must be met**. RAISE is not intended to be used for projects that can be accommodated within other types of proposals or that continue well established practices. ***Prospective PIs must receive approval to submit a proposal from at least two NSF Program Officers***, in intellectually distinct programs, whose expertise is most germane to the proposal topics. **Contingent on Program Officers' <u>approval</u> to submit a proposal**: RAISE proposals must be compliant with Part I of the PAPPG unless a deviation from the standard proposal preparation instructions is indicated below.

- NSF **will not accept collaborative RAISE proposals** for a single project submitted separately from multiple organizations. A multi-organization RAISE project must be submitted as a single proposal requesting a single award with subawards administered by the lead organization.
- Email documentation from at least two NSF Program Officers confirming approval to submit a proposal must be uploaded under 'RAISE – Program Officer Concurrence Emails' in the Supplementary Documentation section of FastLane.
- **Requests may be for up to $1,000,000 and up to five years in duration**. The award size and duration will be consistent with the project scope.
- **The proposal must explicitly address how the project is better suited for RAISE than for a regular NSF review process**.
- **Only internal merit review is required for RAISE proposals.** Program Officers may elect to obtain external reviews to inform their decision. If external review is to be obtained, then the PI will be informed in the interest of maintaining the transparency of the review and recommendation process.
- The two standard NSB-approved merit review criteria will apply. The interdisciplinary and transformative potential of the project will be evaluated within the intellectual merit of the proposal.
- On the basis of the review criteria, the **cognizant Program Officers will decide whether to recommend a RAISE proposal** for co-funding from their programs."

Faculty considering submission of proposals under the foregoing mechanism **must discuss the project with the appropriate NSF program officer**. In preparation for that discussion, it

would be wise to read the abstracts of recently funded RAPID, EAGER or RAISE proposals by searching the NSF awards database using the keyword search terms *RAPID, EAGE*R or *RAISE* under **active** awards.

Planning Proposals in Data Science for Undergraduates

By Mike Cronan, co-publisher

The NSF-supported 108-page study by the National Academies of Sciences, Engineering, and Medicine (*Data Science for Undergraduates Opportunities and Options*, 2018; free pdf download here) sets forth a vision for the ***emerging discipline of data science at the undergraduate level***. This new report emphasizes core underlying principles, intellectual content, and pedagogical issues specific to data science, including core concepts that distinguish it from neighboring disciplines. It focuses on the undergraduate level but also addresses related issues at the ***middle and high school levels, as well as community colleges, as appropriate***.

The relevance of this report to faculty and research offices is underscored by the fact that it was ***funded under an NSF award from four separate directorates.*** In addition, it should be understood in the light of **NSF's Big Data initiatives** and the data science underpinnings of NSF's 10-Big Ideas, particularly Harnessing the Data Revolution. This revolution seeks to engage NSF's research community in the pursuit of fundamental research in ***data science*** and engineering, the development of a cohesive, federated, ***national-scale approach to research data infrastructure, and the development of a 21st-century data-capable workforce.*** (See the related article, *NIH'S Strategic Plan for Data Science,* in this issue.)

The **bottom line here** is that ***a significant number of proposals across all NSF directorates, as well as other federal agencies, will have a data science component for either research, or education, or both***. For research offices and faculty alike, this means that data science research and applications, as well as data science training at the undergraduate level, will be ***required components across a spectrum of funding opportunities at NSF and other federal agencies***.

If there is one thing you can count on at NSF it is that the new frontiers in engineering and science research funded by that agency ***will include a diverse, inclusive, and highly trained STEM workforce of the future***. Faculty and research offices that use this report to further inform proposals that relate, even tangentially, to Big Data and Data Analytics will have **a competitive advantage if their research narrative is informed by this report** and how it best maps to the funding goals and objectives of the funding agency. This is true of specific research in the field as well as applications of the field to other disciplines from smart grids, to precision agriculture, to the brain, to vector borne diseases, to genomics, to cryogenic electron microscopy. (Also see NSF Joint DMS/NLM Initiative on Generalizable Data Science Methods for Biomedical Research (DMS/NLM))

Moreover, as NIH notes in the recently released Strategic Plan for Data Science, "Advances in storage, communications, and processing have led to ***new research methods and tools that were simply not possible just a decade ago***." Heretofore, the development of undergraduate and graduate-level programs, curricula, and training in data science have not aligned well across colleges and universities; instead, they have often addressed the field in a scattershot approach. This has resulted, in siloed activities often initiated under funding solicitations from multiple federal agencies that were themselves unaligned and under internal

program offices that were themselves unaligned and without a shared strategy for developing Big Data and Data Science training programs. That is clearly changing now, particularly with this current report on data science for undergraduates funded by NSF and the related strategic plan for data science at NIH.

An example here is taken from the NIH data science plan that notes, "The finalized plan now recognizes the *importance of mathematics* when advancing biomedical science and references the National Science Foundation's (NSF) Division of Mathematical Sciences/National Institute of General Medical Sciences' Mathematical Biology Program *as a model for the promotion of research at the intersection of these two fields*." This quote *clearly indicates where convergence research and education are going in the coming years among federal research agencies*, particularly NIH and NSF, and can serve as a roadmap as well to university research offices that will play a major role in this new model for research and training at the intersection of multiple disciplines and fields.

As noted in the report, "As our economy, society, and daily life become increasingly dependent on data, *work across nearly all fields is becoming more data driven, affecting both the jobs that are available and the skills that are required*. The study committee considered the core principles and skills undergraduates should learn and discussed the pedagogical issues that must be addressed *to build effective data science education programs.* This report underscores the *importance of preparing undergraduates for a data-enabled world and recommends that academic institutions and other stakeholders take steps to meet the evolving data science needs of students*." A brief summary of those recommendations is offered below (emphasis added):

"In Chapter 2 of the report, the committee considers *what data science professionals will need to know*. Because expectations and tasks for data scientists will vary across industries and over time, it is important to consider the skill sets, learning outcomes, and ethical considerations *best suited for individual undergraduate students to be successful in their future careers*.

"In Chapter 3, the committee lays the groundwork for *exploring how these data science students can be educated and thus well prepared*. Using data from existing data science education programs, the committee discusses the *successes and challenges associated with implementing and delivering 2- and 4-year undergraduate programs and classes*, alternative courses, and interdisciplinary approaches in an effort to guide individual institutions to follow the *pathways that <u>simultaneously align with their missions</u> and meet the varied needs of the field of data science*.

"In Chapter 4, the committee describes a number of *challenges that arise in creating a new data science program*. Acknowledging that the field of data science and the content of data science education will continue to change rapidly, the committee considers how to evolve from current to future data science education and practice.

"In Chapter 5, the committee evaluates strategies to refine educational and administrative infrastructure, create professional development opportunities, and utilize professional societies."

Finally, t**his report will have a significant long-term impact on research offices that support faculty in proposal development because of the dramatic increase in federal agency funding for Big Data and Data Science across all disciplines and fields**. These funding

opportunities may focus on research that advances the fields of Big Data and Data Science, advances the applications of Big Data and Data Science for solving major scientific and technical challenges, or that promotes the education and training at all degree levels of a future workforce in these areas, or these opportunities may result in large center proposals that combine all these areas under one major funding umbrella. Regardless of the configuration, some version of these initiatives will be presented to research offices in the form of faculty proposals for which research offices will be asked to provide multiple kinds of assistance.

Following are linked resources in this topic area:

Data Science for Undergraduates: Opportunities and Options
Project Scope, Committee Membership, and Meeting Information

WATCH REPORT RELEASE WEBINAR

5/2/18 - Data Science for Undergraduates: Opportunities and Options - Webinar Recording
During this webinar, study co-chairs Laura Haas and Alfred Hero discuss the report's findings and recommendations, followed by a question and answer session with webinar participants.

WATCH PAST WEBINARS

4/2/17 – Envisioning Data Science: Overview of the Study - Webinar Recording
During this webinar, committee members discuss the study's plans and solicited input on directions and topics the study should examine.

9/12/17 – Building Data Acumen - Webinar Recording, Slides
During this webinar, invited speakers discuss key components that should be included in data science curriculum, how best to teach students to make good judgments about data, and how data acumen can be evaluated.
Host: Tom Ewing, Virginia Tech
Nicole Lazar, University of Georgia
Mladen Vouk, North Carolina State University

9/19/17 – Incorporating Real-World Applications - Webinar Recording, Slides
During this webinar, invited speakers discuss how partnerships between industry and educational programs could be encouraged, whether a focus on real problems could attract a more diverse cadre of data science students, and how to help students gain access to real-world data sets.
Host: Tom Ewing, Virginia Tech
Cláudio T. Silva, New York University
Sears Merritt, Mass Mutual Financial Group
9/26/17 – Faculty Training and Curriculum Development - Webinar Recording, Slides
During this webinar, invited speakers discuss the types of faculty training that would benefit data science, how to encourage faculty development in data science, and how to build data

science programs with the flexibility needed to respond to changes in the field and encourage diverse participation.

Host: Nicholas Horton, Amherst College

Michael Posner: Villanova University

Robert Panoff, Shodor

10/3/17 – Communication Skills and Teamwork - Webinar Recording, Slides
During this webinar, invited speakers discuss how to foster communication and teamwork in data science programs and how multidisciplinary teams can serve as effective models for the real world.

Host: Lee Rainie, Pew Research

Madeleine Claire Elish, Data & Society

Adam Hughes, Pew Research

10/10/17 – Inter-Departmental Collaboration and Institutional Organization - Webinar Recording, Slides
During this webinar, invited speakers discuss best practices for fostering collaboration between departments, opportunities for new data science education initiatives, and how to restructure organizations to encourage data science collaboration.

Host: Tom Ewing, Virginia Tech

Mark Embree, Virginia Tech

Michael Franklin, University of Chicago

10/17/17 – Ethics -Webinar Recording, Slides
During this webinar, invited speakers will discuss how ethical considerations can best be incorporated throughout data science curricula and how students can be taught to make ethical decisions throughout the problem-solving process.

Host: Lee Rainie, Pew Research

Sorin Matei, Purdue University

Brittany Fiore-Gartland, University of Washington

10/24/17 – Assessment and Evaluation for Data Science Programs - Webinar Recording, Slides
During this webinar, invited speakers discuss existing evaluation processes, best practices for assessing data science programs, and whether standard evaluation approaches can be adopted across programs.

Host: Louis Gross, University of Tennessee, Knoxville

Pamela Bishop, University of Tennessee, Knoxville

Kari Jordan, Data Carpentry

11/7/17 – Diversity, Inclusion, and Increasing Participation - Webinar Recording, Slides
During this webinar, invited speakers discuss how to broaden participation, diversity, and inclusion in data science programs and strategies for recruiting and retaining diverse data science students.

Host: Nicholas Horton, Amherst College

Talithia Williams, Harvey Mudd College
Allison Master, University of Washington

11/14/17 – Two-Year Colleges and Institutional Partnerships - Webinar Recording, Slides
During this webinar, invited speakers discussed how to facilitate partnerships between 2-year and 4-year institutions and what aspects of data science are appropriate and feasible to develop at 2-year institutions.
Host: Laura Haas, University of Massachusetts, Amherst
Brian Kotz, Montgomery College
Suzanne Smith, Johnson County Community College

PLANNING MEETING
On December 12-13, 2016, the study committee held a meeting to discuss plans for the study and upcoming workshops. Participants discussed the state of current undergraduate data science education and brainstormed ways to improve the data science education pipeline. Agenda and Presentations

WORKSHOP
On May 2-3, 2017, the study committee organized a workshop to discuss key themes relevant to envisioning the future of data science. Participants discussed data science skills and knowledge, education delivery, and broad participation.

NIH's Strategic Plan for Data Science

By Mike Cronan, co-publisher

The National Institutes of Health (NIH) Office of Science Policy recently released its new 31-page Strategic Plan for Data Science. The report notes, "According to a 2016 survey, data scientists across a wide array of fields said they *spend about 80 percent of their work time doing what they least like to do*: *collecting existing datasets and organizing data*. That leaves less than 20 percent of their time for creative tasks like mining data for patterns that lead to new research discoveries." Moreover, NIH notes, "Advances in storage, communications, and processing have led to new research methods and tools that were simply not possible just a decade ago." (Also see NSF Joint DMS/NLM Initiative on Generalizable Data Science Methods for Biomedical Research (DMS/NLM))

This strategic plan for data science offers important information to research offices that support faculty in the planning, developing, and writing of proposals. For example, faculty often ask for support from research offices in the writing of the Data Management Plan, not just for NIH but across other agencies as well, including NSF, USDA/NIFA, DOE, etc. The requirements for the Data Management Plan vary across agency, by program area within an agency, by program size, etc., but regardless, common denominators exist across all Data Management Plans across all research agencies. For example, NIH Sharing Policies and Related Guidance on NIH-Funded Research Resources reflects some of the common characteristics of such plans. The **bottom line here** is that the NIH's strategic discussion of plans for data science will largely define the data science environment for researchers over the coming decade.

The strategic plan cites the revolutionary advances in microscope, detectors, algorithms, cryogenic electron microscopy (cryoEM) as "one of the areas of science (along with astronomy, collider data, and genomics) **that have entered the Big Data arena**, pushing hardware and software requirements to unprecedented levels. Current cryoEM detector systems are fast enough to collect movies instead of single integrated images, and users now typically acquire up to 2,000 movies in a single day. As is the case with astronomy, collider physics, and genomics, *scientists using cryoEM generate several terabytes of data per day*."

To account for the rapidly increasing supply of data spread across a broad number of researchers in a variety of formats, the NIH strategic plan for data science "*seeks to mobilize advancements in storage, communication, and processing using tools*—such as artificial intelligence, machine learning, and deep learning—that can revolutionize the way in which data is stored and maintained. Furthermore, the NIH recognizes the importance of developing robust information security approaches to preserve public trust and patient protection." This strategic plan offers the research community *further insight into the NIH's future priorities and needs in data creation and maintenance*.

The overarching principle put forward in this science data plan is "that data should be **Findable, Accessible, Interoperable, and Reusable** (FAIR). NIH has outlined five specific goals for its strategic plan, with objectives and a progress evaluation method under each goal:

1. Support a Highly Efficient and Effective Biomedical Research Data Infrastructure

    1-1. *Optimize Data Storage and Security*

1-2. *Connect NIH Data Systems*

2. Promote Modernization of the Data-Resources Ecosystem

      2-1. *Modernize the Data Repository Ecosystem*

      2-2. *Support the Storage and Sharing of Individual Datasets*

      2-3. *Leverage Ongoing Initiatives to Better Integrate Clinical and Observational Data into Biomedical Data Science*

3. Support the Development and Dissemination of Advanced Data Management, Analytics, and Visualization Tools

      3-1. *Support Useful, Generalizable, and Accessible Tools and Workflows*

      3-2. *Broaden Utility, Usability, and Accessibility of Specialized Tools*

      3-3. *Improve Discovery and Cataloging Resources*

4. Enhance Workforce Development for Biomedical Data Science

      4-1. *Enhance the NIH Data-Science Workforce*

      4-2. *Expand the National Research Workforce*

      4-3. *Engage a Broader Community*

5. Enact Appropriate Policies to Promote Stewardship and Sustainability

      5-1. *Develop Policies for a FAIR Data Ecosystem*

      5-2. *Enhance Stewardship*"

In the data science plan, NIH lists its ***implementation tactics under each objective in further detail***. Several of the tactics under "Enhance Workforce Development for Biomedical Data Science" may be of interest to the research community. Relevant provisions include the following:

- The NIH states that the NSF is at the "forefront of supporting disciplines that contribute to data science," and that it intends to work with the NSF on joint initiatives related to the training and education of researchers at different stages of their careers.
- To train its internal workforce, the ***NIH will recruit data scientists and others from industry and academia for one- to three-year sabbaticals for "NIH Data Fellows,"*** who will be embedded in a range of high-profile, transformative projects like the Cancer Moonshot, the *All of Us* Research Program, and the Brain Research through Advancing Innovative Neurotechnologies Initiative to provide expertise not internally available."

The finalized plan now recognizes the ***importance of mathematics*** when advancing biomedical science and references the National Science Foundation's (NSF) Division of Mathematical Sciences/National Institute of General Medical Sciences' Mathematical Biology Program as a model for the promotion of research at the intersection of these two fields. This Strategic Plan for Data Science was "created in response to specific challenges identified by the NIH:

- The growing cost of data management could diminish the NIH's ability to enable scientists to generate data for understanding biology and improving health.
- The current data-resource ecosystem tends to be 'siloed,' and is not optimally integrated or interconnected.
- Important datasets exist in many different formats and are often not easily shareable, findable, or interoperable.

- The NIH has historically often supported data resources using funding approaches designed for research projects, which has resulted in a misalignment of objectives and review expectations.
- Funding for tool development and data resources has become entangled, making it difficult for one to independently assess the utility of each and optimize value and efficiency.
- No general system currently exists to transform innovative algorithms and tools created by academic scientists into enterprise-ready resources that meet industry standards of ease of use and efficiency of operation."

Finally, keep this report in mind the next time *you are asked to advise, review and comment on the Data Management Plan* for a researcher you are assisting on a proposal to NIH or any other federal research agency.

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Don't Let Your Proposal Wear a Disguise on Halloween

Represented from series of seven articles
By **Mike Cronan**, co-publisher

There are many scary costumes your proposal might wear on Halloween, but it is best to forego the annual disguising festivities, not just on Halloween but on any day of the year. Otherwise, you might *inadvertently* disguise the identity of the great research idea put forward in your proposal, resulting in more tricks than treats when it comes to the success of your grant. Of course, the premise here *assumes that a <u>fundable idea</u> lies cloaked beneath a number of <u>correctable</u> grant writing mistakes* identified sufficiently before the due date to allow for their correction. Unlike Halloween, when scary costumes earn treats, program officers and reviewers will not reward ideas cloaked in ghoulish disguises. This is a particularly important point to make to new faculty who may just be planning their research career at the time Halloween comes around. *Research offices can assist them to make sure they don't send off their first proposal to a funding agency wearing an inappropriate costume*.

Unfortunately, a number of all too common scary costumes can so successfully *disguise a potentially fundable idea that the significance of the idea becomes unrecognizable to reviewers*. To avoid spooking reviewers, not just for proposals due this October 31, but every due date of the coming year, don't submit your proposal cloaked or masked, or wearing one of the more common scary costumes guaranteed to horrify reviewers and program officers alike. There are many *examples of all too common proposal disguises that will lead to a declined proposal, as detailed below*. In this regard, keep in mind former Deputy Director of NIH William Raub's comment: "*There is no grantsmanship that will turn a bad idea into a good one, but there are many ways to disguise a good idea*." **So don't disguise your great ideas with the following masks, costumes, or disguises.**

The Oblivious Mask Trio

Three common disguises worn by many proposals are *The Oblivious Mask Trio*, coming in three versions, but typically together, and unlike the movie *¡Three Amigos!* with Steve Martin, Chevy Chase, and Martin Short, providing **no amusement to reviewers whatsoever**: (1) The Oblivious Mask for the *Tentative Grasp of the Program Guidelines*, (2) The Oblivious Mask for the *Tenuous Grasp of the Review Criteria*, and (3) The Oblivious Mask for the *Feeble Grasp of the Agency Mission*. A proposal wearing **mask 1** may have several outcomes, none good. The most extreme of these is to find your proposal returned without review, but more often, it will just receive a poor review and be assigned a "do not fund" recommendation. Surprisingly, the failure of both new and more experienced investigators to carefully **read** and **reread** and **reread** and follow the program solicitation guidelines is one of the more common causes of a negatively reviewed proposal. In some cases, it comes from the mistaken belief that an RFP need not be read carefully because research agencies always fund good ideas. This belief unfortunately abbreviates the more accurate statement that research agencies fund good ideas that *advance the agency mission or research priorities* in the *specific ways defined in the solicitation guidelines*. Good ideas untethered to the research realities of the funding agency

mission have little chance of success. A proposal wearing **mask 2** will clearly not be able to incorporate responses in the research narrative that address the review criteria in a convincing way. Wearing mask 2 is somewhat like attempting to play a competitive game without understanding what does or does not constitute points or a winning score. A proposal wearing **mask 3** will prevent you from writing a persuasive research narrative that convinces the agency that your research advances its mission in a significant way, either at the project or program level, or, in some cases, at the level of strategic research priorities, and brings value-added benefits to the agency mission or the field. Regardless, it is difficult to make a compelling case for the relevance and value-added benefits of your research to the agency mission or research priorities if you understand little or nothing about the mission, culture, and funding priorities of the agency itself, or about the role the agency plays in advancing national research priorities.

The Wishful Thinking Mask: Blurred Distinction between Basic and Applied Research

Too often in the search for research funding, the applicant makes an unrealistic assessment of whether the research proposed is truly fundamental research, e.g., to NSF, NIH, DOE, or DARPA, or amounts to applied research inappropriate for a basic research agency, or to basic research programs in mission agencies that fund both basic and applied. This critical distinction requires a very candid self-assessment prior to developing and writing a proposal to avoid the mistake of submitting an applied research proposal to a basic research agency. You must ask and answer the specific question: "*At this particular agency, will my research be characterized as basic or applied*?" Moreover, it can be a more challenging distinction to make on research solicitations that do not clearly spell out specific research objectives that assist the potential applicant in addressing key research questions or testable hypotheses. If you don't know whether or not your research is appropriately basic for a specific agency, discuss it with a program officer or seek help from a senior colleague well funded at the agency, or experienced as one of its reviewers. *You need to get this distinction right*.

The Comedy of Errors in Grammar, Usage, and Syntax Mask

While mistaken identity, puns, and word play are charming in Shakespeare's play *The Comedy of Errors*, reviewers will not find them amusing in a research narrative. Inadvertent or careless errors in grammar, usage, and syntax might momentarily bemuse reviewers, or worse, *provide them with comic relief*. They will also suggest to them that you are likely to tolerate errors in your research. Moreover, it is not the job of reviewers to reconstruct your true meaning out of a linguistic jumble of poorly structured sentences, jarring and disorderly syntax, and related grammatical errors. If it is possible for a proposal phoenix to rise out of the linguistic ashes of a poorly written research narrative, it will be as a consequence of the author's recognition and correction of such problems. Authors can learn to recognize such writing errors themselves or they can seek the services of a colleague, research development professional, or editor who can help them *make the proposal professionally presentable, i.e., free of errors.* While reviewers are not likely grammarians, they are likely successful authors of funded proposals, hence good writers, and the gold standard for successful proposals is nothing short of perfection, or as close to it as possible.

The Poor Writing Disguise

Poorly written proposals appear shrouded in a fog that ***introduces ambiguity and hence uncertainty*** into the reviewers' understanding and evaluation of the project research description. ***Ambiguity in grant writing is always punished!*** Poor writing robs the research narrative of clarity, precision, and the persuasiveness needed to convince reviewers to recommend funding. A narrative fog leaves the reviewers unable to see where the narrative argument is going or where it has been. Poor writing offers readers a meandering journey through a blurred landscape without clear waypoints or clear substance, significance, or focus. As H.L. Menken once observed, badly written sentences appear "***like an army of words marching across the page in search of an idea***."

The Cloak of Ambiguity

Cloaking devices worked well when first introduced on the *Klingon Bird of Prey*, but they are definitely not for use in a research narrative. ***The cloak of ambiguity will unfortunately obscure the purpose and methods of an otherwise potentially powerful proposal.*** Ambiguity in the research narrative looms like a dense fog. Reviewers and program officers alike will balk at having to navigate a research narrative befogged by poor or careless writing or both, or by an author's inability or unwillingness to make the key narrative distinctions that would clarify the research vision, goals, objectives, rationale, and outcomes. Ambiguity in the narrative imposes upon reviewers and program officers in many ways, ***particularly in asking them to decide what the author actually meant***. Most reviewers will not have the time, inclination, or patience for this task, and rightfully so, given that it would be difficult to recommend for funding an idea shrouded in ambiguity. Ambiguity in the narrative implies there is ambiguity in the research goals themselves, as well as in how the goals will be achieved. ***Agencies want to know clearly what they are funding and do not want to guess at it***.

The Boiler Plate Costume

Truly frightening proposals emerge when authors view them as nothing more than generic boilerplate text easily transplanted from an old proposal to a new one with a few minor adjustments. Moreover, there is no more horrifying boiler plate than narrative text ***gathered from the websites*** of research team members, an astonishingly common practice. Attempts to find "***spare parts for proposals***" salvaged from prior efforts that now populate the "grant writing cloud" and other so-called "proposal databases" are ill advised (See *Do Not Build Your Proposal Out of Spare Parts, October 2011).*

A successful proposal grows from the seed of a compelling and exciting <u>new</u> research idea. Recycling is great for environmental sustainability but it has no place in grant writing! Every required proposal component that evolves from your new idea must do so in an internally integrated manner that adds a logical synthesis, and hence strength, to the core research idea. Attempts to transplant a modified research narrative from an existing proposal into a new proposal will significantly weaken the overall proposal (see *NSF's Perp Walk for Plagiarism* in the June 2015 issue). Writing a successful project narrative requires many thoughtful iterations of each proposal section that reveal to the reader the relational symmetry of one section to another. ***The well-written and convincing research narrative must clearly evolve to reflect and serve the needs of your specific research vision and the performance metrics required for your success.*** Using so-called boiler plate text in a research narrative will

likely elicit the same response in reviewers as attempting to pass counterfeit $100 bills to a Secret Service agent.

So it is important to beware the notion that a new proposal can be a largely borrowed or heavily modeled statement based upon other proposals, or a tattered template shared "in the grant writing cloud." ***There are not enough immunosuppressant grant-writing techniques available to disguise such "borrowing" from the astute reviewer***, particularly given that the good program officer and reviewer will function as the immune system of a proposal under consideration. If they detect a transplanted research narrative, they should, and most likely will, reject it.

The Mystery Novel Disguise

Many reviewers may in fact enjoy relaxing with a glass of wine and a well-crafted mystery novel, but it is best to leave the crafting of mystery novels to the practitioners of that genre. It is not a good idea to model your proposal after a mystery novel. Asking reviewers and program officers to play the role of "research detective" charged not with determining "who done it?" but with determining "what research is being proposed here?" will likely come to no good end. Reviewers will not be charmed by a proposal forcing them to play the role of, say, Tony Hillerman's Lieutenant Joe Leaphorn or Walter Mosley's Easy Rawlins in order to determine what research you are going to do and why it is significant to the funding agency mission and the disciplinary field. So-called "page turners" are a good thing for the success of a mystery novel but not for the success of a proposal. If reviewers must frantically turn pages to figure out what you propose to do, they will become quickly exasperated rather than intrigued at having to guess at what proposed research might be finally revealed at the end. Get right down to the point in your first paragraph.

The Research Topic 101 Mask

Just as proposals are not mystery novels, neither are they journal articles or textbooks. While a discussion of the research topic's background may be warranted to set the stage for the reviewers to understand the significance and context of your research, avoid the mask of writing a long and meandering narrative tour of the general research topic better suited to an introductory textbook 101 on the topic than to technical reviewers. The background information on the topic must be carefully adjusted to the level of topic expertise the reviewers bring to the review process. For this reason, it is important to understand the review process used by specific funding agencies, particularly how reviewers are selected and assigned. For example, NSF recommends describing the technical topic at a level that might be used in a *Scientific American* article, or for what NSF has described as the "***scientifically literate***" reader. Moreover, keep the background discussion tightly focused on what is relevant to your proposed research and avoid the temptation to go beyond that. While time intervals may be central to your research, you need not provide background information on the ammonia maser built in 1949 by NIST as the first proof of an atomic clock.

At many points in the development and writing of a proposal only a preliminary idea exists of what will be proposed. In those situations, it is comforting to begin writing text in hopes that this will "self-ignite" and coalesce into a compelling narrative. Unfortunately, however, this can lead to developing several pages of an overly general introductory narrative

unable succinctly to inform the reviewers how your research advances the field in some significant way. Moreover, once written, some authors have great difficulty deleting large blocks of text that have lost their relevance to the research narrative as it has matured through multiple drafts. This becomes a particular danger on single-PI proposals without the benefit of a reading by multiple team members. In either case, a thorough "editorial scrub" of the research narrative by an unsentimental editor can help keep the narrative from becoming a "long and winding road," something fine in a Beatles song but not in a proposal.

The Black Hole Disguise

A narrative black hole exists when an author becomes convinced that the page limit and font format guidelines in the solicitation are insufficient to explain the proposed idea. This becomes apparent when an author comes to the ***dubious conclusion that a proposal narrative improves as the font is reduced to the smallest permissible*** size and all white space is squeezed out of every page to allow more elaboration. In some cases, narrative authors may even try an end run around the font size requirements by placing what is essentially narrative text in graphs, figures, illustrations and tables where smaller fonts are often permissible. Unfortunately, the text eventually becomes so dense that the narrative collapses upon itself and becomes impenetrable to the reviewer. In effect, a too-dense narrative text becomes a laborious read for the reviewers, who will likely balk at the idea of a forced march through dense text imposed on them by an author either unable or unwilling to write a clear and readable research narrative. As Mark Twain once commented in a letter to a friend, "If I had more time I would have written you a shorter letter." This makes an excellent point. Increasing the density of text and format to the maximum permissible in hopes of including more information that gives your research narrative a competitive advantage is the iron pyrite or "fool's gold" of grant writing. ***The goal of a research narrative is to communicate the significance of your research to reviewers, not merely to perform an informational data dump***.

The Stove-Pipe Disguise

A proposal narrative disguised as a series of research silos is certain to leave reviewers confused as to the research value lying beneath the stove-pipe costume. Narrative contributions from multiple authors increase the complexity of proposals. Attempts to introduce what are essentially research strangers as research partners with a history of collaboration only after a funding opportunity is identified will be a hard sell to reviewers. Research integration and programmatic synthesis are two key characteristics of competitive proposals. Strategies to ensure the integration of multiple research strands, as well as any other required programmatic components, must begin very early in the proposal process (see *Planning for Narrative Synergy* in this issue). If a research narrative with multiple strands develops over several draft iterations and still remains more like multiple proposals rather than an integrated whole, then it becomes increasingly difficult to correct the narrative without major revisions. Proposals with multiple research and/or educational strands gain significant advantage by adopting early on a proposal narrative integration plan that will demonstrate a clear research synergy. Solipsistic narrative sections are not rewarded in the review process. ***Synergy is the Yellow Brick Road of the successful research narrative. Think synergy not silos!***

The Recycled Proposal Mask

Recycling discarded, broken, failed, or unused items is great for the environment but not so good for declined proposals. Like most recycled materials, old proposals are best left at curbside to be removed for chemical or mechanical processing, or more specifically in the case of a research narrative, substantive rethinking. Unlike the Phoenix, a mythical sacred firebird, a declined proposal rarely will have the ability to be reborn from its own ashes. A recycled proposal submitted in an attempt to do so will be quickly "unmasked" by program officers and reviewers for the truth that lies beneath it—a PI unwilling, unable, or too disorganized to rethink and restructure a research narrative in a way that remolds it into an essentially new proposal. This is not an easy task, but it is a necessary one. ***Proposals have a very specific home within a very specific time frame, not a generic home within an open-ended time frame***.

Shopping declined proposals around to multiple agencies is something akin to (pick your analogy) a snipe hunt, wild goose chase, or fool's errand. ***Proposals are not fungible across agencies, within agencies, or even within programmatic areas within agencies, nor are proposals fungible over time.*** All proposals enjoy fifteen minutes of fame, as Marshall McLuhan might have observed, during the period when reviewers are making the decision to recommend or not recommend funding. However, when a proposal is declined, a resubmit is many months if not a year away in most cases. It is time to begin anew given that a declined proposal, while perhaps not a lemon, certainly had some serious problems that needed fixing. Don't try to pass it off "as is" like a used car with mechanical or electrical problems to some other unsuspecting buyer, i.e., some other funding agency.

The Silo Disguise

When an invitation to a "proposal party" arrives in the form of a solicitation wherein research and/or education integration is explicitly addressed as a key factor in the evaluation of the proposal, or research integration across multiple disciplines is implicit in the research objectives and outcomes of interest to the sponsor, don't show up disguised as research silos or stovepipes. One common and often fatal mistake in writing a proposal that must demonstrate synergy and value-added benefits to multiple research strands is to compose the narrative sections as separate research articles loosely addressing a common research theme without close coordination or integration among principal investigators.

Given the dramatic increase in research funding over the past several years to support research that explores and illuminates the boundaries, interstices, and intersections of multidisciplinary environments in search of new discoveries, it is critical for successful authors to both recognize and avoid siloed sections and ***learn the more difficult skill of writing integrated research narratives***. If the multiple authors of the multiple research sections of a transdisciplinary proposal cannot demonstrate and clearly describe how the intersections of "disciplinary catalysts" accelerate the research discovery process in the research narrative, then programs officers and reviewers will be unlikely to fund the proposal, trusting that the required research integration might magically happen in practice.

The "Trust Me" Mask

The "trust me" mask is typically worn by a very vague proposal narrative containing a lot of reminiscence of past accomplishments and accompanied by long descriptive narrative

sections that read like a textbook, but with only a fuzzy hypothesis and few specifics about what is actually being proposed and its significance. The subtext of the "trust me" proposal is "***just give me the money and great research will happen***." It often reads like a daisy chain of effusive superlatives, but lacks any grounding in specificity and detail. Reading a "trust me" proposal will put you in mind, here again, of H. L. Mencken's comment about "an army of words marching across the page in search of an idea." In other instances, the "trust me" proposal may present a grandiose idea embellished with vague claims of significance. Ultimately, however, the "trust me" proposal, to quote Macbeth's famous soliloquy, "***is a tale told by an idiot, full of sound and fury, signifying nothing***." The "trust me" proposal is the research equivalent of a politician promising "*free beer and wide roads.*" It is simply not believable.

Wearing an NIH Costume to an NSF Costume Party

Perhaps imposter Frank Abagnale, Jr., played in the movie *Catch Me If You Can* by Leonardo DiCaprio, might pull off this disguise successfully, but in most cases it is best not to attempt to wear an NIH costume to an NSF costume party. Some major alterations will be in order. For example, if your NIH costume identifies you as a biochemist able to significantly accelerate the "bench to bedside" benefits of your research in order to impact a specific human disease, you might want to consider wearing a new costume for the NSF party. In this case, your new, ***NSF-appropriate costume*** might better focus on how you will advance the frontiers of biological knowledge, increase our understanding of complex biological systems, and provide a theoretical basis for original research in many other scientific disciplines. ***Unfortunately, wearing the wrong research costume to the wrong agency costume party is a fairly common "fashion faux pas"*** not limited to researchers attempting to expand their funding opportunities by moving beyond NIH and including NSF as a potential funder of their research. This faux pas is quickly recognized and noted by reviewers.

The Claiming Rather than Explaining Mask

In grant writing it is always better to explain than to claim***. Adjectives and superlatives do not have the power to confer legitimacy on your ideas, nor do they communicate anything more than unsubstantiated opinions.*** While your intent may be to use adjectives and superlatives to add a compelling "glitter" to the significance of your research narrative, the most likely result is that they will act more like chaff, annoying or distracting reviewers, much like chaff acts as a countermeasure to confuse radar systems. If something is novel, innovative, unique, or compelling about your research, then demonstrate that with the specificity and detail required to prove it. Claiming that your research is novel, innovative, unique, and compelling without proving it by substantive statements and well supported examples is nothing more than wishful thinking, somewhat analogous to the sixteenth-century English proverb "*If wishes were horses, beggars would ride.*" In the case of a research narrative, it is better to heed Benjamin Franklin's observation: "***Industry need not wish.***" The significance of your ideas should not need the adornment of "linguistic bling" in the form of gushing superlatives. A clear and simple statement directed to reviewers and program officers describing the significance of your idea ***with concise details and specificity will suffice***.

I Love Being in the Weeds Mask

To ensure that reviewers use your proposal as a sleeping aide, overwhelm them with a blizzard of technical minutia achieving the density of a black hole. Take them ever deeper into the disciplinary weeds, page after painful page, extinguishing their hope of finding even a glimmer of significance. Reviewers asked to slog through a seemingly endless series of arcane minutiae will quickly rebel against the numbingly repetitive experience, as desperately as TV meteorologist Phil Connors (Bill Murray) in *Groundhog Day* tries to escape the endlessly repeated series of trivial events. It can be easier to write page after page of familiar technical detail than to write a more disciplined research narrative representing a clear and simple description convincing reviewers of the significance of your research and its likelihood to advance the field in some way. Use technical detail *judiciously to help prove your case rather than disguise it*.

In some cases, the initial writing of technical detail can help you psychologically "jump start" the proposal narrative so you at least have the illusion of words on the page rather than a blank page. Ultimately, however, technical data dumps are nothing more than listings of technical capacities, expertise, and details *without any guiding intelligence* that explains the relational connections among the details and the resultant significance or importance to an agency mission. Excessive technical minutiae in a research narrative unlinked to research relevance forces reviewers into the position of the National Security Agency that gathers massive amounts of global communications but then must mine the "raw data" for relevant information demonstrating a pattern of significance to the agency. Don't expect reviewers to do that job for you. Use the appropriate amount of technical detail to support your arguments, but never assume that "raw" technical details alone will make the funding case for you.

The All Hat and No Cattle Disguise

Putting forth grandiose ideas grounded on generalities rather than specifics is a fairly common failing of many proposals. Grand visions, overly ambitious plans, and unfocused ideas cobbled to unbridled enthusiasm will not impress reviewers. While effusive epiphanies may have their place on your back deck with a bottle of wine at sunset, they are most often, thankfully, ephemeral, and should not find their way into a proposal narrative.

The No-Value-Added Mask

While economists have long argued the merits of a value-added tax (VAT), there is no such debate over the importance of describing the value-added benefits of your research when it comes to writing a successful proposal (see *Make Your Case for Value-Added Benefits* in the August 15 2015 issue). Describing the value-added benefits of your research—to an agency mission, to a scientific field, and in response to the program objectives defined in a solicitation—is a fundamental requirement for competitiveness across all agencies and foundations, regardless of your academic discipline. Surprisingly, such a description is often overlooked or stated unclearly in the project description on many proposals.

Sometimes PIs neglect such a description because they simply have not thought sufficiently about how the proposed research fits into the overall context of an agency's mission priorities, or considered how the proposed research meets the overall goals and objectives of a specific solicitation. At other times, unfortunately, the PI may be proposing

research that does not offer sufficient value-added benefits to warrant funding. Funding agencies support research that advances the disciplinary field in some clear and significant way, or advances the agency's mission-critical objectives in a clear way and significant way.

The key words here linked to value-added benefits are "clear," "significant" and "advances." The benefits that need to be described in the project narrative represent a "unit of change" that advances the current state of knowledge in a field or discipline and moves it forward in some significant way. The intertwining of value-added benefits and significance needs to be described clearly and succinctly in any research narrative if you hope to capture the interest of program officers and reviewers.

Moreover, the exact nature of the value-added benefits your research offers the funding agency is not a trivial consideration. To address it in the most compelling way requires an understanding of the agency mission objectives at multiple scales—from the level of the agency to a specific solicitation. It also needs your keen assessment of how well your research maps to the agency mission objectives and how it does so in the context of the current state of knowledge in the field. Your ability to capture these multiple contexts and weave a compelling narrative statement describing how your proposed research brings value-added benefits to the funding agency will be a key factor in the success of your proposal.

The Overly Ambitious Disguise

While it is common during presidential election years to hear politicians promise the equivalent of "*free beer and wide roads*" on every conceivable political topic of potential interest to voters, it is not a good strategy when it comes to crafting a research narrative that you hope will impress program officers and reviewers sufficiently for them to recommend funding. They are a critical audience with sufficient experience to distinguish between what you hope to do and what you can realistically accomplish given the constraints on your time, resources, and expertise.

The overly ambitious project description is a fairly common reason for denying funding to proposals, particularly those submitted by more junior investigators whose earnest enthusiasm may charm reviewers but finally requires them to recommend against funding, with perhaps the suggestion to resubmit a more realistic proposal in the next grant cycle. The education and outreach component of an NSF CAREER proposal, for example, often tempts new investigators to overreach, while others may overreach in the proposal research plan.

In any proposal, however, getting this balance right is critical. If you submit a proposal in which the research narrative seems to suffer from inflationary promises that are out of balance with your budget, current and pending support, resources, expertise, and teaching obligations, among other constraints, you will likely not be funded. Be realistic in what you can and cannot accomplish within the constraints that set your operational boundaries, and then reflect that in your project narrative. ***Reviewers don't fund promises; they fund promises they are convinced can be kept***.

The Solipsist Disguise

While solipsism is largely dismissed as a frivolous philosophical notion best left to late night discussions in bars bordering college campuses, it does, nonetheless, occasionally manifest itself in proposal narratives. Like its philosophical counterpart, the solipsistic project

description is self-absorbed and apparently oblivious to the external reality of an audience, i.e., program officers and reviewers, that will pass judgment on the proposal.

The PIs of self-absorbed project narratives typically make several fatal mistakes, all in some way related to an inability to place their ideas in the proper context, specifically, advancing the research and mission-critical objectives of the funding agency. These narrative flaws include ignoring or attempting to circumvent the mission objectives of the sponsoring agency in the mistaken belief that the PI's ideas are so important they should be funded whether or not they respond to the agency's research requirements; ignoring or appearing to be unaware or indifferent to the fact that successful project narratives are written with an audience in mind—program officers and reviewers, who must be convinced of the significance and value-added benefits to funding the proposed research; and ignoring the need to write a research narrative that is easily read, responsive to the specifics of the solicitation, and accessible to program officers and reviewers in making their funding decision. The bottom line here is that funding agencies are not interested in funding promotional "self portraits" of ideas only marginally relevant to the agency mission objectives.

The Slogan Mask

Passing slogans off as ideas may be sufficient for those running for political office, but it is a really bad idea for those writing a proposal. ***Slogans are not ideas***. In writing a project description, particularly for certain types of institutional grants where research and educational objectives are intertwined, such as at NSF, or where institutional transformation of some kind is the desired outcome, such as ADVANCE, project narratives often over rely on slogans or too heavily echo an agency phrases picked up from reports, presentations, and conferences.

While it is important to have a common language to describe common programmatic elements, that common language must be used judiciously and, most importantly, be grounded in the specific context of the institutional objectives that motivate the proposal. Making the claim, for example, that your research is transformational or your proposal integrates research and education in innovative ways amounts only to a slogan without substantive programmatic descriptions in the project narrative that outline the specifics and details to support such a claim. Some authors of what are often institutional proposals of one sort of another, as those mentioned above, or authors of educational components required of research proposals such as the NSF CAREER, make the mistake of sprinkling the narrative with key words and phrases used by the agency in multiple solicitations, reports, and presentations. This seems to be done under the mistaken belief that echoing the language used in agency vision statements can substitute for the hard work of grounding an agency's overarching vision or goals in the unique context of the particular institution or research or educational program.

While echoing back an agency's language or phrasing is important to demonstrate that you understand and are familiar with the agency's mission objectives as well as the specific solicitation to which you are responding, the real work, as is always the case in proposal writing, comes when you must move from the general vision to the specific program that will allow that vision to be achieved within your unique institutional context.

So slogans, terms, and phrases adopted by an agency to describe their overarching vision, such as the NSF terms *innovative, transformational, research and education integration*, and numerous others, lack substantive meaning until you define them with the specific details

of your research and/or educational objectives within your unique institutional or programmatic context. Until you perform that hard work, these terms are nothing more than agency vision slogans without substance. Throwing them back at program officers and reviewers without the specificity and detail that gives them substantive meaning will bring no value-added benefit to the agency and no reason to fund your proposal.

The "Why Should I Bother to Write a Budget Justification" Mask

It is wise to treat the budget justification section of the proposal as an opportunity to write a more competitive proposal rather than as an inconvenient boilerplate disconnected from the project description. Whether through inattention or disregard, a poorly written description of the budget justification unlinked to the research narrative risks missing an opportunity to give additional detail and specificity about the operational and management structure of the project, or other factors unique to your proposal.

At the core of a successful proposal must lie a good idea that reviewers judge to be significant, compelling, and meritorious for funding. But it is also the case that your success will depend upon convincing program officers and reviewers that you have the operational and management expertise to manage a research award wisely and successfully over several years or longer, particularly a major award that may involve multiple researchers, post docs, and graduate students, along with other possible program components aligned with the research objectives.

A funded award, after all, represents a major, strategic investment by a research agency in your capacity to perform. Of course, your case for funding is made in the project description in various sections, including in the management and operations sections. However, the budget justification section allows you additional space to explain the budget request at a level of detail that space constraints in the project description may prohibit. In this respect, the budget justification section serves as a functional bridge between the project narrative and the raw budget numbers. It is a place where narrative text and budget numbers may be joined to give reviewers a clearer and deeper understanding of the operational logic of your proposed research and how it will be accomplished using the sponsor's money.

While the format and content of the budget justification section will vary by agency, and often by program and program size within an agency, it is an another important factor in the success of your proposal (if it is a specified component of the solicitation) and, as such, should be approached by the proposal writing team to ensure that it will serve as an illuminating complement to the project description. After all, successful proposals are the sum of an accumulation of marginal advantages, as economists might describe it, whereby every required component of a proposal is brought as close to perfection as possible, recognizing that the aggregate of these factors cumulatively determines the outcome. Failing to give the budget justification section of a proposal the attention it deserves squanders an opportunity to gain further competitive advantage and hence a funded proposal.

The Freddy Krueger Mask

In the seemingly endless series of Freddy Krueger movies beginning with *Nightmare on Elm Street*, the victims all have recurring nightmares and die in their sleep. Program officers and reviewers might also welcome this fate when the "Freddy Krueger Proposal" is submitted to their agency for review with every indication that it has come to them by a circuitous route

of prior **serial rejections by other research agencies**. Some of the most egregious examples of horror stories recounted by program officers and reviewers include having to read proposals containing obvious artifacts of prior submittals, such as instances in which a project timeline or most of the research narrative has been clearly copied and pasted into the current proposal from a prior proposal, occasionally so hurriedly as to incorrectly identify the agency to which the "perennial proposal" is currently being submitted.

But even if the most obvious tell-tale signs of a recycled proposal are deleted from the most current resurrection, most reviewers and other readers will quickly recognize other "crime scene" evidence indicating that the proposal's author is attempting the grant-writing equivalent of "speed dating" funding agencies, perhaps using the same logic that people use in buying lottery tickets. It is fairly easy to recognize when a proposal does not respond to the specific solicitation to which it is being submitted, perhaps because the authors assume such a greatness in the proposed ideas that program officers and reviewers will not care, or eagerly overlook, the fact they are not relevant to the agency mission priorities. Or perhaps authors of recycled proposals assume that all research funding agencies and their programs are fungible, and so a proposal submitted in the past to one of the defense agencies can be tweaked a bit and submitted for an NSF CAREER award.

 Unfortunately, the Freddy Krueger Mask is scalable, as the PI's of large research proposals have likely learned. PI's should take note, if not actually horrified, when a potential research team member provides an "**off the shelf**" narrative contribution that has likely been inserted in many past efforts.

The Achilles Heel of recycled proposals is that they ignore the basics of successful grant writing; specifically, they forget that competitive proposals must contain competitive ideas that respond clearly to the funding agency's mission priorities or other research objectives defined in the solicitation. Recycled proposals are destined for rejection.   Before trying to recycle an old proposal for a new program, it would be wise to heed U.S. House Speaker Sam Rayburn's observation that "there is no education in the second kick of the mule." A recycled proposal is most likely to have suffered a series of "mule kicks" by reviewers in the past, and this should be taken to heart for future efforts.

Bottom line: if you are proposing new research ideas, express the significance of those new ideas, and all topic components of them, in newly-crafted writing for every word of the proposal narrative. Success in proposal writing will not be achieved using recycled parts — successful proposals are not renovations of the past but a creation for the future, together with the compelling arguments you make for the place and significance of your research ideas in that future.

The "I am a Researcher not a Wordsmith" Mask

Mark Twain once stated that he never trusted a person who could only spell a word one way. Unfortunately, Mark Twain will not be reviewing your proposal, but rather program officers and reviewers who may not be amused by errors in spelling, grammar, and punctuation, and the resultant ambiguities they create. When it comes to the mechanics of writing a research proposal, it is prudent to assume a level of perfection in grammar, spelling, and usage equivalent to that of writing a computer program with zero tolerance for coding errors.

While one or perhaps two errors in a major proposal may be tolerated by reviewers, or escape notice, anything more than that will likely draw attention, and not of a positive kind. Reviewers will likely assume, and justifiably so, that sloppy errors in language and usage will translate into sloppy errors in research. Unfortunately, there is no equivalent concept in grant writing to the "Navaho rug flaw," whereby a purposeful imperfection is woven into a wool rug or blanket to allow evil spirits the opportunity to exit the design.

The last comment you want to read in your reviews is that the proposal was poorly written and contained numerous typos, or was in need of wordsmithing. Reviewers will occasionally comment on how well the research narrative was written, or how poorly it was written. But reviewers rarely recommend funding for poorly written proposals. Fortunately, errors of grammar, usage, and spelling are correctable by taking the time to closely proofread your narrative, or, better yet, by getting a fresh set of eyes on the proposal by an experienced editor.

The Unbalanced Disguise

Balance, proportion, and emphasis are key characteristics of a well-written proposal narrative. While the intentional absence or distortion of these characteristics makes for fanciful Halloween masks of ghoulish, frightening features, an unintentional neglect of these characteristics in the proposal narrative will have a similarly disturbing effect on program officers and reviewers. In the case of the ghoulish Halloween mask, the reward may well be a generous amount of candy. But the ghoulishly distorted proposal that knocks on an agency's door will likely leave empty handed.

Unfortunately, the rules for a well-proportioned and balanced project narrative are not as easily described as Euclid's golden triangle, where the ratio of 1.618033 was viewed as proportionally perfect. Of course, the ideal proportion in the project narrative is not something the early Greeks addressed, at least as far as we know, and so it is left to the proposal authors to make sure to appropriately balance the narrative's many sections.

How do proposal narratives become unbalanced or poorly proportioned? When a single author or a team of authors produces the first draft of a proposal, they will typically write most about what they know best. For example, first drafts often feature a disproportionately long background section that imbalances the narrative. Fortunately, creating the first draft of a proposal by following a template or narrative outline drawn from the solicitation and review criteria will reduce the likelihood of writing an imbalanced project narrative.

However, while a narrative template that outlines the required sections and subsections of any specific project description can reduce imbalance, it does not entirely prevent errors in assigning the weight given to particular sections of the proposal, even in cases where a well-crafted template imposes pages limits on sections, or where the solicitation itself imposes page limits on sections. Often, segments receiving the least space in a first draft may emerge as the core sections of the proposal narrative that are not only the most important but also the most challenging to write. These sections tend to relate to the research vision, synergy among project objectives, and the like, which lie at the core of the competitive submittal.

Balance, proportion, and emphasis in the project description need to be continuously monitored during the writing and internal review process with each thoughtful iteration of the narrative. It is not unusual that initial proposal drafts develop a significant amount of

imbalance. This needn't hamper the proposal's success as long as the authors recognize that each subsequent draft of the proposal requires a new rebalancing to account for the revised text.

For instance, authors commonly allow a draft narrative, particularly in the early stages of development, to run well over the page limit to ensure that they cast a broad "narrative net" over all of the ideas with a potential to contribute to the proposal's success. However, as the due date approaches, the process of honing, crafting, and tightening the narrative begins. This is the point at which close attention must be paid to achieving balance among sections of the proposal.

For example, if buffers are not important to the proposed research project, don't spend narrative time on buffers. Check to see whether or not the management plan is appropriate for the scale and scope of the project, or whether the narrative balance reflects the agency's weighting of review criteria, or whether the narrative overemphasizes less important questions asked in the solicitation and underemphasizes the most important questions, or whether the narrative description appears untethered from the budget requests.

Balance, proportion, and emphasis are key attributes of the well-written, and hence successful, proposal and need to reflect an internal hierarchy of ideas advanced in the narrative and the support requested in the budget to develop those ideas.

The "I Really Need this Grant" Mask

If you want to strike horror into the hearts of program officers and reviewers alike, then make a need-based arguments to a merit-based research agency. If need is a factor in the review of the proposal, it will be stated as such in the solicitation, e.g., in U.S. Department of Education solicitations, need is sometimes a weighted factor. Moreover, if other non-merit-based factors are part of the review process, then those will be stated in the solicitation as well. For example, in some cases, federal mission agencies look for a geographic distribution in making awards under a specific program. Absent a note in the program solicitation describing review factors other than those related to merit, don't disguise and overshadow a potentially fundable idea by focusing on need-based descriptions rather than the merit of your ideas.

While in some instances at certain funding agencies a compelling description of the need for the project is one review criterion, it is typically not a criterion at the major research funding agencies. Therefore, making need-based pleas in a proposal to a merit-based agency, such as NSF or NIH, arguing that rejecting your proposal amounts to callously shutting down the local orphanage, is not a wise strategy. These arguments are perhaps better directed to a foundation, particularly state or regional foundations, or federal agencies with programs that do account for need as a factor in competitiveness.

Moreover, without guidance from a university research office or members of a university community, some faculty or professional staff without sufficient experience in reading a solicitation closely, or an understanding of the mission and culture of a particular agency, may mistake a research proposal solicitation for an infrastructure support solicitation. This can often be exacerbated when reduced or flat budget appropriations force some university offices to adopt unrealistic expectations of finding grant funding to support personnel and administrative infrastructures. Or, this can happen when faculty with a history of internal support for various programmatic infrastructures are forced to look elsewhere for funding due

to budget cuts and fiscal redirections. In other cases, it may occur when faculty or professional staff in university offices with a history of funding from need-based agencies and foundations are looking for a new revenue stream to support expanded programs, or for those programs that are being defunded.

While this misinterpretation of a merit-based research agency's mission can be directed to many federal agencies, it is most often directed to the NSF. Taking what is essentially a need-based rather than a merit-based argument to NSF occurs fairly commonly, particularly in the domain of education, where researchers may lack familiarity with NSF's mission and culture .

Helping potential applicants clearly understand the distinction between need- and merit-based agencies or solicitations as early in the proposal development process as possible can save a significant amount of time and resources, not only for those writing the proposals but also for those who must advise, process, or submit those proposals.

Research Grant Writing Web Resources
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Department of Health and Human Services Strategic Plan 2018-2022

NIH-Wide Strategic Plan Fiscal Years 2016-2020

NIH Shares Videos To Inform and Educate
YouTube isn't just for funny cat videos. While that may go without saying, you might not be aware many NIH institutes, including NIAID, use the popular website to share videos to educate and inform viewers. For instance, we broadcast seminars, conferences, Advisory Council meetings, and other news events to keep our audience up to date, wherever they are and whenever they want to watch.
Here are some useful video resources from both NIH and NIAID:

- NIH Grants YouTube Channel (link is external)—Find short videos explaining the policies and procedures surrounding NIH grant application, review, and management processes.
- NIH Videocasting YouTube Channel (link is external)—Learn about the latest biomedical and health-related research. The channel broadcasts NIH Director's Wednesday Afternoon Lectures and Director's Seminars as well as different topic talks of Demystifying Medicine.
- NIH Center for Scientific Review YouTube Channel (link is external)—Get advice ahead of your next application to ensure success during peer review, including the series 8 Ways to Successfully Navigate NIH Peer Review.
- NIH Office of the Director YouTube Channel (link is external)—Watch interviews and coverage related to NIH-wide priorities and initiatives.
- National Library of Medicine YouTube Channel (link is external)—View training videos for PubMed (link is external) users, as well as archived footage relevant to scientific research.
- NIAID YouTube Channel (link is external)—See videos covering the research that NIAID supports, including scientific advances, disease information, clinical studies, and educational webinars.
- NIH Videocasting and Podcasting (link is external)—Watch council and committee meetings, including NIAID's Advisory Council and NIH's Advisory Committee to the Director.
- Dr. Anthony Fauci in the News—Find an index of presentations and media appearances from NIAID's director.

These channels are updated regularly. To receive email notifications about updates, click Subscribe within a given channel.

How To Demonstrate Scientific Progress in NIH Annual Reports
Most research projects do not move along in a linear fashion, steadily progressing until inevitably reaching a scientific breakthrough. So how do you describe scientific progress in your

annual Research Performance Progress Report (RPPR) (link is external) to demonstrate success and merit while the project is still ramping up?

What Program Officers Look For

A good first step is to know what your program officer is looking for. Program officers assess:

- Is progress satisfactory?
- Is there a change in the scope, goals, or objectives of the project?
- Is there a change in key personnel?
- Is there evidence of scientific overlap?
- Are there human subject issues or concerns?
- Are there animal welfare issues or concerns?
- Are there changes in the use of biohazards or select agents?
- Are there new or additional foreign components?
- If the award requires inclusion monitoring, is the enrollment date appropriate, on target, and updated in the Inclusion Management System?
- Were any products (link is external)pdf reported, such as publications, websites, technologies, inventions, or reagents?
- Is there compliance with sharing policies?
- If the award has special reporting requirements, was the information provided and acceptable?
- Is there an unobligated balance greater than 25 percent? Is the justification acceptable?
- Are there other issues that require action or documentation that must be resolved before issuing an award?

As you can see, many of these questions concern whether the project has changed since the award was made or when progress was previously reported. Therefore, detail any changes to your Research Plan in the RPPR. Keep in mind, you need our prior approval before making Changes to Project or Budget; do so by following the process laid out in our Prior Approvals for Post-Award Grant Actions SOP. If you requested approval before submitting the RPPR, refer to the previous correspondence.

List any changes in approach and reasons for the change. Describe any problems or delays and what actions you took or plan to take to resolve them. If there is an unobligated balance greater than 25 percent, provide a justification and be prepared to make a carryover request.

Your program officer will assess the progress, delays, and planned next steps you describe and compare that to your budget request and justification for approval. Providing sufficient information in the progress report avoids delays in your award.

Program officers will also verify compliance with sharing requirements (link is external), e.g., model organisms, public access policy, genomic data sharing; ClinicalTrials.gov registration and results reporting; and other policies for research with vertebrate animals, human subjects, biohazards, select agents, and foreign involvement.

Above all, program officers directly consider whether progress is satisfactory.

Completing the RPPR

Grantees can demonstrate progress when completing Section B—Accomplishments of the RPPR (see section 6.2 of the NIH and Other PHS Agency RPPR Instruction Guide (link is

external)pdf). List publications and other products in Section C–Products (see section 6.3 of the NIH and Other PHS Agency RPPR Instruction Guide).

First, you list the scientific goals of the project (for NIH these are your Specific Aims) and whether they have changed. Then list your accomplishments:

For this reporting period describe: 1) major activities, 2) specific objectives, 3) significant results, including major findings, developments, or conclusions (both positive and negative), and 4) key outcomes or other achievements. Include a discussion of stated goals not met. When your project is in its initial stages, this section will focus more on the activities you undertake, e.g., enrolling study participants, preparing reagents, or testing compounds *in vitro* before conducting animal studies. In future reports, the focus will shift to results and findings, e.g., showing whether variance among study interventions was statistically significant. Include data, graphs, and images to support your accomplishments section rather than relying solely on bullet-point text.

Remember, too, that NIH is placing increased emphasis on rigor and transparency, so you also need to describe how your research ensures reproducibility.

When you complete your annual RPPR, you should also address any special reporting requirements or deadlines listed in your Notice of Award. Many solicited grants include benchmarks or go/no-go criteria that must be met before NIAID will fund an award's next budget period. Look at your latest Notice of Award in the eRA Commons (link is external) to find any special reporting requirements.

In Conclusion

Take the reporting of scientific progress seriously, including any pitfalls and ways you plan to overcome them. Doing so will help keep your research on track and lay the groundwork for a future renewal application. And in some circumstances your program officer can work with you to overcome some of the obstacles. For additional help and resources, refer to NIAID's Research Performance Progress Report (RPPR) SOP.

Educational Grant Writing Web Resources
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RELs to Hold Two Sessions on Rural Education Needs at the National Rural Education Association convention

STEM Pathways: Do Men and Women Differ in Why They Enter and Exit?
To remedy the disparity between sexes in science, technology, engineering, and mathematics (STEM) fields, it is important to understand the factors critical to initiating and maintaining STEM interest. To this end, we created and administered a survey to almost 8,000 individuals in and outside of STEM fields. Our results shed light on the various factors that are critical for sparking STEM interest and persisting in STEM fields for each sex as well as the differences in movement in and out of STEM pathways for each. These results reveal that although there is no singular pathway into STEM fields, self-driven interest is a large factor in persistence, especially for males, and females rely more heavily on support from others.

Video: The Importance of Early Math Education

32 percent of regular, full-time public school teachers hold summer jobs outside of their teaching positions

REL Appalachia Webinar: Algebra for All: Focus on Visual Representations
This webinar will share research-based strategies that support all learners in preparing for algebra I, including English learner students and students who are struggling. Presenters will focus on the use of visual representations to support mathematics content learning and review mathematics tasks to demonstrate using visual representations to see algebraic relationships. Webinar presenters will highlight research throughout, including recommendations from Institute of Education Sciences (IES) practice guides.

IES Announces 12 Additional FY 2018 Awards Across 4 Competitions

Changes Are Coming to Research Competitions

Considerations for STEM Education from PreK Through Grade 3
This brief draws on research and development supported by the National Science Foundation to highlight important considerations about STEM educational experiences for young children and professional learning for educators who provide those experiences.

An Iterative Participatory Approach to Developing an Early Childhood Problem-based STEM Curriculum
This paper describes an iterative participatory curriculum design approach to developing a problem-based STEM curriculum for preschool children. The curriculum aims to teach young

children problem-solving using an adapted version of the engineering design process (EDP). Despite evidence showing that a rigorous, integrated STEM curriculum promotes cognitive development and curiosity, very little STEM or engineering instruction occurs in classrooms for three- to five-year-old children, and few studies include teachers in the curriculum design process. Research has shown that, when children experience an engineering curriculum, they show an increase in engagement, in the number of engineering behaviors displayed, and in persistence in completing activities. As well, when teachers are involved in designing curriculum, they are more likely to feel empowered and sustain implementation. Qualitative analysis of semi-structured interviews with 13 preschool teachers after the development process showed that teachers who participated in the process perceived increased knowledge and self-efficacy in teaching STEM in their classrooms. These reflections support using a participatory curriculum design approach for empowering teachers and enhancing self-efficacy in teaching STEM to young children. High teacher self-efficacy has been associated with positive classroom outcomes and teacher retention in the profession.

Coding and Computational Thinking in Early Childhood: The Impact of ScratchJr in Europe

In recent years, there has been an increased effort to introduce coding and computational thinking in early childhood education. In accordance with the international trend, programming has become an increasingly growing focus in European education. With over 9.5 million iOS downloads, ScratchJr is the most popular freely available introductory programming language for young children (ages 5-7). This paper provides an overview of ScratchJr, and the powerful ideas from computer science it is designed to teach. In addition, data analytics are presented to show trends of usage in Europe and and how it compares to the rest of the world. Data reveals that countries with robust computer science initiatives such as the UK and the Nordic countries have high usage of ScratchJr.

Exploring Moments of Agency for Girls During an Engineering Activity

The persistent underrepresentation of women in engineering continues to be a complex and difficult challenge. The interactions of young women and their parents during early, family-oriented engineering design experiences can provide girls with opportunities to express agency during an engineering activity, which can ultimately contribute to the development of sustained interest and self-efficacy in engineering. However, few studies have examined these parent-child interactions to date, and none have specifically focused on moments when girls express agency during an engineering design process. In this paper, we examine one such setting: a museum exhibit that engages visitors in engineering design activity. A qualitative content analysis was performed on transcripts from a total of 39 family groups videotaped at the exhibit, each involving a daughter between the ages of 5-12 and at least one parent. Qualitative codes describing the ways children expressed agency and led interactions with their parents included directing, proposing design ideas, and asking questions. Interestingly, the analysis also suggests that the young women in this study tended to direct their mothers more than their fathers. Although focused specifically on parent-child interactions, this study can inform both formal and informal engineering educators who engage young students in engineering activities.

Agency Research News
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Dear Colleague Letter: NSF ENG, GEO, and SBE Directorates Accepting Proposals for Research Related to the 2018 Hurricane Season

Through this Dear Colleague Letter (DCL), the Directorates for Engineering (ENG), Geosciences (GEO), and the Social, Behavioral and Economic Sciences (SBE) encourage the submission of proposals that address challenges related to Hurricane Florence, similar events that could occur in the coming weeks, and their aftermaths. These directorates support fundamental science and engineering research projects whose results enable families, communities, businesses, institutions, and governments to better prepare for, respond to, and recover from future catastrophic events. With this DCL, NSF seeks to support research on new science and engineering questions posed by such natural disasters, primarily those that require immediate, time-sensitive data collection and other research activities to advance basic science.

The ENG, GEO, and SBE directorates invite proposals to support time-sensitive research seeking to address the challenges related to Hurricane Florence and any other hurricanes that might occur in the United States prior to October 31, 2018. Rapid Response Research (RAPID) proposals may be submitted to conduct new research related to these hurricanes. Although NSF accepts RAPID proposals at any time, Hurricane Florence-related RAPID awards proposals must be submitted by 5:00 p.m. submitter's local time on October 15, 2018.

Submission Guidelines: The RAPID funding mechanism supports projects for which there is an urgent need for data, facilities, or specialized equipment that can be utilized for quick-response research about natural disasters. RAPID proposal project descriptions are expected to be brief. They may not exceed five pages. Requests may be up to $200,000 and up to one year in duration. See the *NSF Proposal and Award Policies and Procedures Guide* (PAPPG) Chapter II.E.1 for instructions on preparation of a RAPID proposal. Proposals submitted pursuant to this DCL must designate the proposal as being related to this DCL by including "2018 Hurricane Season:" at the beginning of the proposal title.

To submit a RAPID request, *investigators must contact the ENG, GEO, or SBE Program Officer most closely related to the proposal topic before submitting* to determine if the proposed activities meet NSF's guidelines for these types of submissions or whether the proposed work is more suitable for submission as a regular research proposal. Proposals submitted pursuant to this DCL may request the use of NSF-funded advanced computing resources such as Blue Waters or Stampede2. In these cases, investigators must contact the NSF Office of Advanced Cyberinfrastructure (OAC) prior to submission of the proposal.

Research proposals relating to a better fundamental understanding of storms and their impacts (physical, biological and societal), human aspects of natural disasters (including first responders and the public), means of improving emergency response methods, and approaches that promise to reduce future damage also are welcome. NSF continues to support fundamental science and engineering research projects whose results on the topics listed above are not time-sensitive. Such proposals should be submitted to standing programs and competitions according to their established deadlines.

Dear Colleague Letter: Enabling Early-Stage Secure and Trustworthy Cyberspace (SaTC) Socio-Technical Interdisciplinary Collaborations

The National Science Foundation's (NSF) Secure and Trustworthy Cyberspace (SaTC) program aims to promote research on the fundamentals of security and privacy as a multidisciplinary subject that will lead to new ways to design, build, and operate cyber systems, protect existing infrastructure, and motivate and educate individuals about cybersecurity. With this DCL, NSF is announcing its intention to encourage the submission of EArly-Concept Grants for Exploratory Research (EAGER) proposals that foster excellent interdisciplinary research in the SaTC domain to be carried out in early-stage collaborations between one or more Computer and Information Science and Engineering (CISE) researchers and one or more Social, Behavioral, and Economic Sciences (SBE) researchers. Note that this DCL is focused on collaborations of principal investigators (PIs) who have not previously jointly received a SaTC award.

Many scientific and practical challenges of security, privacy, and trust have sociotechnical dimensions, making it important to encourage interdisciplinary collaborations among researchers from the disciplines represented in NSF's CISE and SBE directorates on topics that draw on the strengths of each researcher. Some of these topics are suggested in the most recent SaTC program solicitation (NSF 18-572), but other topics relevant to the SaTC program are also welcome.

NSF anticipates funding up to 10 EAGER awards pursuant to this DCL, subject to the availability of funds and quality of proposals received. Proposals in response to this DCL are due December 12, 2018

NOAA-NOS-OCM-2019-2005778 National Estuarine Research Reserve System (NERRS) Collaborative Science Program 2019

The purpose of this document is to advise the public that NOAA is soliciting applications to administer a 5-year, applied research program that supports collaborative research in the National Estuarine Research Reserve System (NERRS).

This funding opportunity will provide support for the grantee to develop and administer a comprehensive national program that funds extramural collaborative science projects to address the system-wide research and management needs of the National Estuarine Research Reserve System, while being responsive to local and regional reserve priorities and those of NOAA. The NERRS collaborative science program is intended to deliver highly credible and relevant information to the coastal management community by incorporating user input into the design and implementation of research projects and ensure that the outcomes support the needs of stakeholders. This program will also increase the capacity of the NERRS management, research, education, stewardship, and coastal training sectors to transfer information and skills to end-users and more effectively support coastal and estuarine resource management. A NERRS collaborative science program has been in existence for ten years, and this is the third competition for the five-year program.

This funding opportunity is intended to support the administration of the collaborative research program and is not intended to directly support individual research projects or short term activities focused on specific local coastal and estuarine issues. Eligible funding applicants are: non-federal institutions of higher education, other non-profits, state, local, Indian Tribal

Governments, and commercial organizations. Federal agencies and employees are not allowed to receive funds under this announcement but may serve as collaborators or project partners.

News Release: DHS S&T Reveals New Business Model and Organizational Structure
The Department of Homeland Security (DHS) Science and Technology Directorate (S&T) today begins a new approach to its research and development (R&D) mission with a new organizational structure that will improve its ability to more rapidly transition technology capabilities into operations and enable it to quickly respond to emerging threats.
"We no longer have the luxury of time to do traditional R&D, so we must change if we are to get ahead of threats cycles and keep pace with rapid innovation," said William N. Bryan, the Senior Official Performing the Duties of the Under Secretary for Science and Technology. "We are improving our R&D business practices to make it easier for industry, including the start-up community, to work with us."

The revitalized S&T structure enhances the focus on the needs of the DHS operational components and Homeland Security operators across all levels of government. S&T works across components and communities to learn their needs and challenges and includes its customers, partners and homeland security stakeholders in efforts to find and share solutions for making the nation safer.

The new structure enables the agency to be more agile and responsive, ready to move quickly to respond to changes in the threat environment, and to make use of existing technologies that can be adapted and leveraged to expedite the development of vital capabilities.

Another critical element of the new structure is the ability to more rapidly transfer capabilities to where they are most needed, working closely with S&T's component partners and industry to deliver effective solutions.

"We are engaging our DHS acquisition colleagues earlier in the R&D process to help pave the way for a successful transition of capabilities to our customers as well as to the homeland security marketplace," said Mr. Bryan. "Our emphasis is on clarity, transparency, and staying open to new ideas. Scientific and engineering excellence is at the core of everything we do."

At the core of the revitalization is the three-pronged operating model blueprint that focuses first on understanding customers' needs through strategic and transparent engagement, leveraging S&T's expertise in operational analysis and systems engineering to help customers refine their needs. Next, S&T applies a deliberate, team-based approach that leverages S&T's full range of capabilities, beginning with seeking out ready-made or easily adaptable solutions that can be delivered quickly and cost-effectively. And finally, efficient, transparent and accountable execution when a solution must be adapted or developed.
To accomplish this, S&T has reorganized into four primary offices that will work collaboratively.
- The Office of Mission & Capability Support will conduct the majority of program management in support of borders, immigration, maritime, first responders, detection capabilities, and physical and cyber security.
- The Office of Engineering & Science will include operations and requirements analysis, systems engineering, standards, technology scouting, test & evaluation, and transition.

- The Office of Innovation & Collaboration will focus on industry and international partnerships, and include such efforts as the Silicon Valley Innovation Program, Federally Funded Research & Development Centers, university programs and collaboration with national labs.
- The Office of Enterprise Services will include all of S&T's support functions such as administration, communications, finance and budget, and the chief information office.

The revitalization effort involved more than 90 S&T employees who analyzed business practices and operational processes, and engineered the new structure with input from across the entire Directorate.

Additional information about the new S&T organizational structure can be found on the About S&T page of the website.

Agency Reports, Workshops & Research Roadmaps
(Back to Page 1)

Future Water Priorities for the Nation Directions for the U.S. Geological Survey Water Mission Area (2018)

Solving problems related to use of water resources will be of paramount importance in coming decades as increasing pressure from growing populations, climate change, extreme weather, and aging water-related infrastructure threaten water availability and quality. The Water Mission Area (WMA) of the U.S. Geological Survey (USGS) has a long-established reputation for collecting and delivering high-quality, unbiased scientific information related to the nation's water resources. WMA observations help inform decisions ranging from rapid responses during emergencies such as hurricanes, floods, and forest fires, to the long-term management of water resources. Produced at the request of USGS, this report identifies the nation's highest-priority water science and resources challenges over the next 25 years. Future Water Priorities for the Nation summarizes WMA's current water science and research portfolio, and recommends strategic opportunities for WMA to more effectively address the most pressing challenges.

Recoverability as a First-Class Security Objective: Proceedings of a Workshop

The Forum on Cyber Resilience of the National Academies of Sciences, Engineering, and Medicine hosted the Workshop on Recoverability as a First-Class Security Objective on February 8, 2018, in Washington, D.C. The workshop featured presentations from several experts in industry, research, and government roles who spoke about the complex facets of recoverability—that is, the ability to restore normal operations and security in a system affected by software or hardware failure or a deliberate attack. This publication summarizes the presentations and discussions from the workshop.

Enhancing the Resilience of the Nation's Electricity System (2017)

Americans' safety, productivity, comfort, and convenience depend on the reliable supply of electric power. The electric power system is a complex "cyber-physical" system composed of a network of millions of components spread out across the continent. These components are owned, operated, and regulated by thousands of different entities. Power system operators work hard to assure safe and reliable service, but large outages occasionally happen. Given the nature of the system, there is simply no way that outages can be completely avoided, no matter how much time and money is devoted to such an effort. The system's reliability and resilience can be improved but never made perfect. Thus, system owners, operators, and regulators must prioritize their investments based on potential benefits. Enhancing the Resilience of the Nation's Electricity System focuses on identifying, developing, and implementing strategies to increase the power system's resilience in the face of events that can cause large-area, long-duration outages: blackouts that extend over multiple service areas and last several days or longer. Resilience is not just about lessening the likelihood that these outages will occur. It is also about limiting the scope and impact of outages when they do

occur, restoring power rapidly afterwards, and learning from these experiences to better deal with events in the future.

Assessing and Responding to the Growth of Computer Science Undergraduate Enrollments examines the increasing enrollments in undergraduate CS courses and majors, underlying drivers, and associated diversity implications, with recommendations about how best to respond.

Securing the Vote: Protecting American Democracy recommends steps that the federal government, state and local governments and election administrators can take to make elections more secure, accessible, reliable, and verifiable.

Opportunities from the Integration of Simulation and Data Science: Proceedings of a Workshop examines current and emerging science applications that span simulation and data-driven science, their characteristics, and future approaches for cyberinfrastructure to support them.

Assessing and Responding to the Growth of Computer Science Undergraduate Enrollments examines the increasing enrollments in undergraduate CS courses and majors, underlying drivers, and associated diversity implications, with recommendations about how best to respond.

Envisioning the Data Science Discipline: The Undergraduate Perspective: Interim Report offers perspectives on the state of undergraduate data science education and invites comments to inform the study's final report on future directions.

Foundational Cybersecurity Research: Improving Science, Engineering, and Institutions focuses on foundational research strategies and on building collaborative links across disciplines and between research and practice.

A 21st Century Cyber-Physical Systems Education describes the knowledge and skills required to engineer increasingly capable, adaptable, and trustworthy systems that integrate the cyber and physical worlds and recommends paths for creating the courses and programs needed to educate the engineering workforce that builds them.

Future Directions for NSF Advanced Computing Infrastructure to Support U.S. Science and Engineering in 2017-2020 makes recommendations aimed at achieving four broad goals: (1) positioning the United States for continued leadership in science and engineering, (2) ensuring that resources meet community needs, (3) aiding the scientific community in keeping up with the revolution in computing, and (4) sustaining the infrastructure for advanced computing.

How People Learn II: Learners, Contexts, and Cultures

There are many reasons to be curious about the way people learn, and the past several decades have seen an explosion of research that has important implications for individual learning, schooling, workforce training, and policy. In 2000, How People Learn: Brain, Mind, Experience, and School: Expanded Edition was published and its influence has been wide and deep. The report summarized insights on the nature of learning in school-aged children; described principles for the design of effective learning environments; and provided examples of how that could be implemented in the classroom. Since then, researchers have continued to investigate the nature of learning and have generated new findings related to the neurological processes involved in learning, individual and cultural variability related to learning, and educational technologies. In addition to expanding scientific understanding of the mechanisms of learning and how the brain adapts throughout the lifespan, there have been important discoveries about influences on learning, particularly sociocultural factors and the structure of learning environments. How People Learn II: Learners, Contexts, and Cultures provides a much-needed update incorporating insights gained from this research over the past decade. The book expands on the foundation laid out in the 2000 report and takes an in-depth look at the constellation of influences that affect individual learning. How People Learn II will become an indispensable resource to understand learning throughout the lifespan for educators of students and adults.

Improving Data Collection and Measurement of Complex Farms

America's farms and farmers are integral to the U.S. economy and, more broadly, to the nation's social and cultural fabric. A healthy agricultural sector helps ensure a safe and reliable food supply, improves energy security, and contributes to employment and economic development, traditionally in small towns and rural areas where farming serves as a nexus for related sectors from farm machinery manufacturing to food processing. The agricultural sector also plays a role in the nation's overall economic growth by providing crucial raw inputs for the production of a wide range of goods and services, including many that generate substantial export value.

If the agricultural sector is to be accurately understood and the policies that affect its functioning are to remain well informed, the statistical system's data collection programs must be periodically revisited to ensure they are keeping up with current realities. This report reviews current information and makes recommendations to the U.S. Department of Agriculture's (USDA's) National Agricultural Statistics Service (NASS) and Economic Research Service (ERS) to help identify effective methods for collecting data and reporting information about American agriculture, given increased complexity and other changes in farm business structure in recent decades.

New Funding Opportunities

Content Order
New Funding Posted Since September 15 Newsletter
URL Links to New & Open Funding Solicitations
Solicitations Remaining Open from Prior Issues of the Newsletter
Open Solicitations and BAAs

[User Note: URL links are active on date of publication, but if a URL link breaks or changes a Google search on the key words will typically take you to a working link. Also, entering a grant title and/or solicitation number in the Grants.gov search box will work as well.]

New Funding Solicitations Posted Since September 15 Newsletter

Long Term Research in Environmental Biology (LTREB)
The Long Term Research in Environmental Biology (LTREB) Program supports the generation of extended time series of data to address important questions in evolutionary biology, ecology, and ecosystem science. Research areas include, but are not limited to, the effects of natural selection or other evolutionary processes on populations, communities, or ecosystems; the effects of interspecific interactions that vary over time and space; population or community dynamics for organisms that have extended life spans and long turnover times; feedbacks between ecological and evolutionary processes; pools of materials such as nutrients in soils that turn over at intermediate to longer time scales; and external forcing functions such as climatic cycles that operate over long return intervals. **Proposals accepted at any time**.

NOAA-NWS-NWSPO-2019-2005754 Collaborative Science, Technology, and Applied Research (CSTAR) Program
Through the Collaborative Science, Technology, and Applied Research (CSTAR) Program, the NWS Office of Science and Technology Integration is soliciting proposals to conduct research and development activities. NOAA/NWS believes its warning and forecast mission will benefit significantly from a strong partnership with outside investigators in the broad academic community. The CSTAR Program represents a NWS effort to create a cost-effective transition from basic and applied research to operations and services through collaborative research between operational forecasters and academic institutions which have expertise in the environmental sciences. These activities will engage university researchers and students in applied research of interest to the operational meteorological community for the provision of improving the accuracy of forecasts and warnings of environmental hazards. This announcement is for research and development topics identified as priorities by the NWS to support field forecasting operations. There is one grant competition under this announcement valued at $700,000 for approximately four to seven new projects. NOAA's Office of Oceanic

and Atmospheric Research (OAR) has announced a Fiscal Year (FY) 2019 federal funding opportunity with eight separate grant competitions reflecting multiple science objectives. Please search for funding opportunity number NOAA-OAR-OWAQ-2019-2005820 in https://www.grants.gov to learn more about this NOAA/OAR funding announcement. **Due December 14.**

Big Data Regional Innovation Hubs

NSF's Directorate for Computer and Information Science and Engineering (CISE) initiated the National Network of Big Data Regional Innovation Hubs (BD Hubs) program in FY 2015 (NSF 15-562). Four Big Data Hubs (BD Hubs)—*Midwest*, *Northeast*, *South,* and *West*—were established, one in each of the four Census Regions of the United States[1]. The BD Hubs provide the ability to engage local or regional stakeholders, e.g., city, county, and state governments, local industry and non-profits, and regional academic institutions, in big data research, and permit a focus on regional issues. These collaborative activities and partnerships play a critical role in building and sustaining a successful national big data innovation ecosystem.

This solicitation continues the operation of a national network of BD Hubs. It builds on demonstrated strengths of the program, which has grown to include a set of BD Spokes affiliated with the BD Hubs, and is responsive to the recent developments in data science. For instance, the recently released report on Data Science for Undergraduates: Opportunities and Options from the National Academies of Sciences, Engineering, and Medicine exemplifies the urgency of multi-faceted education and training in data science. The BD Hubs will continue to nucleate regional collaborations and multi-sector projects, while fostering innovation in data science.

The NSF BD Hubs program is aligned with NSF's Harnessing the Data Revolution (HDR) Big Idea, one of NSF's 10 Big Ideas for Future Investment. HDR is a visionary, national-scale activity to enable new modes of data-driven discovery, allowing fundamentally new questions to be asked and answered in science and engineering frontiers, generating new knowledge and understanding, and accelerating discovery and innovation. The HDR vision is realized via a coordinated set of program solicitations resulting in an ecosystem of interrelated activities enabling (i) research in the foundations of data science; frameworks, algorithms, and systems for data science; and data-driven research in science and engineering; (ii) advanced cyberinfrastructure; and (iii) education and workforce development—all of which are designed to amplify the intrinsically multidisciplinary nature of the data science challenge. The HDR Big Idea will establish theoretical, technical, and ethical data science frameworks, and apply them to practical problems in science and engineering, and in society more generally.

Please note that this particular solicitation is not meant to be a source of funding for new research. Other funding opportunities relevant to the NSF HDR Big Idea include, but are not limited to, Critical Techniques, Technologies and Methodologies for Advancing Foundations and Applications of Big Data Sciences and Engineering (BIGDATA); Cyberinfrastructure for Sustained Scientific Innovation (CSSI) - Data and Software: Elements and Frameworks; Resource Implementations for Data Intensive Research in the Social, Behavioral and Economic Sciences (RIDIR); and Partnerships between Science and Engineering Fields and the NSF TRIPODS Institutes (TRIPODS + X). **Due December 18.**

N00014-18-S-B007 National Oceanographic Partnership Program (NOPP)
In this BAA, NOPP participants have identified seven ocean research and technology topics of mutual and emerging interest. Selected projects will be awarded and funded by individual agencies after the NOPP office, ONR and panels of experts conduct an evaluation of the full proposals under each topic. All successful offerors will be notified and the NOPP office will provide the 2019 NOPP project announcement on their website. Up to $27.3 million over three (3) years may be available for this solicitation, subject to appropriation, availability of funds and final approval by the participating NOPP agencies. NOPP funding will be dependent on proposal topic availability and individual agency policies, procedures, and regulations. There will be no classified work funded under this solicitation. **Closes December 21.**

Joint DMS/NLM Initiative on Generalizable Data Science Methods for Biomedical Research (DMS/NLM)
The Division of Mathematical Sciences (DMS) in the Directorate for Mathematical and Physical Sciences (MPS) at the National Science Foundation (NSF) and the National Library of Medicine (NLM) at the National Institutes of Health (NIH) plan to support the development of innovative and transformative mathematical and statistical approaches to address important data-driven biomedical and health challenges. The rationale for this interagency collaboration is that significant advances may be expected as the result of continued NSF investments in foundational research in mathematics and statistics as well as inter- and multi-disciplinary research and training at the intersection of the quantitative/computational sciences and domain sciences, while NIH benefits from the enhancement of biomedical data science with new approaches that strengthen the reproducibility of biomedical research and support open science. **Due January 1.**

NOAA-OAR-OWAQ-2019-2005820 FY2019 Office of Weather and Air Quality Research Programs
There will be eight grant competitions from this notification valued at approximately $16,200,000 as follows: 1) High Impact Weather Testbeds, 2) Joint Technology Transfer Initiative (JTTI), 3) Air Quality Research and Forecasting, 4) Verification of the Origins of Rotation in Tornadoes Experiment - Southeast U.S. (VORTEX-SE), 5) Infrasound Detection of Tornadoes and High Impact Weather, 6) Next Generation of Mesoscale Weather Observing Platforms, 7) Snowpack and Soil Moisture Observations and Data Assimilation to Improve the National Water Model (NWM), and 8) Subseasonal to Seasonal (S2S).

   These eight competitions in this notification of funding opportunity reflect multiple science objectives spanning time scales from the very short-term (hours) to seasonal and from weather and water observations and modeling to social and behavioral science. It is focused on improving NOAA's understanding and ultimately its weather and water forecasting services through engagement with the external scientific community on key science gaps of mutual interest through funded grant opportunities.

   One of the key themes is supporting applied research and development that leads to the demonstration in NOAA's testbeds during the project period of new high impact weather, water, and air quality observing and forecasting applications, including new data or products, improved analysis techniques, better statistical or dynamic forecast models and techniques,

and communication of that information to better inform the public. It is expected that NOAA's support of these new capabilities will speed the transition of this new research into operations in order to improve NOAA weather and water services for the public. **Due March 20**.

[HR001118S0057 DARPA Information Innovation Office (I2O) Office-wide](#)
This Broad Agency Announcement (BAA) seeks revolutionary research ideas for topics not being addressed by ongoing I2O programs or other published solicitations. Potential proposers are highly encouraged to review the current I2O programs (http://www.darpa.mil/about-us/offices/i2o) and solicitations (http://www.darpa.mil/work-with-us/opportunities) to avoid proposing efforts that duplicate existing activities or that are responsive to other published I2O solicitations. **Closes August 30**.

URL Links to New & Open Funding Solicitations
Links verified June 8, 2018

- **[SAMHSA FY 2017 Grant Announcements and Awards](#)**
- **[Open Solicitations from IARPA (Intelligence Advanced Research Projects Activity)](#)**
- **[Bureau of Educational and Cultural Affairs, Open Solicitations, DOS](#)**
- **[ARPA-E Funding Opportunity Exchange](#)**
- **[DOE Funding Opportunity Exchange](#)**
- **[NPS Broad Agency Announcements (BAAs)](#)**
- **[NIJ Current Funding Opportunities](#)**
- **[NIJ Forthcoming Funding Opportunities](#)**
- **[Engineering Information Foundation Grant Program](#)**
- **[Comprehensive List of Collaborative Funding Mechanisms, NORDP](#)**
- **[ARL Funding Opportunities — Open Broad Agency Announcements (BAA)](#)**
- **[NASA Open Solicitations](#)**
- **[CDMRP FY 2018 Funding Announcements](#)**
- **[DOE/EERE Funding Opportunity Exchange](#)**
- **[New Funding Opportunities at NIEHS (NIH)](#)**
- **[National Human Genome Research Institute Funding Opportunities](#)**
- **[Office of Naval Research Currently Active BAAs](#)**
- **[HRSA Health Professions Open Opportunities](#)**
- **[Foundation Center RFP Weekly Funding Bulletin](#)**

Solicitations Remaining Open from Prior Issues of the Newsletter

[Infrastructure Innovation for Biological Research (IIBR)](#)
The Infrastructure Innovation for Biological Research (IIBR) solicitation supports new and innovative research in biological informatics, instrumentation and associated methods, as well as multidisciplinary approaches to these broad themes that address needs in basic biological research. These awards support pioneering approaches that develop de novo infrastructure,

significantly redesign existing infrastructure, or apply existing infrastructure in novel ways. Activities must demonstrate the potential to advance or transform research in biology as supported by the Directorate for Biological Sciences at the National Science Foundation (https://nsf.gov/bio). **Proposals Accepting Anytime**.

Infrastructure Capacity for Biology (ICB)

The Infrastructure Capacity for Biology (ICB) supports the development, expansion, or improvement of infrastructure that will enable fundamental research within the biological sciences. Infrastructure supported under this solicitation may include cyberinfrastructure, instrumentation, biological collections, living stocks, field stations, marine labs, or other resources that are shared and openly accessible. Proposals submitted to the ICB solicitation must make a compelling case that the proposed infrastructure will advance or transform research in areas of science that are supported by the Directorate for Biological Sciences (BIO) at the National Science Foundation. **Proposals Accepting Anytime**.

Plant Biotic Interactions

The Plant Biotic Interactions (PBI) program supports research on the processes that mediate beneficial and antagonistic interactions between plants and their viral, bacterial, oomycete, fungal, plant, and invertebrate symbionts, pathogens and pests. This joint NSF/NIFA program supports projects focused on current and emerging model and non-model systems, and agriculturally relevant plants. The program's scope extends from fundamental mechanisms to translational efforts, with the latter seeking to put into agricultural practice insights gained from basic research on the mechanisms that govern plant biotic interactions. Projects must be strongly justified in terms of fundamental biological processes and/or relevance to agriculture and may be purely fundamental or applied or include aspects of both perspectives. All types of symbiosis are appropriate, including commensalism, mutualism, parasitism, and host-pathogen interactions. Research may focus on the biology of the plant host, its pathogens, pests or symbionts, interactions among these, or on the function of plant-associated microbiomes. **Proposals Accepting Anytime**.

DARPA-RA-18-02 Young Faculty Award

The Defense Advanced Research Projects Agency (DARPA) Young Faculty Award (YFA) program aims to identify and engage rising stars in junior faculty positions in academia and equivalent positions at non-profit research institutions and expose them to Department of Defense (DoD) and National Security challenges and needs. In particular, this YFA will provide high-impact funding to elite researchers early in their careers to develop innovative new research directions in the context of enabling transformative DoD capabilities. The long-term goal of the program is to develop the next generation of scientists and engineers in the research community who will focus a significant portion of their future careers on DoD and National Security issues. DARPA is particularly interested in identifying outstanding researchers who have previously not been performers on DARPA programs, but the program is open to all qualified applicants with innovative research ideas. **Due November 13**.

DE-FOA-0001914 Scientific Infrastructure Support for Consolidated

The Department of Energy's (DOE) Office of Nuclear Energy (NE) conducts crosscutting nuclear energy research and development R&D) and associated infrastructure support activities to develop innovative technologies that offer the promise of dramatically improved performance for advanced reactors and fuel cycle concepts while maximizing the impact of DOE resources. The development of nuclear energy-related infrastructure and basic capabilities in the research community is necessary to promote R&D that supports nuclear science and engineering (NS&E), DOE-NE's mission, and the Nation's nuclear energy challenges. Accordingly, DOE intends to enable the education and training of nuclear scientists, engineers, and policy-makers in graduate and undergraduate study and two-year programs, as well as R&D that is relevant to the Department and the nuclear energy industry in general. The Nuclear Energy University Program (NEUP) utilizes up to 20 percent of funds appropriated to NE's R&D program for university-based infrastructure support and R&D in key NE program-related areas. **Due Nov. 15.**

[DE-FOA-0001836 Innovative Design Concepts for Standard Modular Hydropower and Pumped-Storage Hydropower](#)
Complete information on this Funding Opportunity Announcement can be found on the EERE Exchange website - https://eere-exchange.energy.gov DOE's Water Power Technologies Office (WPTO) is committed to lowering the cost and build time of hydropower and pumped storage systems, further increasing their ability to provide essential reliability services and contribute to the resilience of the grid, and continuing to reduce their environmental impacts and permitting timelines. This Funding Opportunity Announcement (FOA) contains two Topic Areas. Topic Area 1: Facility Design Concepts for Standard Modular Hydropower Development Topic Area 2: New Use Cases for Pumped-Storage Hydropower Please carefully review the complete Funding Opportunity Announcement, which can be accessed on the EERE Exchange website - https://eere-exchange.energy.gov **Due Nov. 30**.

[18-596 Formal Methods in the Field National Science Foundation](#)
The Formal Methods in the Field (FMitF) program ([NSF Publication 18-596](#)) aims to bring together researchers in formal methods with researchers in other areas of computer and information science and engineering to jointly develop rigorous and reproducible methodologies for designing and implementing correct-by-construction systems and applications with provable guarantees. FMitF encourages close collaboration between two groups of researchers. The first group consists of researchers in the area of formal methods, which, for the purposes of this solicitation, is broadly defined as principled approaches based on mathematics and logic, including modeling, specification, design, program analysis, verification, synthesis, and programming language-based approaches.   The second group consists of researchers in the "field," which, for the purposes of this solicitation, is defined as a subset of areas within computer and information science and engineering that currently do not benefit from having established communities already developing and applying formal methods in their research. This solicitation limits the field to the following areas that stand to directly benefit from a grounding in formal methods: computer networks, cyber-human systems, distributed /operating systems, hybrid/dynamical systems, and machine learning. Other field(s)

may emerge as priority areas for the program in future years, subject to the availability of funds. The FMitF program solicits two classes of proposals:

- Track I: Research proposals: Each proposal must have at least one Principal Investigator (PI) or co-PI with expertise in formal methods and at least one with expertise in one or more of these fields: computer networks, cyber-human systems, distributed/operating systems, hybrid/dynamical systems, and machine learning. Proposals are expected to address the fundamental contributions to both formal methods and the respective field(s) and should include a proof of concept in the field along with a detailed evaluation plan that discusses intended scope of applicability, trade-offs, and limitations. All proposals are expected to contain a detailed collaboration plan that clearly highlights and justifies the complementary expertise of the PIs/co-PIs in the designated areas and describes the mechanisms for continuous bi-directional interaction. Projects are limited to $750,000 in total budget, with durations of up to four years.
- Track II: Transition to Practice (TTP) proposals: The objective of this track is to support the ongoing development of extensible and robust formal methods research prototypes/tools to facilitate usability and accessibility to a larger and more diverse community of users. These proposals are expected to support the development, implementation, and deployment of later-stage successful formal methods research and tools into operational environments in order to bridge the gap between research and practice. A TTP proposal must include a project plan that addresses major tasks and system development milestones as well as an evaluation plan for the working system. Proposals are expected to identify a target user community or organization that will serve as an early adopter of the technology. Collaborations with industry are strongly encouraged. Projects are limited to $100,000 in total budget, with durations of up to 18 months.

The Project Description can be up to 15 pages for Track I proposals, and up to 7 pages for the Track II proposals. **Due January 15.**

DE-FOA-0001913 Fiscal Year 2019 Consolidated Innovative Nuclear Research
This FOA is open to U.S. universities, national laboratories, and industry. Research consortiums may be composed of diverse institutions including academia, national laboratories, non-profit research institutes, industry/utilities, and international partners. Research teams should strive to achieve the synergies that arise when individuals with forefront expertise in different methodologies, technologies, disciplines, and areas of content knowledge approach a problem together, overcoming impasses by considering the issue from fresh angles and discovering novel solutions. DOE-NE strongly encourages diversifying its research portfolio through effective partnerships with industry, underrepresented groups, and MSI, which may receive funding support from the project. International partners are encouraged to participate, however no U.S. government funding will be provided to entities incorporated outside of the United States. DOE-NE will evaluate the benefit and contribution of any such proposed partnerships as part of its program relevancy evaluation and scoring. See eligibility requirements in the body of the FOA document to be sure you can apply. **Due Feb. 12.**

Open Solicitations and BAAs

[BAA's remain open for one or more years. During the open period, agency research priorities may change or other modifications are made to a published BAA. If you are submitting a proposal in response to an open solicitation, as below, check for modifications to the BAA at Grants.gov or by utilizing Modified Opportunities by Agency to receive a Grants.gov notification of recently modified opportunities by agency name.]

FA9550-18-S-0003 Research Interests of the Air Force Office of Scientific Research

AFOSR plans, coordinates, and executes the Air Force Research Laboratory's (AFRL) basic research program in response to technical guidance from AFRL and requirements of the Air Force. Additionally, the office fosters, supports, and conducts research within Air Force, university, and industry laboratories; and ensures transition of research results to support U.S. Air Force needs. The focus of AFOSR is on research areas that offer significant and comprehensive benefits to our national war fighting and peacekeeping capabilities. These areas are organized and managed in two scientific Departments: Engineering and Information Science (RTA) and Physical and Biological Sciences (RTB). The research activities managed within each Department are summarized in this section. **Open Until Superseded**.

National Geospatial-Intelligence Agency Academic Research Program (NARP)

NGA welcomes all innovative ideas for path-breaking research that may advance the GEOINT mission. The NGA mission is to provide timely, relevant, and accurate geospatial intelligence (GEOINT) in support of national security objectives. GEOINT is the exploitation and analysis of imagery and geospatial information to describe, assess, and visually depict physical features and geographically referenced activities on the Earth. GEOINT consists of imagery, imagery intelligence, and geospatial information. NGA offers a variety of critical GEOINT products in support of U.S. national security objectives and Federal disaster relief, including aeronautical, geodesy, hydrographic, imagery, geospatial and topographical information. The NGA Academic Research Program (NARP) is focused on innovative, far-reaching basic and applied research in science, technology, engineering and mathematics having the potential to advance the GEOINT mission. The objective of the NARP is to support innovative, high-payoff research that provides the basis for revolutionary progress in areas of science and technology affecting the needs and mission of NGA. This research also supports the National System for Geospatial Intelligence (NSG), which is the combination of technology, systems and organizations that gather, produce, distribute and consume geospatial data and information. This research is aimed at advancing GEOINT capabilities by improving analytical methods, enhancing and expanding systems capabilities, and leveraging resources for common NSG goals. The NARP also seeks to improve education in scientific, mathematics, and engineering skills necessary to advance GEOINT capabilities. It is NGA's intent to solicit fundamental research under this BAA. Fundamental research means basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from Industrial development, design, production, and product utilization, the results of which ordinarily are restricted for proprietary or national security reason. (National Security Decision Directive (NSDD) 189, National Policy on the Transfer of Scientific, Technical, and Engineering Information).NGA seeks proposals from eligible U.S.

institutions for path-breaking GEOINT research in areas of potential interest to NGA, the DoD, and the Intelligence Community (IC). **Open to Dec. 31, 2018**.

PAR-16-242 Bioengineering Research Grants (BRG) (R01) Department of Health and Human Services National Institutes of Health

The purpose of this funding opportunity announcement is to encourage collaborations between the life and physical sciences that: 1) apply a multidisciplinary bioengineering approach to the solution of a biomedical problem; and 2) integrate, optimize, validate, translate or otherwise accelerate the adoption of promising tools, methods and techniques for a specific research or clinical problem in basic, translational, or clinical science and practice. An application may propose design-directed, developmental, discovery-driven, or hypothesis-driven research and is appropriate for small teams applying an integrative approach to increase our understanding of and solve problems in biological, clinical or translational science. **Open to May 9, 2019.**

BAA-RQKD-2014-0001 Open Innovation and Collaboration Department of Defense Air Force -- Research Lab

Open innovation is a methodology to capitalize on diverse, often non-traditional talents and insights, wherever they reside, to solve problems. Commercial industry has proven open innovation to be an effective and efficient mechanism to overcome seemingly impossible technology and/or new product barriers. AFRL has actively and successfully participated in collaborative open innovation efforts. While these experiences have demonstrated the power of open innovation in the research world, existing mechanisms do not allow AFRL to rapidly enter into contractual relationships to further refine or develop solutions that were identified. This BAA will capitalize on commercial industry experience in open innovation and the benefits already achieved by AFRL using this approach. This BAA will provide AFRL an acquisition tool with the flexibility to rapidly solicit proposals through Calls for Proposals and make awards to deliver innovative technical solutions to meet present and future compelling Air Force needs as ever-changing operational issues become known. The requirements, terms and specific deliverables of each Call for Proposals will vary depending on the nature of the challenge being addressed. It is anticipated that Call(s) for Proposals will address challenges in (or the intersection between) such as the following technology areas: Materials: - Exploiting material properties to meet unique needs - Material analysis, concept / prototype development, and scale up Manufacturing Processes that enable affordable design, production and sustainment operations Aerospace systems: - Vehicle design, control, and coordinated autonomous and/or manned operations - Power and propulsion to enable next generation systems Human Effectiveness: - Methods and techniques to enhance human performance and resiliency in challenging environments - Man – Machine teaming and coordinated activities Sensors and Sensing Systems: - Sensor and sensing system concept development, design, integration and prototyping - Data integration and exploitation. **Open to July 12, 2019.**

HDTRA1-14-24-FRCWMD-BAA Fundamental Research to Counter Weapons of Mass Destruction

** Fundamental Research BAA posted on 20 March 2015.** Potential applicants are strongly encouraged to review the BAA in its entirety. **Please note that ALL general correspondence

for this BAA must be sent to HDTRA1-FRCWMD-A@dtra.mil. Thrust Area-specific correspondence must be sent to the applicable Thrust Area e-mail address listed in Section 7: Agency Contacts.** **Open to Sept. 30, 2019.**

BAA-RQKH-2015-0001 Methods and Technologies for Personalized Learning, Modeling and Assessment Air Force -- Research Lab
The Air Force Research Laboratories and 711th Human Performance Wing are soliciting white papers (and later technical and cost proposals) on the following research effort. This is an open ended BAA. The closing date for submission of White Papers is 17 Nov 2019. This program deals with science and technology development, experimentation, and demonstration in the areas of improving and personalizing individual, team, and larger group instructional training methods for airmen. The approaches relate to competency definition and requirements analysis, training and rehearsal strategies, and models and environments that support learning and proficiency achievement and sustainment during non-practice of under novel contexts. This effort focuses on measuring, diagnosing, and modeling airman expertise and performance, rapid development of models of airman cognition and specifying and validating, both empirically and practically, new classes of synthetic, computer-generated agents and teammates. An Industry Day was held in November 2014. Presentation materials from the Industry Day and Q&A's are attached. If you would like a list of Industry Day attendees, send an email request to helen.williams@us.af.mil **Open until November 17, 2019.**

BAA-AFRL-RQKMA-2016-0007 Air Force Research Laboratory, Materials & Manufacturing Directorate, Functional Materials and Applications (AFRL/RXA) Two-Step Open BAA
Air Force Research Laboratory, Materials & Manufacturing Directorate is soliciting White Papers and potentially technical and cost proposals under this two-step Broad Agency Announcement (BAA) that is open for a period of five (5) years. Functional Materials technologies that are of interest to the Air Force range from materials and scientific discovery through technology development and transition, and support the needs of the Functional Materials and Applications mission. Descriptors of Materials and Manufacturing Directorate technology interests are presented in the context of functional materials core technical competencies and applications. Applicable NAICS codes are 541711 and 541712. **Open to April 20, 2021.**

Army Research Office Broad Agency Announcement for Basic and Applied Scientific Research
This BAA sets forth research areas of interest to the ARO. This BAA is issued under FAR 6.102(d)(2), which provides for the competitive selection of basic and applied research proposals, and 10 U.S.C. 2358, 10 U.S.C. 2371, and 10 U.S.C. 2371b, which provide the authorities for issuing awards under this announcement for basic and applied research. The definitions of basic and applied research may be found at 32 CFR 22.105.Proposals submitted in response to this BAA and selected for award are considered to be the result of full and open competition and in full compliance with the provision of Public Law 98-369, "The Competition in Contracting Act of 1984" and subsequent amendments. **Open to April 30, 2022**.

FA9453-17-S-0005 Research Options for Space Enterprise Technologies (ROSET)

The Air Force Research Laboratory (AFRL) Space Vehicle Directorate (RV) is interested in receiving proposals from all offerors to advance state of the art technology and scientific knowledge supporting all aspects of space systems including payload adapters, on-orbit systems, communications links, ground systems, and user equipment. Efforts will include basic and advanced research, advanced component and technology development, prototyping, and system development and demonstration and will span the range from concept and laboratory experimentation to testing/demonstration in a relevant environment. Specific tasks include design, development, analysis, fabrication, integration, characterization, testing/experimentation, and demonstration of hardware and software products. **Open to September 22, 2022.**

[Broad Agency Announcement for the Army Rapid Capabilities Office](#)
This Broad Agency Announcement (BAA), W56JSR-18-S-0001, is sponsored by the Army Rapid Capabilities Office (RCO). The RCO serves to expedite critical capabilities to the field to meet Combatant Commanders' needs. The Office enables the Army to experiment, evolve, and deliver technologies in real time to address both urgent and emerging threats while supporting acquisition reform efforts. The RCO executes rapid prototyping and initial equipping of capabilities, particularly in the areas of cyber, electronic warfare, survivability and positioning, navigation and timing (PNT), as well as other priority projects that will enable Soldiers to operate and win in contested environments decisively. This BAA is an expression of interest only and does not commit the Government to make an award or pay proposal preparation costs generated in response to this announcement.
Questions concerning the receipt of your submission should be directed:
http://rapidcapabilitiesoffice.army.mil/eto/
        Technical questions will be sent to the appropriate Technical Points of Contact (TPOC), topic authors, and/or Subject Matter Experts (SMEs) to request clarification of their areas of interest. No discussions are to be held with offerors by the technical staff after proposal submission without permission of the Army Contracting Command-Aberdeen Proving Ground (ACC-APG) Contracting Officer. **Open to March 23, 2023.**

[W911NF-18-S-0005 U.S. Army Research Institute for the Behavioral and Social Sciences Broad Agency Announcement for Basic, Applied, and Advanced Research (Fiscal Years 2018-2023)](#)
The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) announces the ARI FY18-23 Broad Agency Announcement for Basic, Applied, and Advanced Scientific Research. This Broad Agency Announcement, which sets forth research areas of interest to the United States Army Research Institute for the Behavioral and Social Sciences, is issued under the provisions of paragraph 6.102(d)(2) of the Federal Acquisition Regulation (FAR), which provides for the competitive selection of proposals. Proposals submitted in response to this BAA and selected for award are considered to be the result of full and open competition and in full compliance with the provisions of Public Law 98-369 (The Competition in Contracting Act of 1984) and subsequent amendments. The U.S. Army Research Institute for the Behavioral and Social Sciences is the Army's lead agency for the conduct of research, development, and analyses for the improvement of Army readiness and performance via research advances and applications of the behavioral and social sciences that address personnel, organization, training,

and leader development issues. Programs funded under this BAA include basic research, applied research, and advanced technology development that can improve human performance and Army readiness.

Those contemplating submission of a proposal are encouraged to contact the ARI Technical Point of Contact (TPOC) for the respective topic area cited in the BAA. If the R&D warrants further inquiry and funding is available, submission of a proposal will be entertained. The recommended three-step sequence is (1) telephone call to the ARI TPOC or responsible ARI Manager, (2) white paper submission, (3) full proposal submission. Awards may be made in the form of contracts, grants, or cooperative agreements. Proposals are sought from educational institutions, non-profit/not-for-profit organizations, and commercial organizations, domestic or foreign, for research and development (R&D) in those areas specified in the BAA. The U.S. Army Research Institute for the Behavioral and Social Sciences encourages Historically Black Colleges and Universities/Minority Serving Institutions (HBCU/MSI) and small businesses to submit proposals for consideration. Foreign owned, controlled, or influenced organizations are advised that security restrictions may apply that could preclude their participation in these efforts. Government laboratories, Federal Funded Research and Development Centers (FFRDCs), and US Service Academies are not eligible to participate as prime contractors or recipients. However, they may be able to participate as subcontractors or Subrecipients (eligibility will be determined on a case by case basis). **Open to April 29, 2023.**

FA8650-17-S-6001 Science and Technology for Autonomous Teammates (STAT)
The objective of Science and Technology for Autonomous Teammates (STAT) program is to develop and demonstrate autonomy technologies that will enable various AF mission sets. This research will be part of Experimentation Campaigns in: 1 -Multi-domain Command and Control; 2-Intelligence, Surveillance, Recognizance (ISR) Processing Exploitation and Dissemination (PED); and 3- Manned-Unmanned combat Teaming to demonstrate autonomy capabilities to develop and demonstrate autonomy technologies that will improve Air Force operations through human-machine teaming and autonomous decision-making. The technology demonstrations that result from this BAA will substantially improve the Air Force's capability to conduct missions in a variety of environments while minimizing the risks to Airmen. The overall impact of integration of autonomous systems into the mission space will enable the Air Force to operate inside of the enemy's decision loop.

STAT will develop and apply autonomy technologies to enhance the full mission cycle, including mission planning, mission execution, and post-mission analysis. Particular areas of interest include multi-domain command and control, manned-unmanned teaming, and information analytics. The technology demonstrations that result from this BAA will substantially improve the Air Force's capability to conduct missions in a variety of environments while minimizing the risks to Airmen. The overall impact of integration of autonomous systems into the mission space will enable the Air Force to operate inside of the enemy's decision loop. This effort plans to demonstrate modular, transferable, open system architectures, and deliver autonomy technologies applicable to a spectrum of multi-domain applications. Development efforts will mature a set of technologies that enable airmen to plan, command, control, and execute missions with manageable workloads. The software algorithms and supporting architectures shall:• Ingest and understand mission taskings and commander's intent• Respond

appropriately to human direction and orders• Respond intelligently to dynamic threats and unplanned eventsChosen technologies will be open, reusable, adaptable, platform agnostic, secure, credible, affordable, enduring, and able to be integrated into autonomous systems. The program will be comprised of various technologies developed by AFRL and Industry, integrated into technology demonstrations and deliverables with all the necessary software, hardware, and documentation to support AFRL-owned modeling and simulation environments for future capability developments. Thus, all technology development efforts must adhere to interface designs and standards. **Open to July 23, 2023**.

Changes at Academic Research Funding Strategies
By Lucy Deckard
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Expanded Editing Services

In response to numerous requests, we are now expanding our editing services to accommodate clients working on manuscripts as well as proposals. We are also offering editing only (as opposed to intensive grantsmanship assistance) at several levels:

- **Technical editing**: Editing for technical clarity as well as grammar, punctuation, etc.
- **Editing:** Editing for grammar, punctuation, etc.
- **Editing Especially for Non-native English Speakers:** Editing for grammar, punctuation, usage, etc. with special attention to mistakes commonly made by non-native English speakers.

These options will provide a more economical option for authors who don't need our intensive review and editing services. More information will be posted on our website soon.

Former NIH branch chief, Dr. John Williamson, joining ARFS

We are excited to announce that Dr. John Williamson is joining Academic Research Funding Strategies as one of our consultants. He will work with clients applying to NIH, providing one-on-one mentoring as well as reviews of NIH proposal drafts. A short bio is provided below.

Dr. Williamson is an emeritus professor of medicinal chemistry at the University of Mississippi, a former NIH branch chief, and currently a research initiatives coordinator at the University of Dayton. During his tenure as a full professor he garnered millions in extramural funding from: federal agencies including the NIH, NSF, CDC, and DoD; pharmaceutical companies including Merck and Schering-Plough; as well as foundations and societies including the Elsa Pardee Foundation, Sigma Xi, the American Society of Pharmacognosy, and the Bill and Melinda Gates Foundation.

At NIH he served as a Branch Chief of Basic and Mechanistic Research, maintaining a branch grants and contract portfolio of approximately $50M/yr. The portfolio included projects associated with brain neuroscience, bioengineering of opiate pathways, mechanisms associated with chronic pain, brain microbiome connection mechanisms, pharmacodynamics and pharmacokinetics and methodologies associated with bioactive natural products, analgesic cannabinoids, various small business awards, complementary medical approaches, and training programs. While at NIH, Williamson's portfolio contained a broad array of funding mechanisms including: DP1, DP2, F31, F32, K00, K01, K99, P01, P20, P30, P50, R01, R03, R13, R15, R21, R41, R42, R43, R44, R61, R61, R90, T32, T42, T90, and U01s. In addition, he was the named program contact on more than 75 published funding opportunity announcements (RFAs & PAs). Williamson also worked on interagency collaborative programs with the NSF, FDA, USDA, and FTC. He is currently associated with the University of Dayton where, as Research Initiatives Coordinator, he helps faculty and staff in developing and submitting competitive research proposals.

Academic Research Funding Strategies, LLC (Page 1)
http://academicresearchgrants.com/home
ph: 979-693-0825
LDeckard@academicresearchgrants.com
mjcronan@gmail.com

What We Do--
We provide consulting for colleges and universities on a wide range of topics related to research development and grant writing, including:

- Strategic Planning - Assistance in formulating research development strategies and building institutional infrastructure for research development (including special strategies for Emerging Research Institutions, Predominantly Undergraduate Institutions and Minority Serving Institutions)

- Training for Faculty - Workshops, seminars and webinars on how to find and compete for research funding from NSF, NIH, DoE and other government agencies as well as foundations. Proposal development retreats for new faculty.

- Large proposals - Assistance in planning, developing and writing institutional and center-level proposals (e.g., NSF ERC, STC, NRT, ADVANCE, IUSE, Dept of Ed GAANN, DoD MURI, etc.)

- Assistance for new and junior faculty - help in identifying funding opportunities and developing competitive research proposals, particularly to NSF CAREER, DoD Young Investigator and other junior investigator programs

- Assistance on your project narrative: in-depth reviews, rewrites, and edits

- Editing and proof reading of journal articles, book manuscripts, proposals, etc.

- Facilities and Instrumentation - Assistance in identifying and competing for grants to fund facilities and instrumentation

- Training for Staff - Professional Development for research office and sponsored projects staff

Workshops by Academic Research Funding Strategies
We offer workshops on research development and grant writing for faculty and research professionals based on all published articles.
(View Index of Articles)