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Research Development & Grant Writing News ©

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Making Copy-and-Paste Illegal

By Mike Cronan, co-publisher

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Anyone involved in the planning, developing, writing, editing, and reviewing of research proposals can easily sympathize with those who advocate for making it a class C misdemeanor, punishable by up to one week in jail, a fine of up to $1,000, or both, for contributing authors to the research narrative to use the copy and paste function in any way whatsoever. Others advocate the more progressive and less punitive position of having IT personnel disable the copy and paste function on the computers of all contributors to a research narrative.

Where you come down on this issue will likely be a function of the level of frustration you have felt working with contributing authors who believe that all the parts to a new research narrative, or narrative section, lie scattered about their hard drive. All they need to do is to copy and paste from old text and reassemble a new narrative section. Unfortunately, attempting to construct a new proposal out of old narrative "spare parts" contributed by one or more authors is always a terrible, horrible, no good, very bad idea, to paraphrase from the children's book *Alexander and the Terrible, Horrible, No Good, Very Bad Day*. It will just lead to one more proposal populating that vast graveyard of declined proposals, a very bad outcome indeed.

Early on in the process of writing the research narrative, those contributing authors who recycle old narrative text and reconfigure it as new can hopefully be identified and dissuaded from the practice. While a commitment to recycling has enormous benefits when it comes to our environment, recycling research narrative text is quite toxic and quickly pollutes the entire new narrative.

Of course, the best way to avoid ending up with a first draft of a research narrative that is an overly generalized, vague, and disorganized aggregate of multiple contributing authors largely unresponsive to the funding solicitation, is to get everyone around the same table to, for example:

- conduct a finely grained review of the solicitation as a team,
- resolve any ambiguities in the solicitation as a team,
- develop an organizational template based on the solicitation guidelines,
- assign writing assignments based on the template,
- develop an agreed upon protocol for integrating narrative contributions from the multiple authors,
- discuss the interconnectedness of multiple disciplinary contributions drafted by each of the multiple authors to the project's overall vision, goals, objectives, and rationale,
- identify the goals, objectives, rationale, specifics, details, and connection to the overall project of each section of the narrative assigned to each of the multiple authors,
- discuss **how** each goal and objective will be accomplished and identify agreed upon specifics and details that support that discussion, and
- start the first narrative draft as the first of many numerous future drafts that converge on perfection, or as close to it as possible.

That said, it is a sad truth that writing a research narrative is not always a neatly planned and coordinated process. Authors contributing to the research narrative often differ in how well they write, how well they understand the funding solicitation, and how well they understand the characteristics of a successful, integrated, and synergistic research narrative. Contributing authors differ in the time they can commit to writing their narrative contribution, their availability for attending team meetings where the overarching goals, objectives, and research strategies are discussed, and, unfortunately, in their familiarity with other members of the research team. The fact is, proposal planning, development, and writing can often be a much more messy process than we would like it to be, no matter how much we wish otherwise.

Research offices and others often work with research teams who do not have a track record of funding success, or are newly formed interdisciplinary teams put together to respond to new funding directions. It is not unexpected, then, that as funding solicitations push the disciplinary boundaries into newly charted research domains, newly formed teams will emerge to respond to these new directions.

However, when newly formed research teams respond to a funding solicitation in a new area, the team members often lack experience writing multiple narrative contributions that have to be melded into the integrated research narrative. At this point, the inexperienced contributor to the research narrative may struggle and fall back on copying and pasting from existing research text, perhaps from an old proposal, or from a research website, or be tempted to contribute overly long, too generalized, and vague research background information to the narrative while failing to describe what will be done and how it will be done.

After all, most faculty learn grant-writing skills on the job, so to speak, and so it is not unexpected that there will be contributions to the research narrative from multiple authors that may be deeply flawed in content, organization, and responsiveness to the funding solicitation. Fortunately, these shortcomings are easily correctable. The first step in that process is to eschew copying and pasting and always start a new narrative contribution as new text. This text will answer the core questions that always must be answered at any proposal scale, from the overall proposal, to sections, to paragraphs: what are you going to do, why are you going to do it, how are you going to do it, why is it significant, what is your rationale, how do outcomes impact the field, etc.

Finally, proposals are won with specificity and detail. Narrative text that has been copied and pasted is, by definition, general and vague. If it were not, i.e., if it were grounded on specificity and detail, it would stand out like a sore, disconnected thumb when pasted into a new narrative structure.

NSF INCLUDES: Success Is All About Scalability

By Mike Cronan, co-publisher

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NSF's new program, *Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science* (NSF INCLUDES), "aims to improve the preparation, increase the participation, and ensure the contributions of individuals from groups that have traditionally been underrepresented and underserved in the STEM enterprise. . . . The goal is to achieve national level impact and progress toward STEM inclusion. . . . Viewing this challenge as a social innovation problem, NSF is ***particularly interested in using approaches to scaling and growth*** such as collective impact, networked communities, and strategic partnerships.

"The objective is to ***develop networks that involve representative organizations and consortia from different sectors*** that are committed to a common agenda to solve a specific STEM inclusion problem ***at scale***." NSF views this as a grand challenge area. The groundwork INCLUDES originates from a major report, *Broadening Participation in STEM,* by the Committee on Equal Opportunities in Science and Engineering (CEOSE). Preliminary INCLUDES proposals are due NSF April 15 and full proposals June 24. NSF expects to receive around 250 preliminary proposals. Importantly, success in this initial solicitation positions applicants to compete for one of the planned center-level INCLUDES. While NSF may fund a second round of the pilot projects, depending on the outcome of the FY 2017 budget, it appears that, the best strategy for applicants who want to compete in this arena is to compete now rather than later.

INCLUDES was announced on February 22 through an NSF Dear Colleague Letter. This first NSF INCLUDES solicitation will fund approximately 40 Design and Development Launch Pilot projects at around $300,000 each. More importantly, NSF notes, "in FY 2017, all of these Pilot projects will be eligible to apply for full **NSF INCLUDES Alliances**, proposed in the President's FY 2017 Budget Request at a level of **$12.5 million each for five years**." As noted in the FY 2016 NSF budget presentation to Congress, "INCLUDES is intended as a six-year activity, **FY 2015 through FY 2020**. The pilot activities will be three-year efforts with a review in the third year to determine next steps." The total NSF investment in INCLUDES is expected to be $75 million.

A key point to keep in mind is that **even if you will not be submitting** an INCLUDES preliminary proposal April 15, the next decade will see a major investment by NSF in this program area **across all directorates**. This investment in INCLUDES will impact other program areas at NSF as well, particularly in broader impacts, given NSF's long-term commitment to diversity in the scientific workforce. This means that if you plan to compete in the future for any NSF research center (e.g., MERSEC, ERC, STC, etc.) or other grant where the integration of research and education will be a component of the proposal, you will need to understand thoroughly the models developed under INCLUDES, since they will likely become the "gold standard" of "best practices" for NSF's strategic investments to expand the culture of diversity in science and engineering across all sectors.

Moreover, as noted in the FY 2016 budget presentation to Congress, NSF will use tracking studies to determine the contributions to excellence, equity, diversity and inclusion in STEM made by funded INCLUDES. NSF states specifically, "NSF INCLUDES provides the opportunity to implement a coordinated approach for evaluating ongoing efforts. **Therefore, results from NSF INCLUDES will strengthen, improve, or refine ongoing programs**. This investment priority will be closely monitored for ***breaking new ground in both assessment practices and innovative solutions for addressing the underrepresentation challenge in STEM***. This will happen through, for example, the use of a portfolio approach and innovative text-mining tools for portfolio analysis. The development of **common cross-directorate** broadening participation (BP) performance goals and milestones within the context of NSF's broader impacts (BI) criterion will promote bold BP actions that will help ensure the return on the investment of NSF INCLUDES." **Bottom line**: Even if you are not submitting an INCLUDES proposal, ***your understanding of INCLUDES will be an important factor in the competitiveness of any future submission for research and/or education***, particularly in how you address BP and BI in your proposal.

In FY 2016, as noted in the report to Congress, "an external evaluation will be contracted for NSF INCLUDES monitoring and evaluation. Evaluation will be driven by a focus on the '**bold visions**' and on the **design of indicators and measures for tracking** NSF's collective progress toward achieving them. ***External evaluation experts and NSF staff will develop and refine the theory of action/logic framework for each of the major investment goals of NSF INCLUDES***, including annual metrics and ambitious short- and long-term targets (three year and five or more years, respectively). ***To be successful, NSF INCLUDES must be systemic, have impact at scale, and be sustainable***. Key to this broader impact of the initiative is an **evidence-based** approach that drives management decision-making, mid-course corrections, improvements, and enhancements for ***yields greater than incremental progress***."

According to the INCLUDES solicitation, the long-term goal of INCLUDES is to "support, over the next ten years, **innovative models**, networks, partnerships, and research that enable the U.S. science and engineering workforce to thrive by ensuring that women, blacks, Hispanics, and people with disabilities are represented in percentages comparable to their representation in the U.S. population. . . . This initiative will leverage investments from NSF programs and projects focused on broadening participation, ***building on lessons learned, best practices, and proven mechanisms for achieving success***."

As with many NSF education programs, the key to a competitive INCLUDES proposal is scalability. As NSF often notes, the agency funds education program models that have the ***potential for replication across multiple scales rather than project-specific activities uniquely linked to a particular institution or academic ecosystem***. Basically, NSF does not have the budget for funding "one off" projects, which they make very clear in this solicitation, where **scalability** is a core attribute of a successful proposal. To be competitive, your INCLUDES proposal will need a **plan for scalability** that is validated by the specifics, details, and metrics to convince reviewers that you meet this key attribute of a funded proposal.

As noted repeatedly in the solicitation, "NSF is particularly interested in using approaches to **scaling and growth** such as collective impact, networked communities and strategic partnerships. . . . The objective is to develop networks that involve representative organizations and consortia from different sectors that are committed to a common agenda to

solve a specific STEM inclusion problem at scale. . . . NSF INCLUDES aims to mobilize communities concerned with STEM opportunities to bring renewed focus and effective collaboration to **solving broadening participation challenges at scale**. . . . Collective commitment to specific objectives for inclusion is **necessary for impact at scale in STE**M. . . . Collaborative alliances spanning both education levels and public and private sectors, and including new partners, will need to be developed, expanded, organized and built by ***leveraging state-of-the-art knowledge on scaling of social innovations***. . . . For example, the collective impact approaches that incorporate key success determinants of common agenda, shared measurements, mutually reinforcing activities, continuous communications, and backbone support organizations have the potential to yield **large-scale progress** towards NSF INCLUDES' goals. While the latest knowledge from the science of broadening participation provides a strong foundation, ***novel systems approaches and designs for achieving scale are critical for advancing diversity and inclusion in STEM***." (See Jon McPhedran Waitzer and Roshan Paul, "*Scaling Social Impact, When Everybody Contributes, Everybody Wins," Innovations*" [2011]).

The INVOLVES solicitation relies on several reports of value not only specifically to this program but also to the writing of BP and BI components to other research proposals, including: *NSF Broadening Participation Portfolio*; *Collective Impact*; *Getting Ideas into Action: Building Networked Improvement Communities in Education*; *Scaling Social Impact, When Everybody Contributes, Everybody Wins*; CEOSE, 2011 - 2012 Biennial Report to Congress; *Understanding the Value of Backbone Organizations in Collective Impact, Part 1*.

The Generic Management Plan

By Mike Cronan, co-publisher

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As interdisciplinarity becomes increasingly common in research funding solicitations, often as a function of the complexity of the scientific challenge being addressed, so too does the importance of the research management plan. On center-level projects, it is common for the funding agency to specify in great detail what needs to be addressed in the management plan, whereas on smaller proposals, there may be little or no guidance given with regards to what needs to be addressed in the required plan. In other cases, the solicitation may not specifically require a management plan, remaining silent on the issue, and leaving it up to the PI to make the determination. Or, most commonly, if the program guidelines do not mention a management plan as a required part of the project narrative, PIs will assume none is needed. That may be a mistake. After all, failing to require an element in a proposal does not mean that its inclusion will not work to the applicant's advantage..

For example, many NSF solicitations do not explicitly list the required sections of the project description, other than to note that the proposal must follow the Grant Proposal Guide (GPG), which is general rather than specific in nature when it comes to the required content of the Project Description.

This lack of prescriptive guidance when it comes to a management plan often causes some anxiety in those writing the proposal, particularly those new to more complex, transdisciplinary team proposals. To be sure, if the funding solicitation does not mention a research management plan, but it is clear that a competitive response to the funding opportunity requires a multi-, inter- or transdisciplinary team approach to address the scientific challenges that motivate the research goals, then a management plan is implicitly required.

When in doubt about whether or not a management plan should be included in the project description, always ask yourself the question about the goal of the management plan in a proposal. **Bottom line**:

- The goal of the management plan is to convince reviewers and program officers that an investment in your proposed research project will be well managed by you and your coPIs and will result in successful outcomes.
- The management plan is where you instill in reviewers and program officers the confidence that you will perform the research you propose in an efficient, effective, and coordinated fashion.
- Through the management plan, you will demonstrate to reviewers and program officers that you have the research management skills and experience to guide the research in a way that the outcomes will represent synergy and not silos.
- The management plan invites you to offer reviewers and program officers the details and specificity on performance metrics you have identified to allow you to effectively manage and evaluate the project on a periodic basis, make any required changes to the research activities, and ensure that project activities and outcomes occur as scheduled.

The generic, i.e., unspecified, management plan typically will describe the management, communication, and administrative structure of the project with sufficient detail to demonstrate the capability to conduct the proposed work. The management plan will identify the roles and responsibilities of all named participants. It should include an appropriate milestone chart or Gantt chart describing how the tasks will be integrated over the course of the project.

Other possible components of the management plan may:

- Describe the overall management structure, including a graphic to show personnel by research topic area, interaction among team members, and reporting structure,
- Describe role of PI/project director,
- Describe PI experience managing/facilitating team research,
- Describe key research thrust area leaders and team members' roles in the project as well as their roles in managing specific research areas,
- Describe how thrust area leaders will work together to ensure an integrated project and not a siloed project,
- Reference a milestone chart and address how the project will be implemented over the funding period,
- Discuss project start-up activities,
- Address a management integration plan to bring research components together,
- Discuss a project communications plan among participants, scheduled meetings for project coordination, and tracking,
- Address planned collaborators,
- Discuss key project components needed from collaborators, e.g., datasets, access to information, equipment and instrumentation, etc., needed for the proposed research,
- Address additional partners needed or anticipated,
- Discuss advisory board, engaging partners,
- Discuss metrics/evaluation/assessment methods for measuring project inputs, outputs, and outcomes over time (e.g., as in logic models for USDA) to ensure project success,
- Discuss annual performance reviews to ensure project goals are being met,
- Discuss facilities and other institutional commitments that support the project and ensure its success.

Whether required or **simply appropriate**, the strong management plan will play a critical role in your proposal's overall competitiveness. It will convince program officers and reviewers that a funded project will be well managed and hence likely to meet the sponsor's research expectations. However, before drafting a management plan, it is important to first understand what the sponsor expects of such a plan, as noted above; secondly, think about how ***your management structure will bring added value to a project*** in terms of meeting your proposed research goals, objectives, expected outcomes, and other ***performance metrics that validate a sponsor's investment in your research***.

By contrast, weak management plans are often characterized by a lack of contextual specificity and detail, particularly integrative detail among research topic areas. This results in a management narrative that appears disconnected from the research vision, goals, and

operational objectives. Another sign of a weak management plan appears when the plan fails to reflect the proportional continuity of the proposal's budget, especially within the budget justification narrative. In the worst scenario, the research plan, management plan, and budget justification sections are essentially stovepiped or siloed statements, written as stand-alone sections that fail to explain how they interconnect. ***Finally, weak management plans occur when the writing team treats the management plan as nothing more than generic boilerplate text easily transplanted from old proposals to current ones with a few minor adjustments, thereby guaranteeing that the proposal will receive the reviewers' kiss of death.***

FY 2017 Budget: Funding Social and Behavioral Sciences

By Mike Cronan, co-publisher
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The Consortium of Social Science Associations (COSSA) recently (February 2016) published a 41-page analysis of future funding directions in the social and behavioral sciences (SBS). Entitled COSSA's Analysis of the President's FY 2017 Budget, the analysis identifies which federal agencies fund SBS research, the specific SBS research programs funded at each agency, and the SBS priority research areas. (See College and University Rankings for Federal Social and Behavioral Science R&D for a ranked list of 444 universities nationally in SBS research, or **HERE** for a downloadable pdf file for printing.)

For research offices that assist faculty in finding funding and otherwise support proposal planning, development, and writing, the COSSA overview is highly recommended reading, particularly for new and junior faculty whose research is in the social and behavioral sciences. Faculty in these disciplines are often dispersed across multiple colleges and departments, and for a good number of them, finding a "funding home" at federal agencies can be a challenge. This is particularly the case for many new PhD's beginning careers as assistant professors for whom research funding is part of the expectation for promotion and tenure.

New faculty in the social and behavioral sciences frequently have to do a significant about of digging for funding if their area of research does not fall neatly into the funding opportunities at such agencies as NSF, HHS, and DoED. This COSSA document together with its many referenced agency-specific URLs related to the FY 2017 budget is a good starting point for those whose research funding journey requires a lot of "rummaging " around at federal agency, foundation, and association websites to find a good portal to funding success.

Often, the most helpful way to find funding in more challenging areas is to have a good lead on where to start. This COSSA analysis is such a good lead and offers numerous potential funding tentacles into multiple funding agencies specific to SBS research. Some examples related to SBS research include the below extracted from the COSSA report.

Finally, given the large role of SBS across NIH, COSSA noted that "As part of the National Institutes of Health (NIH) Office of Behavioral and Social Sciences Research (OBSSR) strategic planning process to update its 2007 strategic plan for fiscal years (FY) 2016-2020 the Office ***plans to reconsider NIH's definition of behavioral and social sciences*** (BSSR). In his recent *OBSSR Connector* blog post, OBSSR Director William Riley explained that the office is Congressionally mandated to 'define behavioral and social sciences research to assess and monitor NIH funding.' As a consequence, the current definition resulted in a high level taxonomy of BSSR and delineates basic versus applied behavioral and social sciences research with a range of examples for each."

NIH National Institute on Aging

The FY 2017 budget request for the National Institute on Aging (NIA) is $1.6 billion, the FY 2016 funding level. The programs supported by NIA, however, will experience a slight decrease in their FY 2017 budgets. **The budget request for NIA's Behavioral and Social Research (BSR) Program is $209.6 million, roughly flat with the FY 2016 funding level**. Planned

BSR initiatives for 2017 include support for research on "mid-life adults that can inform efforts to optimize health and well-being, prevent illness and disability in later years, and potentially reverse the negative impact of early life adversity on later life health." BSR plans to support adding respondents from the "Late Baby Boom" cohort, thereby expanding the collection of objective health measures and conducting a nationally-representative study of cognitive impairment and dementia to allow for international comparisons to the Health and Retirement Study (HRS).

NIH Office of Behavioral and Social Sciences Research

Within the Office of the Director, the request for the Office of Behavioral and Social Sciences Research (OBSSR) is also the same as the FY 2016 funding level of $26.7 million. OBSSR would use the funds to complete several program evaluation projects it began in FY 2015, laying the foundation for its strategic planning, including an assessment of the various OBSSR-supported training programs. These programs use the Community-Based Participatory Research approach, and a **comprehensive analysis of the NIH behavioral and social sciences research portfolio**. OBSSR would also use the funds to "stimulate the development and adoption of new and innovative behavioral and social science methodologies and measures via new initiatives, workshops, and training." The Office intends to produce a compendium of methods for researchers targeting health outcomes. In addition, OBSSR plans to continue participating in collaborations designed to "advance mobile and wireless health research, data harmonization, integration, and the development of a common behavioral ontology to promote data sharing in the behavioral and social sciences."

The Office also intends to **release a new funding opportunity announcement**, "*Education and Health: New Frontiers*," designed to illuminate the "pathways involved in the relationship between education and health outcomes, identify the specific aspects and qualities of education that are responsible for this relationship, and determine the mediating factors that influence the robust relationship of education and health and contribute to health disparities."

Institute of Education Sciences

The FY 2017 budget request for the Department of Education's Institute of Education Sciences (IES) is $692.8 million, an increase of $75 million above the FY 2016 funding level. The request includes $209.3 million for research, development, and dissemination (RDD), an increase of $14.3 million above the FY 2016 level, along with increased funding for "research related to postsecondary education and funds to enhance the Department's program performance data." RDD programs and activities include: (1) National Center for Education Research's (NCER) education research grants, national research and development centers, research training, and small business innovation research; and (2) National Center for Education Evaluation's What Works Clearinghouse (WWC), Education Resources Information Center (ERIC), National Library of Education (NLE), and the National Board for Education Sciences (NBES). **The proposed increase in funding would also allow IES to fund approximately $52.3 million in new research awards** and provide an increase of $2 million to enhance dissemination activities. The FY 2017 budget request includes $175.7 million for NCER grant programs.

Department of Defense

The Department of Defense (DOD) has taken steps in recent years to **better harness social science expertise and apply it to its national defense efforts**. Most notable is the Minerva Research Initiative, which began in 2008 at the behest of then-Secretary of Defense Robert Gates. **Minerva is a university-based social science research program** that seeks to "improve DOD's basic understanding of the social, cultural, behavioral, and political forces that shape regions of the world of strategic importance to the U.S."

U.S. Department of Agriculture

The Administration's FY 2017 request for the **Economic Research Service** (ERS) is $91.3 million, a $5.9 million increase from FY 2016. Of the proposed increase, $4 million would be used to conduct a second round of the National Household Food Purchase and Acquisition Survey (FoodAPS). The first FoodAPS was initiated in 2009 and **collected never-before-available data** on Americans' food purchase patterns, providing particular insight into the factors influencing the choices of poor and low-income households. **ERS proposes an updated version of FoodAPS that could be conducted regularly every six or seven years**.

The **National Agricultural Statistics Service** (NASS), **one of two statistical agencies** within USDA, would receive an $8.2 million increase for its core agricultural estimates. The request would create a new $3 million initiative to collect data from new and beginning farmers that would help gauge the effectiveness of USDA programs aimed at that audience. The request proposes flat funding from FY 2016 ($42.2 million) for the **quinquennial Census of Agriculture**. The next Census will be conducted in FY 2018, with no follow-on special studies to be conducted during the preparation year for the Census.

National Oceanic and Atmospheric Administration

The budget request includes a total of $5.85 billion in discretionary funding for the National Oceanic and Atmospheric Administration (NOAA), an increase of 1.3 percent. While NOAA is first and foremost a mission agency and not a basic science grant-making agency like the National Science Foundation, NOAA relies on science from its internal laboratories and experts from throughout the extramural research community to inform its many services and activities. **In particular, NOAA has been looking in recent years at ways to better utilize social and behavioral science, particularly as it relates to risk communication.** NOAA released a five-year research and development plan in 2013. **In it, the agency makes several references to greater utilization of social science**.

Department of Energy

The Department of Energy does not have a dedicated social and behavioral science research program, though it funds basic and applied research through its Office of Science and Advanced Research Projects Agency-Energy (ARPA-E). The Department's 2015 Quadrennial Technology Review **noted several areas in which insights from the social sciences can play a role in research, development, and demonstration activities**. The Department houses the Energy Information Administration, the principal statistical agency that reports objective information on the energy sector.

Agency for Healthcare Research and Quality

The Agency for Healthcare Research and Quality (AHRQ) funds research on improving the quality, safety, efficiency, and effectiveness of America's health care system. **The FY 2017 request calls for $363.7 million in discretionary funds, which would restore AHRQ to its FY 2015 funding level, undoing the effects of an 8.2 percent cut in FY 2016**. The cut for FY 2016 was a compromise with the Administration after AHRQ was initially proposed for much larger cuts in the Senate and total elimination in the House. The President's request calls for $83.5 million of AHRQ's discretionary funding to come from Public Health Service (PHS) Evaluation transfers (sometimes called the "evaluation tap"). This funding mechanism has historically been unpopular with many in Congress, and appropriators have not utilized it for AHRQ's funding since FY 2014.

Research Grant Writing Web Resources

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Updates on Addressing Rigor in Your NIH Applications

To briefly recap, in October, NIH announced updates to the application instructions and review criteria for most research grants and individual mentored career development awards. These updates instruct applicants to address four key areas NIH deems important for enhancing rigor and transparency in research: 1) the scientific premise forming the basis of the proposed research; 2) rigorous experimental design for valid, robust, and unbiased results; 3) consideration of relevant biological variables; and 4) authentication of key biological and/or chemical resources. My October blog post, "Bolstering Trust in Science Through Rigorous Standards," describes the rationale behind the changes and the steps NIH has taken to engage the community in these efforts. For the January 25, 2016 application due dates, the updates apply to most NIH research grant applications, with some exceptions, as described in the October NIH Guide notice. We also announced requirements to address rigor in individual mentored career development award applications submitted after January 25, 2016. In addition, Research Performance Progress Reports (RPPR) for these programs must also address rigor if they are submitted on or after January 25**.**

NSF Grants Conference hosted by Portland State University - February 29 - March 1, 2016

- **Introduction and NSF Overview**
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- **NSF Merit Review Process**
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Archived Webcast of Fall 2015 NSF Grants Conference

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Computational Thinking in K-12 : A Review of the State of the Field

Jeannette Wing's influential article on computational thinking 6 years ago argued for adding this new competency to every child's analytical ability as a vital ingredient of science, technology, engineering, and mathematics (STEM) learning. What is computational thinking? Why did this article resonate with so many and serve as a rallying cry for educators, education researchers, and policy makers? How have they interpreted Wings definition, and what advances have been made since Wings article was published? This article frames the current state of discourse on computational thinking in K-12 education by examining mostly recently published academic literature that uses Wing's article as a springboard, identifies gaps in research, and articulates priorities for future inquiries.

Math, Science, and Engineering Integration in a High School Engineering Course: A Qualitative Study

Engineering in K-12 classrooms has been receiving expanding emphasis in the United States. The integration of science, mathematics, and engineering is a benefit and goal of K-12 engineering; however, current empirical research on the efficacy of K-12 science, mathematics, and engineering integration is limited. This study adds to this growing field, using discourse analysis techniques to examine whether and why students integrate math and science concepts into their engineering design work. The study focuses on student work during a unit from a high school engineering course. Video data were collected during the unit and were used to identify episodes of students discussing math and science concepts. Using discourse analysis, the authors found that students successfully applied math and science concepts to their engineering design work without teacher prompting when the concepts were familiar. However, explicit teacher prompting and instruction regarding the integration of less familiar concepts did not seem to facilitate student use of those concepts. Possible explanations and implications are discussed.

Webinar: Measuring Impacts of Partnerships

The Research-Practice Partnerships Forum is a monthly webinar series created by the Research + Practice Collaboratory to discuss challenges, successes, and strategies for doing collaborative work in education. Every month, our host, Bill Penuel, invites a panel of researchers and educators involved in research-practice partnerships (RPPs) across the country to share their experiences and resources for new and ongoing collaborations.
Join the live stream every third Thursday starting at 5pm ET and follow the conversation at #RPPchat on Twitter. Watch the Webinars:
RPP Forum: Getting a Partnership Started (October 15, 2015)
RPP Forum: Defining the Focus of Partnership Work (November 19, 2015)
RPP Forum: Negotiating Roles in Partnerships (December 15, 2015)
RPP Forum: Addressing Challenges in Partnerships (January 21, 2016)

RPP Forum: Measuring Impacts of Partnerships (February 18, 2016)
RPP Forum: Sustaining Partnerships (March 17, 2016)

Agency Research News

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Institute of Education Sciences (IES): Education Research CFDA Number 84.305A; Notice inviting applications for new awards for fiscal year (FY) 2017

The Institute will conduct nine research competitions in FY 2017 through two of its centers: Catalog of Federal Domestic Assistance (CFDA) Numbers: 84.305A, 84.305B, 84.305D, 84.305H, 84.305L, 84.305N, 84.324A, 84.324B, and 84.324L. The Deputy Director for Policy and Research, Delegated the Duties of the Director, of the Institute of Education Sciences (Institute) announces the Institute's FY 2017 competitions for grants to support education research and special education research. The Delegated Director takes this action under the Education Sciences Reform Act of 2002. The Institute's purpose in awarding these grants is to provide national leadership in expanding fundamental knowledge and understanding of (1) developmental and school readiness outcomes for infants and toddlers with or at risk for disability, and (2) education outcomes for all students from early childhood education through postsecondary and adult education. Applications for grants under the Education Research, Research Training Programs in the Education Sciences, Statistical and Research Methodology in Education, Partnerships and Collaborations Focused on Problems of Practice or Policy, Low-Cost, Short-Duration Evaluation of Education Interventions, Research Networks Focused on Critical Problems of Education Policy and Practice, Special Education Research, Research Training Programs in Special Education, and Low-Cost, Short-Duration Evaluation of Special Education Interventions competitions, CFDA numbers 84.305A, 84.305B, 84.305D, 84.305H, 84.305L, 84.305N, 84.324A, 84.324B, and 84.324L must be submitted electronically using the Governmentwide Grants.gov Apply site at www.Grants.gov. Through this site, you will be able to download a copy of the application package, complete it offline, and then upload and submit your application.

Dear Colleague Letter: I-Corps L - Stimulating Innovation in STEM Education

To challenge NSF researchers to think beyond their research results and toward broader adoption of STEM education and learning innovations, NSF's Innovation Corps Teams Program (I-Corps Teams - a description of which can be found in the I-Corps Teams solicitation) encourages submission of proposals that utilize recent discoveries and promising practices from STEM education research and development and promote opportunities for their widespread adoption, adaptation, and utilization. I-Corps for Learning (I-Corps L) Teams will receive support - in the form of mentoring and funding - to accelerate innovation in learning that can be successfully scaled, in a sustainable manner. I-Corps L promotes an entrepreneurial approach to getting the best evidence-based practices out to potential adopters where those practices can benefit large numbers of students or learners, rather than just in a few classrooms or informal learning organizations. There are a number of analogous elements between trying to bring product discoveries to market and getting learning innovations into broad practice that the research community can leverage to help promote widespread use of promising educational learning practices. Through I-Corps L, the tools of science can benefit education

researchers by helping them to identify approaches that are effective in STEM teaching and learning.

Dear Colleague Letter: National Brain Observatory: A Phased Approach for Developing a National Research Infrastructure for Neuroscience

With this Dear Colleague Letter (DCL), the National Science Foundation (NSF) is announcing the intention to foster the development of a national research infrastructure for neuroscience (National Brain Observatory) to support collaborative and team science for achieving a comprehensive understanding of the brain in action and context. Understanding the brain is one of the grand scientific challenges at the intersection of experimental, theoretical, and computational investigation in the biological, physical, social and behavioral sciences, education research, and engineering. Achieving a comprehensive understanding of the brain requires increased emphasis on systematic, multidisciplinary collaboration and team science to establish quantitative and predictive theories of brain structure and function that span levels of organization, spatial scales of study, and the diversity of species. This challenge necessitates the development of innovative, accessible, and shared capabilities, resources and cyberinfrastructure, along with the eventual organizing of these into a coherent national infrastructure for neuroscience research.

Large-scale collaborative efforts facilitated by shared instrumentation, communication, data representation, and workflow systems, and advanced computational and data resources have enabled transformative discoveries across the spectrum of scientific disciplines. In neuroscience, rapid proliferation of advanced measurement instrumentation and techniques has allowed researchers to study the brain, nervous system, cognition, and behavior at ever-finer physical and temporal scales, and generate very large datasets. However, integrative efforts in neuroscience research are hampered by a lack of systematic means for encouraging maximal utilization of existing resources, and for developing and disseminating new resources that can serve whole disciplines in collecting, managing, and analyzing large-scale data, and comparing those data to theoretical and computational models.

This multi-directorate effort is part of the NSF's Understanding the Brain activity, including NSF's participation in the Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative (http://www.nsf.gov/brain/) and the National Brain Observatory (NBO) effort. This effort will be realized through a phased approach that:

Fosters development and dissemination/deployment of innovative research resources and instrumentation, neurotechnologies and behavioral paradigms that can be applied across the phylogenetic spectrum, theoretical and computational frameworks, and data infrastructure resources while providing greater access to existing resources where possible and serving broad communities within the brain sciences;

Supports collaborative networks composed of neuroscientists, behavioral scientists, and theorists working in concert with technology and cyberinfrastructure developers on a common question or theme from a variety of perspectives; and

Facilitates the emergence of a coherent national infrastructure comprising the above shared and accessible tools, resources and networks that will allow rapid integration, analysis, and modeling of brain data associated with behaviors from multi-disciplinary projects and

enable large-scale collaborative research efforts nationally and internationally that will advance our understanding of brain structure and function.

NSF plans to continue to release Dear Colleague Letters and Solicitations with refined guidance and specific funding opportunities aligned with each of the three phases described above, as this campaign continues into the future. NSF anticipates that this initiative will usher in a new frontier of brain exploration by empowering research communities to cooperatively collect, share, analyze, and model data across molecular, cellular, organismal, developmental, behavioral and evolutionary levels in order to reveal the fundamental principles of nervous system function and complex behavior. If you have questions concerning this DCL, please contact a program officer representing the program or solicitation of interest.

Agency Reports, Workshops & Research Roadmaps

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Effective Chemistry Communication in Informal Environments

Chemistry plays a critical role in daily life, impacting areas such as medicine and health, consumer products, energy production, the ecosystem, and many other areas. Communicating about chemistry in informal environments has the potential to raise public interest and understanding of chemistry around the world. However, the chemistry community lacks a cohesive, evidence-based guide for designing effective communication activities. This report is organized into two sections. Part A: The Evidence Base for Enhanced Communication summarizes evidence from communications, informal learning, and chemistry education on effective practices to communicate with and engage publics outside of the classroom; presents a framework for the design of chemistry communication activities; and identifies key areas for future research. Part B: Communicating Chemistry: A Framework for Sharing Science is a practical guide intended for any chemists to use in the design, implementation, and evaluation of their public communication efforts.

Statistical Challenges in Assessing and Fostering the Reproducibility of Scientific Results:

Summary of a Workshop (2016)

Attribution of Extreme Weather Events in the Context of Climate Change

As climate has warmed over recent years, a new pattern of more frequent and more intense weather events has unfolded across the globe. Climate models simulate such changes in extreme events, and some of the reasons for the changes are well understood. Warming increases the likelihood of extremely hot days and nights, favors increased atmospheric moisture that may result in more frequent heavy rainfall and snowfall, and leads to evaporation that can exacerbate droughts. Even with evidence of these broad trends, scientists cautioned in the past that individual weather events couldn't be attributed to climate change. Now, with advances in understanding the climate science behind extreme events and the science of extreme event attribution, such blanket statements may not be accurate. The relatively young science of extreme event attribution seeks to tease out the influence of human-cause climate change from other factors, such as natural sources of variability like El Niño, as contributors to individual extreme events. Event attribution can answer questions about how much climate change influenced the probability or intensity of a specific type of weather event. As event attribution capabilities improve, they could help inform choices about assessing and managing risk, and in guiding climate adaptation strategies. This report examines the current state of science of extreme weather attribution, and identifies ways to move the science forward to improve attribution capabilities.

Developing a National STEM Workforce Strategy: A Workshop Summary

The future competitiveness of the United States in an increasingly interconnected global economy depends on the nation fostering a workforce with strong capabilities and skills in

science, technology, engineering, and mathematics (STEM). STEM knowledge and skills enable both individual opportunity and national competitiveness, and the nation needs to develop ways of ensuring access to high-quality education and training experiences for all students at all levels and for all workers at all career stages. The National Science Foundation (NSF) holds a primary responsibility for overseeing the federal government's efforts to foster the creation of a STEM-capable workforce. As part of its efforts in this endeavor, NSF's Directorate on Education and Human Resources asked the National Academies of Sciences, Engineering, and Medicine to convene a workshop that would contribute to NSF's preparation of a theoretical and evidence-based STEM Workforce Development R&D Core Framework. Participants discussed research themes, identified gaps and emerging research opportunities, and recommended refinements in the goals of the framework. This report summarizes the presentations and discussions from the workshop.

Statistical Challenges in Assessing and Fostering the Reproducibility of Scientific Results: Summary of a Workshop

Questions about the reproducibility of scientific research have been raised in numerous settings and have gained visibility through several high-profile journal and popular press articles. Quantitative issues contributing to reproducibility challenges have been considered (including improper data measurement and analysis, inadequate statistical expertise, and incomplete data, among others), but there is no clear consensus on how best to approach or to minimize these problems.

A lack of reproducibility of scientific results has created some distrust in scientific findings among the general public, scientists, funding agencies, and industries. While studies fail for a variety of reasons, many factors contribute to the lack of perfect reproducibility, including insufficient training in experimental design, misaligned incentives for publication and the implications for university tenure, intentional manipulation, poor data management and analysis, and inadequate instances of statistical inference.

The workshop summarized in this report was designed not to address the social and experimental challenges but instead to focus on the latter issues of improper data management and analysis, inadequate statistical expertise, incomplete data, and difficulties applying sound statistic inference to the available data. Many efforts have emerged over recent years to draw attention to and improve reproducibility of scientific work. This report uniquely focuses on the statistical perspective of three issues: the extent of reproducibility, the causes of reproducibility failures, and the potential remedies for these failures.

Infusing Ethics into the Development of Engineers: Exemplary Education Activities and Programs

Ethical practice in engineering is critical for ensuring public trust in the field and in its practitioners, especially as engineers increasingly tackle international and socially complex problems that combine technical and ethical challenges. This report aims to raise awareness of the variety of exceptional programs and strategies for improving engineers' understanding of ethical and social issues and provides a resource for those who seek to improve ethical development of engineers at their own institutions. This publication presents 25 activities and programs that are exemplary in their approach to infusing ethics into the development of

engineering students. It is intended to serve as a resource for institutions of higher education seeking to enhance their efforts in this area.

New Funding Opportunities

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Content Order

New Funding Posted Since February 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 typically work as well.]

New Funding Solicitations Posted Since February 15 Newsletter

Collaborative Research in Magnetic Fusion Energy Sciences on International Long-Pulse Superconducting Tokamaks, Department of Energy - Office of Science

The Office of Fusion Energy Sciences (FES) of the Office of Science (SC), U.S. Department of Energy (DOE), hereby announces its interest in receiving applications from multi-institutional teams to carry out experimental research in magnetic fusion energy sciences on international long-pulse superconducting tokamak facilities. The FES Burning Plasma Science: Long Pulse: Tokamak program element supports U.S scientific teams who work in collaboration with overseas scientists to explore critical science and technology issues at the frontiers of magnetic fusion research, including the exploration of new plasma physics regimes. These collaborations take advantage of the unique capabilities of the most advanced international research facilities and allow the U.S. fusion program to gain the knowledge needed to operate long duration plasma discharges in ITER and other fusion energy devices. The specific areas of interest for this FOA involve the major scientific challenge of achieving high-performance core plasma regimes suitable for long pulse. Specific topical areas of interest include: 1. Studying and developing high-performance operating states that can be robustly produced, sustained, and controlled for long periods of time; 2. Understanding boundary and scrape-off layer physics and developing and demonstrating divertor solutions that provide improved power handling, acceptable target plate erosion and compatibility with good core confinement; 3. Understanding the processes that couple the plasma to the material walls, including actuators for sustainment and control, and developing and demonstrating integrated solutions for the plasma material interface that extrapolate to steady-state reactor application; and 4. Establishing the physics and engineering of auxiliary systems that provide the means of controlling plasmas for long periods. To be considered for funding, applicants must have discussed their proposed research with the program leaders and key scientific collaborators at the international facility or facilities where they propose to carry out collaborative research. Applicants must provide a letter of collaboration or other indication of common understanding for the proposed research from a

program leader at each facility, which should include the specific commitments in terms of local resources made by each facility, as well as describe the respective roles, responsibilities and mode of interaction between the hosts and collaborators. **Due April 28**.

Biological Control, Solicitation Number: DARPA-BAA-16-17

The objective of the DARPA Biological Control program is to build new capabilities for the control of biological systems across scales from nanometers to centimeters, seconds to weeks, and biomolecules to populations of organisms using embedded controllers made of biological parts to program system-level behavior. **Due April 29.**

Humanities Access Grants, National Endowment for the Humanities

Humanities Access grants help support capacity building for humanities programs that benefit one or more of the following groups: youth, communities of color, and economically disadvantaged populations. Humanities Access grants establish or augment term endowments (that is, endowments whose funds are entirely expended over the course of a set time period) to provide funding for existing programs at institutions such as public libraries, local and regional museums, historical societies, community colleges, HBCUs and tribal colleges, Hispanic-serving institutions, archival repositories, and other cultural organizations. Humanities Access grants are intended to seed longer-term endowment-building efforts. Programs supported by Humanities Access grants might include, for example: a summer project for teens at a local historical society; internships for Native American students at a tribal museum; or a Clemente course at a homeless shelter organized by a community college. Humanities Access Grants offer two years of match-based funding to be expended through a term endowment over the final three years of the five-year grant period. Humanities Access grant funds should not be used to replace existing program funds. Instead, the grant should expand or enhance an existing exemplary humanities program. Institutions that have never received an NEH grant and small to mid-sized institutions are especially encouraged to apply. **Due May 4.**

NSF/USDA/NIFA 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 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. The program welcomes proposals on the dynamics of initiation, transmission, maintenance and outcome of these complex associations, including studies of metabolic interactions, immune recognition and signaling, host-symbiont regulation, reciprocal responses among interacting

species and mechanisms associated with self/non-self recognition such as those in pollen-pistil interactions. Explanatory frameworks may include molecular, genomic, metabolic, cellular, network and organismal processes, with projects guided by hypothesis and/or discovery driven experimental approaches. Where appropriate, quantitative modeling in concert with experimental work is encouraged. Overall, the program seeks to support research that will deepen our understanding of the fundamental processes that mediate interactions between plants and the organisms with which they intimately associate and advance the application of that fundamental knowledge to benefit agriculture. Note that PBI does not require submission of preliminary proposals. **Due June 6**.

Materials Research Science and Engineering Centers

Materials Research Science and Engineering Centers (MRSECs) provide sustained support of interdisciplinary materials research and education of the highest quality while addressing fundamental problems in science and engineering. MRSECs address research of a scope and complexity requiring the scale, synergy, and interdisciplinarity provided by a campus-based research center. They support materials research infrastructure in the United States, promote active collaboration between universities and other sectors, including industry and international institutions, and contribute to the development of a national network of university-based centers in materials research, education, and facilities. A MRSEC may be located at a single institution, or may involve multiple institutions in partnership. **Preliminary July 1; full December 2.**

Joint DMS/NIGMS Initiative to Support Research at the Interface of the Biological and Mathematical Sciences (DMS/NIGMS)

The Division of Mathematical Sciences in the Directorate for Mathematical and Physical Sciences at the National Science Foundation and the National Institute of General Medical Sciences at the National Institutes of Health plan to support research in mathematics and statistics on questions in the biological and biomedical sciences. Both agencies recognize the need and urgency for promoting research at the interface between the mathematical sciences and the life sciences. This program is designed to encourage new collaborations, as well as to support existing ones. **Due September 14.**

Bridges to the Baccalaureate (R25)

The NIH Research Education Program (R25) supports research education activities in the mission areas of the NIH. The over-arching goal of this NIGMS R25 program is to support educational activities that enhance the diversity of the biomedical, behavioral and clinical research workforce. To accomplish the stated over-arching goal, this FOA will support creative educational activities with a primary focus on Courses for Skills Development, Research Experiences, and Curriculum or Methods Development. A proposed program must include each activity and describe how they will be integrated. The Bridges to Baccalaureate Program is intended to provide these activities to community college students to increase transfer and retention to BS graduation in biomedical sciences. This program requires partnerships between community colleges or other two-year post-secondary educational institutions granting the associate degree with colleges or universities that offer the baccalaureate degree. Applicants

should directly address how the set of activities will complement and/or enhance the training of a workforce to meet the nation's biomedical and clinical research needs by discussing 1) the rationale underlying the balance of effort and resources dedicated to each activity; 2) how the activities integrate; and 3) objective indicators that can measure the effectiveness of the program. Recruitment and retention plans are required elements of the program. **Due September 25**.

Bridges to the Doctorate (R25)

The NIH Research Education Program (R25) supports research education activities in the mission areas of the NIH. The over-arching goal of this NIGMS R25 program is to support educational activities that enhance the diversity of the biomedical, behavioral and clinical research workforce. To accomplish the stated over-arching goal, this FOA will support creative educational activities with a primary focus on Courses for Skills Development and Research Experiences. The Bridges to Doctorate Program is intended to provide these activities to master's level students to increase transition to and completion of PhDs in biomedical sciences. This program requires partnerships between master's degree-granting institutions with doctorate degree-granting institutions. Applicants should directly address how the set of activities will complement and/or enhance the training of a diverse workforce that also meets the nation's biomedical and clinical research needs by discussing 1) the rationale underlying the balance of effort and resources dedicated to each activity; 2) how the activities integrate; and 3) objective indicators that can measure the effectiveness of the program. A program application must include each activity, and describe how they will be synergized to make a comprehensive program. Additionally, recruitment and retention plans are expected as part of the application. **Due September 25.**

URL Links to New & Open Funding Solicitations

- **HHS Grants Forecast**
- **American Cancer Society Index of Grants**
- **SAMHSA FY 2014 Grant Announcements and Awards**
- **DARPA Microsystems Technology Office Solicitations**
- **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**
- **NIAID Funding Opportunities List**
- **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)**

- HHS Grants Forecast
- American Psychological Association, Scholarships, Grants and Awards
- EPA 2014 Science To Achieve Results (STAR) Research Grants
- NASA Open Solicitations
- Defense Sciences Office Solicitations
- The Mathematics Education Trust
- EPA Open Funding Opportunities
- CDMRP FY 2014 Funding Announcements
- Office of Minority Health
- Department of Justice Open Solicitations
- DOE/EERE Funding Opportunity Exchange
- New Funding Opportunities at NIEHS (NIH)
- National Human Genome Research Institute Funding Opportunities
- Army Research Laboratory Open Broad Agency Announcements (BAA)
- SBIR Gateway to Funding
- Water Research Funding
- Fellowship and Grant Opportunities for Faculty Humanities and Social Sciences
- DARPA Current Solicitations
- Office of Naval Research Currently Active BAAs
- HRSA Health Professions Open Opportunities
- NIH Funding Opportunities Relevant to NIAID
- National Institute of Justice Current Funding Opportunities
- Funding Opportunities by the Department of Education Discretionary Grant Programs
- EPA's Office of Air and Radiation (OAR) Open Solicitations
- NETL Open Solicitations
- DoED List of Currently Open Grant Competitions
- Foundation Center RFP Weekly Funding Bulletin

Solicitations Remaining Open from Prior Issues of the Newsletter

USDA-NIFA-ICGP-005596 Organic Transitions

The overall goal of the Organic Transitions Program (ORG) is to support the development and implementation of research, extension and higher education programs to improve the competitiveness of organic livestock and crop producers, as well as those who are adopting organic practices. In FY 2014, ORG will continue to prioritize environmental services provided by organic farming systems in the area of soil conservation and climate change mitigation, including greenhouse gases (GHG). Two new priorities have been added to support (1) the development of educational tools for Cooperative Extension personnel and other agricultural professionals who advise producers on organic practices and (2) the development of cultural practices and other allowable alternatives to substances recommended for removal from the National Organic Programs National List of Allowed and Prohibited Substances. Practices and

systems to be addressed include those associated with organic crops, organic animal production, and organic systems integrating plant and animal production. **Due April 15.**

Capacity Building Grants for Non-Land Grant Colleges of Agriculture Program (NLGCA)
NLGCA Institutions may use the funds: (a) to successfully compete for funds from Federal grants and other sources to carry out educational, research, and outreach activities that address priority concerns of national, regional, State, and local interest; (b) to disseminate information relating to priority concerns to interested members of the agriculture, renewable resources, and other relevant communities, the public, and any other interested entity; (c) to encourage members of the agriculture, renewable resources, and other relevant communities to participate in priority education, research, and outreach activities by providing matching funding to leverage grant funds; and (d) through: (1) the purchase or other acquisition of equipment and other infrastructure (not including alteration, repair, renovation, or construction of buildings); (2) the professional growth and development of the faculty of the NLGCA Institution; and (3) the development of graduate assistantships. **Due April 22.**

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.]

DARPA-BAA-15-27 Innovative Systems for Military Missions
The Tactical Technology Office of the Defense Advanced Research Projects Agency is soliciting executive summaries, white papers and proposals for advanced research and development of innovative systems for military missions. This solicitation seeks system and subsystem level technologies that enable revolutionary improvements to the efficiency and effectiveness of the military. Novel concepts are sought in the following focus areas: Ground Systems, Maritime Systems, Air Systems, and Space Systems. Refer to the URL stated below for complete details of the BAA. **Open to April 29, 2016.**

APS-OAA-15-000048 U.S. Agency for International Development (Higher Education Partnerships for Innovation and Impact (HEPII) Annual Program Statement (APS)
The United States Agency for International Development (USAID) is seeking concept papers from qualified U.S. and non-U.S. higher education institutions (HEIs) to work with USAID to advance strategic priorities and objectives and achieve sustainable development outcomes, results, and impact. This Annual Program Statement (APS) has the flexibility to award Cooperative Agreements, Grants, Fixed Amount Awards, and leader with Associate Awards. This APS is not supported by specific funding, and any funding for any USAID-HEI partnership proposed under this APS would have to be requested from the specific USAID Mission, Bureau, or Independent Office with which the prospective applicant seeks to collaborate and to which the Concept Paper will be submitted. USAID seeks to optimize its relationship with HEIs by identifying and promoting successful partnerships and collaboration models, and increasing

USAID's access to higher education technical resources. The purpose of this APS is to promote opportunities for leveraging HEI capabilities across USAID's portfolio and its program cycle, and strengthen developing country HEI capabilities to respond to and solve critical development challenges. **Original Closing Date for Applications: Jun 29, 2016**

DARPA-BAA-15-39 DSO Office-wide BAA Department of Defense

The mission of the Defense Advanced Research Projects Agency (DARPA) Defense Sciences Office (DSO) is to identify and pursue high-risk, high-payoff research initiatives across a broad spectrum of science and engineering disciplines and to transform these initiatives into important, radically new, game-changing technologies for U.S. national security. In support of this mission, this DSO Office-wide BAA invites proposers to submit innovative basic or applied research concepts in one or more of the following technical areas: Physical Systems; Mathematics, Modeling and Design; and Human-Machine Systems. Each of these areas is described below and includes a list of example research topics. For each technical area addressed, proposed research should investigate innovative approaches that enable revolutionary advances. DSO is explicitly not interested in approaches or technologies that primarily result in evolutionary improvements to the existing state of practice. **Open to July 2, 2016.**

FY 2016 Continuation of Solicitation for the Office of Science Financial Assistance Program

The Office of Science (SC) of the Department of Energy hereby announces its continuing interest in receiving grant applications for support of work in the following program areas: Advanced Scientific Computing Research, Basic Energy Sciences, Biological and Environmental Research, Fusion Energy Sciences, High Energy Physics, and Nuclear Physics. On September 3, 1992, DOE published in the Federal Register the Office of Energy Research Financial Assistance Program (now called the Office of Science Financial Assistance Program), 10 CFR 605, as a Final Rule, which contained a solicitation for this program. Information about submission of applications, eligibility, limitations, evaluation and selection processes and other policies and procedures are specified in 10 CFR 605. This Funding Opportunity Announcement (FOA), DE-FOA-0001414, is our annual, broad, open solicitation that covers all of the research areas in the Office of Science and is open throughout the Fiscal Year. **This FOA will remain open until September 30, 2016**, 11:59 PM Eastern Time, or until it is succeeded by another issuance, whichever occurs first.

DoD USAMRMC FY16 Broad Agency Announcement for Extramural Medical Research

The U.S. Army Medical Research and Materiel Command's (USAMRMC) mission is to provide solutions to medical problems of importance to the American Service member at home and abroad, as well as to the general public at large. The scope of this effort and the priorities attached to specific projects are influenced by changes in military and civilian medical science and technology, operational requirements, military threat assessments, and national defense strategies. The extramural research and development programs play a vital role in the fulfillment of the objectives established by the USAMRMC. General information on USAMRMC can be obtained at https://mrmc.detrick.army.mil/ . This Fiscal Year 2016 (FY16) Broad Agency Announcement (BAA) is intended to solicit extramural research and development ideas and is

issued under the provisions of the Competition in Contracting Act of 1984 (Public Law 98-369), as implemented in Federal Acquisition Regulation (FAR) 6.102(d)(2) and 35.016. In accordance with FAR 35.016, projects funded under this BAA must be for basic and applied research and that part of development not related to the development of a specific system or hardware procurement. Projects must be for scientific study and experimentation directed toward advancing the state-of-the-art or increasing knowledge or understanding rather than focusing on a specific system or hardware solution. Research and development funded through this BAA is intended and expected to benefit and inform both military and civilian medical practice and knowledge. This BAA provides a general description of USAMRMC's research and development programs, including research areas of interest, evaluation and selection criteria, pre-proposal/pre-application and full proposal/application preparation instructions, and general administrative information. Specific submission information and additional administrative requirements can be found in the document titled "General Submission Instructions" available in Grants.gov along with this BAA. This FY16 BAA is continuously open for a 12-month period, from October 1, 2015 through September 30, 2016, at 11:59 p.m. Eastern Time. Submission of a pre-proposal/pre-application is required and must be submitted through the electronic Biomedical Research Application Portal (eBRAP) (https://eBRAP.org/). Pre-proposals/pre-applications may be submitted at any time throughout the 12-month period. If the USAMRMC is interested in receiving a full proposal/application, the PI will be sent an invitation to submit via eBRAP. A full proposal/application must be submitted through Grants.gov (http://www.grants.gov/). **Invited full proposals/applications can be submitted under the FY16 BAA through September 30, 2016**.

W912HZ-16-BAA-01 2016 Broad Agency Announcement Department of Defense Engineer Research and Development Center

The U.S. Army Engineer Research and Development Center (ERDC) has issued a Broad Agency Announcement (BAA) for various research and development topic areas. The ERDC consists of the Coastal and Hydraulics Lab (CHL), the Geotechnical and Structures Lab (GSL), the Environmental Lab (EL), and the Information Technology Lab (ITL) in Vicksburg, Mississippi; the Cold Regions Research and Engineering Lab (CRREL) in Hanover, New Hampshire; the Construction Engineering Research Lab (CERL) in Champaign, Illinois; and the Topographic Engineering Center (TEC) in Alexandria, Virginia. The ERDC is responsible for conducting research in the broad fields of hydraulics, dredging, coastal engineering, instrumentation, oceanography, remote sensing, geotechnical engineering, earthquake engineering, soil effects, vehicle mobility, self-contained munitions, military engineering, geophysics, pavements, protective structures, aquatic plants, water quality, dredged material, treatment of hazardous waste, wetlands, physical/mechanical/chemical properties of snow and other frozen precipitation, infrastructure and environmental issues, computer science, telecommunications management, energy, facilities maintenance, materials and structures, engineering processes, environmental processes, land and heritage conservation, and ecological processes. The BAA is available at http://erdc.usace.army.mil and is open until superseded. Proposals may be accepted at any time. For questions regarding proposals to CHL, EL, GSL, TEC & ITL, contact Mike Lee at 601-634-3903 or via email at Michael.G.Lee@usace.army.mil . For questions regarding proposals to CERL, contact Wanda Huber at 217-373-6730 or via email at

Wanda.L.Huber@usace.army.mil or Andrea Krouse at 217-373-6746 or via email at Andrea.J.Krouse@usace.army.mil . For questions regarding proposals at CRREL, contact Ashley Jenkins at 217-373-7297 or via email at Ashley.M.Jenkins@usace.army.mil . Contact the technical personnel listed at the end of each topic area for questions concerning the topic areas themselves. **Open until January 31, 2017**.

Open Solicitations from IARPA (Intelligence Advanced Research Projects Activity)
Army Research Laboratory Broad Agency Announcement for Basic and Applied Scientific Research
This Broad Agency Announcement (BAA), which sets forth research areas of interest to the **Army Research Laboratory** (ARL) Directorates and Army Research Office (ARO), is issued under the paragraph 6.102(d)(2) of the Federal Acquisition Regulation (FAR), which provides for the competitive selection of basic research 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 provision of Public Law 98-369, "The Competition in Contracting Act of 1984" and subsequent amendments. **Open June 1, 2012 to March 31, 2017**.

W911NF-12-R-0012 Army Research Office Broad Agency Announcement for Basic and Applied Scientific Research
The purpose of this Broad Agency Announcement (BAA) is to solicit research proposals in the engineering, physical, life, and information sciences for submission to the Army Research Office (ARO) for consideration for possible funding. For ease of reference, this BAA is an extraction of the ARO sections of the Army Research Laboratory BAA.
(www.arl.army.mil/www/default.cfm?page=8). **Open to May 31, 2017**

ARL Core Broad Agency Announcement for Basic and Applied Scientific Research for Fiscal Years 2012 through 2017

University Small Grants Broad Agency Announcement
This is a five-year, open-ended Broad Agency Announcement (BAA) to solicit research proposals for the United States Air Force Research Laboratory (AFRL) Directed Energy (RD) Directorate. This BAA is a university grant vehicle that can provide small grants of $100k or less to students/professors in a timely manner for the purpose of engaging U.S./U.S. territories' colleges and universities in directed energy-related basic, applied, and advanced research projects that are of interest to the Department of Defense. **Open to April 1, 2017.**

HM0210-14-BAA-0001 National Geospatial-Intelligence Agency Academic Research Program
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 September 30, 2017.**

NOAA-NFA-NFAPO-2016-2004791 FY2016 to FY2017 NOAA Broad Agency Announcement

This notice is not a mechanism to fund existing NOAA awards. The purpose of this notice is to request applications for special projects and programs ***associated with NOAA's strategic plan and mission goals***, as well as to provide the general public with information and guidelines on how NOAA will select proposals and administer discretionary Federal assistance under this Broad Agency Announcement (BAA). **This BAA is a mechanism to encourage research, education and outreach, innovative projects, or sponsorships that are not addressed through our competitive discretionary programs**. Funding for activities described in this notice is contingent upon the availability of Fiscal Year 2016 and Fiscal Year 2017 appropriations. Applicants are hereby given notice that funds have not yet been appropriated for any activities described in this notice. Publication of this announcement does not oblige NOAA to review an application beyond an initial administrative review, or to award any specific project, or to obligate any available funds. **Open to September 30, 2017.**

NOAA-OAR-SG-2016-2004772 National Sea Grant College Program 2016-17 Special Projects

The purpose of this notice is to request proposals for special projects associated with the National Sea Grant College Program's (Sea Grant) strategic focus areas, and to provide the general public with information and guidelines on how Sea Grant will select proposals and administer Federal assistance under this announcement. This announcement is a mechanism to encourage research or other projects that are not normally funded through Sea Grant national competitions. This opportunity is open only to Sea Grant Programs. Section III of this announcement describes eligibility requirements in more detail. Funding has not yet been made available to support applications submitted to this Federal Funding Opportunity (FFO),

but such funding may become available during the year. Section II.A. below describes individual competition announcements that will be used to announce when funding is available; any restrictions or requirements on such funding, such as matching funds; and other funding details. Awards will be made under this FFO only if funds have been announced as provided in this FFO. **Open to September 30, 2017.**

BAA-16-100-SOL-00002 Broad Agency Announcement (BAA) for the Advanced Development of Medical Countermeasures for Pandemic Influenza- BARDA

BARDA (full announcement) encourages the advanced research, development and acquisition of medical countermeasures such as vaccines, therapeutics, and diagnostics, as well as innovative approaches to meet the threat of Pandemic Influenza in support of the preparedness mission and priorities of the HHS Public Health Emergency Medical Countermeasures Enterprise (PHEMCE) articulated in the 2014 PHEMCE Implementation Plan. The Implementation Plan is located on the ASPR website: http://www.phe.gov/Preparedness/mcm/phemce/Documents/2014-phemce-sip.pdf The Pandemic and All Hazard Preparedness Act Pub. L. No. 109-417, 42 U.S.C. § 241 et seq. (PAHPA; http://www.gpo.gov/fdsys/pkg/PLAW-109publ417/pdf/PLAW-109publ417.pdf) and The Pandemic and All Hazard Preparedness Reauthorization Act Pub. L. No. 113-5, (PAHPRA: http://www.gpo.gov/fdsys/pkg/PLAW-113publ5/pdf/PLAW-113publ5.pdf) authorizes BARDA to (i) conduct ongoing searches for, and support calls for, potential qualified countermeasures and qualified pandemic or epidemic products; (ii) direct and coordinate the countermeasure and product advanced research and development activities of the Department of Health and Human Services; (iii) establish strategic initiatives to accelerate countermeasure and product advanced research and development (which may include advanced research and development for purposes of fulfilling requirements under the Federal Food, Drug, and Cosmetic Act or section 351 of this Act) and innovation in such areas as the Secretary may identify as priority unmet need areas; and (iv) award contracts, grants, cooperative agreements, and enter into other transactions, for countermeasure and product advanced research and development. Development Area of Interest: The purpose of this BAA is to solicit proposals that focus on one or more of the following area of interest as listed below: Development Area of Interest; Personal Protective Equipment (Mask and Respirators) for Influenza Infection for All- Hazards; Full-Featured Continuous Ventilators for Influenza and All-Hazards; Influenza Test Systems and Diagnostic Tools; Influenza Therapeutics; Influenza Vaccines BARDA anticipates that research and development activities awarded from this Broad Agency Announcement (BAA) will serve to advance the knowledge and scientific understanding of candidates' to protect the civilian population of the United States against pandemic influenza and serve to advance candidate medical countermeasures towards licensure or approval by the Food and Drug Administration (FDA). **Open to Oct. 24, 2017.**

AFRL Research Collaboration Program

The objective of the AFRL Research Collaboration program is to enable collaborative research partnerships between AFRL and Academia and Industry in areas including but not limited to Materials and Manufacturing and Aerospace Sensors that engage a diverse pool of domestic businesses that employ scientists and engineers in technical areas required to develop critical

war-fighting technologies for the nation's air, space and cyberspace forces through specific AFRL Core Technical Competencies (CTCs). **Open until December 20, 2017.**

United States Army Research Institute for the Behavioral and Social Sciences Broad Agency Announcement for Basic, Applied, and Advanced Scientific Research (FY13-18)

Announcement for Basic, Applied, and Advanced Scientific Research. This Broad Agency Announcement (BAA), 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 US 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. The funding opportunity is divided into two sections- (1) Basic Research and (2) Applied Research and Advanced Technology Development. The four major topic areas of research interest include the following: (1) Training; (2) Leader Development; (3) Team and Inter-Organizational Performance in Complex Environments; and (4) Solider/Personnel Issues. Funding of research and development (R&D) within ARI areas of interest will be determined by funding constraints and priorities set during each budget cycle. **Open to February 5, 2018.**

BAA-HPW-RHX-2014-0001 Human-Centered Intelligence, Surveillance Air Force Research Lab

This effort is an open-ended BAA soliciting innovative research concepts for the overall mission of the Human-Centered Intelligence, Surveillance, & Reconnaissance (ISR) Division (711 HPW/RHX). It is intended to generate research concepts not already defined and planned by RHX as part of its core S&T portfolio. The core RHX mission is to develop human-centered S&T that (1) enables the Air Force to better identify, locate and track humans within the ISR environment and (2) enhance the performance of ISR analysts. To accomplish this mission, the RHX core S&T portfolio is structured into three major research areas: (1) Human Signatures - develop technologies to sense and exploit human bio-signatures at the molecular and macro (anthropometric) level, (2) Human Trust and Interaction – develop technologies to improve human-to-human interactions as well as human-to-machine interactions, and (3) Human Analyst Augmentation – develop technologies to enhance ISR analyst performance and to test the efficacy of newly developed ISR technologies within a simulated operational environment. The RHX mission also includes research carried over from the Airman Biosciences and Performance Program. While not directly linked to the core S&T strategic plan, there exists a unique capability resident within RHX to address critical Air Force operational and sustainment needs resulting from chemical and biological hazards. Research areas include contamination detection, hazard assessment and management, individual and collective protection, and restoration and reconstitution of operational capability. **Open to Feb. 12, 2018.**

Air Force BAA - Innovative Techniques and Tools for the Automated Processing and Exploitation (APEX) Center

The AFRL/RIEA branch performs Research and Development (R&D) across a broad area of Air Force Command, Control, Communications, Computers/Cyber, and Intelligence (C4I). All applicable "INTs" are investigated with emphasis on Ground Moving Target Indication (GMTI), Electronic Intelligence (ELINT), Signals Intelligence (SIGINT), Image Intelligence (IMINT), Non Traditional Intelligence, Surveillance and Reconnaissance (NTISR), and Measurement and Signature Intelligence (MASINT). The APEX Center is used to perform analysis for seedling efforts, provide baseline tool development for major programs, and to provide realistic operational systems/networks/databases for integration efforts. The APEX Center resources will be used by the Government to perform the necessary research, development, experimentation, demonstration, and conduct objective evaluations in support of emerging capabilities within the Processing and Exploitation (PEX) area. Software tools, data sets, metrics (Measures of Performance/Measures of Effectiveness), and analysis are needed for the Government to perform the vetting, maturing, and analysis of efforts related to PEX, e.g. Automatic Tracking, Activity Based Intelligence, Entity, Event & Relationship (EER) Extraction, Association & Resolution (A&R), Analysis & Visualization (A&V), Social Network Analysis, Network Analytics, Pattern Discovery, Scalable Algorithms, and Novelty Detection. The AFRL APEX Center is the AFRL/RI gateway into the cross-directorate PCPAD-X (Planning & Direction, Collection, Processing & Exploitation, Analysis & Production, and Dissemination eXperimentation) initiative. **Open to FY 2018**.

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.**

Academic Research Funding Strategies, LLC (Page 1)

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What We Do--

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- 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

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