

Research Development & Grant Writing News

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Grants Are Awarded Not Anointed

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By [Mike Cronan](#), co-publisher

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One challenging expectation that comes up in grant writing workshops, as well as in support of faculty writing proposals, is the not infrequent notion that there exists “insider information” available to only a few “in the know” that guarantees funding success at an agency, but is otherwise unavailable to the vast majority of applicants submitting a proposal. This belief, perhaps better characterized as an urban legend, is somewhat mindful of pop singer Dobie Gray’s 1964 hit “The ‘In’ Crowd” (“...I’m in with the in crowd, And I know what the in crowd knows...”).

The way this assumption often plays out is the belief that any research development professional, grant writer, or grant mentor worth his or her salt should be a treasure trove of “insider information” easily transferred to the uninitiated through a form of *Vulcan Mind Meld*. This is wishful thinking, of course, particularly the assumption that it is possible to escape all the hard work and difficult intervening steps (planning well, writing well, revising well) required to write a successful grant—***which all presupposes an idea of significant value to the funding agency exists in the first place to warrant support.*** But the idea that success is somehow bestowed rather than earned is a common human dream that extends well beyond grant writing.

Most often this belief in insider information assumes there is some mysterious person within an agency channeling “Deep Throat” of Watergate fame and giving out privileged information to a privileged few. It is one of the more curious and stubbornly persistent myths of grant writing—that all that is needed for funding success is to get the inside scoop that is sprinkled on a proposal like magical pixie dust by someone claiming to channel Tinker Bell. That kind of insider information may work briefly to a person’s advantage in the stock market, although it did not end well for the likes of Martha Stewart and Michael Milken, but it is a fool’s errand in grant writing.

Bottom line: Grants are awarded not anointed. Once that fundamental rule is accepted and understood, the real hard work of planning, developing, and writing a successful proposal can begin. This is not to say that information about a particular agency or program outside the scope of the specific details addressed in a solicitation is not important. An understanding of the broader agency vision, mission, culture, strategic plan, funding priorities, role of program officers, merit review process, etc. are always important dimensions to keep in mind when writing the research narrative and defining the value and impact of your research to the agency and the field.

For example, if you are advising faculty on writing proposals to NSF, it is important that they understand NSF’s decades-long mantra calling for the “***integration of research and education,***” and “***diversity of the scientific workforce,***” among others, particularly including “***intellectual merit***” and “***broader impacts.***” These are critical pieces of information for anyone seeking NSF funding. NSF has repeated these terms publicly in an endless drumbeat, and yet they are too often ignored as an obvious declaration of key criteria for evaluating proposals during the review process.

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Fact: The most important “insider information” needed for success at a federal research agency is often “hidden in plain sight”: agency websites. Moreover, the most common reasons proposals are not funded stem not from the lack of so-called “insider information” but from a failure to sift through and think about an enormous amount of available information, starting with the solicitation and referenced documents that define the goals and objectives of any proposed research.

Perhaps the most common shortcoming of proposals declined for funding is that they fail to respond fully to the solicitation, followed by proposals that are poorly written and organized, proposals that do not clarify the significance and value-added benefits of the research in the context of the agency mission or the field, and proposals that do not advance the research field in some clear and convincing way, among many other reasons. Proposals are declined for these reasons—not because the proposer failed to discover mysterious insider information.

Proposals are declined because the proposed ideas are not fundable for various reasons, perhaps the ideas offer only modest impact to the field or on the agency mission, or the ideas do not fit the agency agenda, or perhaps the research team has no history of collaboration, or the rationale for the research is poorly stated, or a convincing case is not made for the capacity to perform the research, or the research plan is flawed, or the research narrative itself is flawed and obscures the value of the proposed research, and on and on. Regardless, the finger of blame for a declined proposal always points back to those who planned, developed, and wrote it—it is never the fault of the agency, the reviewers, ***or the lack of insider information.***

All information needed for writing a successful proposal is ***always available to be known*** if you do your due diligence—seek it out, find it, think about it, and use it to your advantage in writing the research narrative. What too often is thought of as “insider information” is really just information that someone has been astute and strategic and persistent enough to garner over time and then to apply to writing a funded proposal.

Moreover, while the wellspring of important information on grant success comes from understanding the vision, mission, culture, strategic directions, solicitations, funding priorities, etc. of research agencies through websites, agency grant conferences, workshops, reports, etc., an important complementary source of information about an agency comes from colleagues. Seek out those who have been successful at the agency, who have served as reviewers at the agency, and those who have served as agency program officers. Don’t overlook research office staff with a robust corporate memory of ***specific factors that lead to success*** at specific agencies and programs and those who have a robust corporate memory of ***specific factors that led to failure*** at specific agencies and programs. Read funded proposals, declined proposals, and their reviews; join research affinity groups who are writing proposals; and offer to serve as a reviewer at an agency.

As Thomas Edison once observed, “*Genius is one percent inspiration, ninety nine percent perspiration.*” This is good advice in grant writing as well. Writing successful grants is really hard work. Don’t be distracted by the belief in secret insider information like the misfit gold prospectors in *The Treasure of the Sierra Madre*. ***Just remember that grants are awarded to you and not anointed on you.***

Tracking New Directions in Broadening Participation

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By [Mike Cronan](#), co-publisher

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Programs to increase the diversity of the engineering and scientific workforce are often required components of large research grants to federal research agencies, particularly NSF, an agency that continuously expands the boundaries and programmatic models used to broaden participation. But such programs are of interest to other agencies as well, e.g., NIH, DOE, DOD, NASA, NOAA, USDA, etc., that seek to prepare the next generation technical workforce. However, for PIs of large research grants, tracking and keeping informed about evolving models for broadening participation is a difficult, if not impossible, task.

Keep in mind that those recently invited to submit a full proposal to NSF June 16 under the Science and Technology Center program will author a research narrative of 25 pages, only **10 pages** of which will address the core Narrative Description of the Center's Research Objectives. **Five pages** will address the Narrative Description of the **Education and Human Resource Development** Objectives of the Center, **3 pages** will address the Narrative Description of the **Broadening Participation** Objectives of the Center, and another **3 pages** will address the Narrative Description of the Management Plan for the **Research, Education, Broadening Participation, and Knowledge Transfer** Activities of the proposed Center.

The take-away message here is that an STC must first be won on the science (40% of the research narrative), but that science must be integrated with the other programmatic components required for a successful proposal, particularly the intertwined objectives related to **education, human resource development, and broadening participation**. While the PI of a center grant needs to have a significant record of success in scientific research and management of interdisciplinary research activities and teams, it is unrealistic to expect her to have an equivalent expertise in research related to education and broadening participation.

Bottom line: large-team grants require a dynamic, integrated team, hence the term "*Integrative Partnership*" in the STC program title. Keep in mind, the goal is research, education, and broadening participation **synergy, not silos**. Too often, and unnecessarily so, the ***Achilles heel of unfunded centers and large-team grants can be attributed to narrative silos***. To reviewers, these siloed sections read like two ships passing in the night with little impact on each other, like weakly interacting neutrinos.

This is where research offices can play an important support role in the success of large-team and center grants—by helping the PI move from a research narrative siloed by section to a truly integrated research narrative whereby all the proposal sections work in a coordinated way, underpinning the center's core objectives that so often include education and broadening participation requirements.

Moreover, NSF tends to lead the new directions in the realm of effective, innovative, and **evidence-based** program models for education and human resources development and broadening participation. Other federal research agencies frequently adopt and adapt NSF models in these domains. So if you have informed yourself about the NSF models, you will be competitive at other federal agencies with similar narrative objectives in addition to the research core. The key point is that the models must be integrated with the proposed research

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and ***make sense in the context of the proposed research***. This will help insure that you do not, as one NSF program officer observed, “*reinvent the flat tire*.” To avoid the flat tire,, two things must happen: (1) the research development team itself needs to be integrated sufficiently so the PI is informed about effective education and broadening participation strategies ***in the context of the proposed research***; and (2) those responsible for the nonresearch core objectives must be sufficiently informed about the proposed research so that a true integration can occur. ***This is not a trivial expectation***. Research offices can offer PIs valuable input for making this integrative narrative structure work, but it requires planning and sufficient discussion among the research development team to ensure that it works.

Moreover, when exploring the best evidence-based models fitted to a particular research domain or context, it will be important to advance those models in an way that is innovative and demonstrates an engaged team. NSF, in particular, likes to see activities that are both ***informed by the theory and literature*** (i.e., on broader impacts, research and education integration, broadening participation, etc.) and also those that ***advance the theory and literature*** in some important and innovative ways. This, of course, requires paying attention to how the proposed activities will be evaluated in terms of both immediate outputs and longer-term outcomes and knowledge transfer to various domains, e.g., in formal and informal settings. It is the very rare PI that can navigate this process without support from an informed research office.

This said, important new directions in broadening participation are being proposed by NSF in the recent [***Dear Colleague Letter \(DCL\): Stimulating Research Related to the Science of Broadening Participation***](#). Research offices that support faculty in the planning, development, and writing of large-team grants and centers would be well advised to track the new directions addressed in this DCL. Models that result from this DCL will likely become important competitive components of future research center initiatives at NSF and elsewhere.

Specifically, NSF notes, “Building on previous investments, the Directorate for Social, Behavioral & Economic Sciences (SBE) and the Directorate for Education & Human Resources (EHR) announce their interest in stimulating research related to the Science of Broadening Participation (SBP). The **Science of Broadening Participation** will employ the **theories, methods, and analytic techniques** of the social, behavioral, economic, and learning sciences to better understand the barriers that hinder and factors that enhance our ability to broaden participation in science, technology, engineering, and mathematics (STEM). The results of these efforts will ***inform approaches*** to increase the access, involvement, and retention of underrepresented groups in STEM and to strengthen our national STEM capabilities and competitive advantage. Ultimately, the SBP research will provide scientific evidence that STEM educators, STEM employers, and policy makers need to make informed decisions and ***to design effective programs and interventions***.

“SBE and EHR will continue their partnership to support SBP research proposals that will contribute to the overall understanding of the positive and negative factors impacting the participation of underrepresented individuals in STEM education and careers. SBP research proposals may focus on factors such as the following: Institutional and organizational factors (e.g., studies of organizational, structural or climate factors that impact STEM participation); Cultural, psychological, social, demographic and community factors (e.g., studies of how individual, behavioral, family, school or neighborhood factors affect STEM participation and

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achievement rates); Economic and policy-related factors (e.g., studies of economic factors that impact STEM participation and the relationship between broader participation and social innovation)

“We anticipate that many of the fields represented within SBE and EHR can contribute to the Science of Broadening Participation. **Some examples of potential research questions related to the SBP include but are not limited to:**

- What are the underlying organizational, psychological, and social issues affecting the different participation and graduation rates in STEM of women, men, persons with disabilities, and racial and ethnic minorities?
- Under which conditions do behavioral, economic, and socio-legal factors influence recruitment and retention in STEM education at the individual, meso, and macro levels?
- What aspects of preK-12, informal, and higher education learning environments or workplace culture moderate the factors impacting underrepresented minorities, women, and/or persons with disabilities?
- How do attitudes and stereotypes influence decisions to pursue STEM careers?
- What behavioral or economic processes result in outcomes that are associated with success in STEM?
- What theoretical approaches predict success in ensuring that young people from underrepresented groups do not lose interest in STEM during adolescence or other critical developmental transition periods?”

If an NSF STC or ERC or other large team research grant is part of your vision for the future, you would do well to be informed about the above research questions posed by NSF. ***You can be assured that the models that evolve under this NSF direction will be incorporated into future NSF solicitations for large-center grants.*** Tracking these models will be an important first step to becoming informed about them and incorporating them into future proposals when appropriate.

Writing as a Team

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By [Mike Cronan](#), co-publisher

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In the 1967 film, *The Graduate*, Dustin Hoffman's character, Benjamin, is given some insider career advice by his father's business partner: "There is a great future in plastics." If the movie were made today, the classic line might be rephrased as: "***There is a great future in interdisciplinary research.***" Indeed, if interdisciplinary research were listed on the New York Stock Exchange, it would surely be a growth stock, something obvious to anyone tracking funding trends in federal agency solicitations over the past several years. Of course, along with interdisciplinarity comes teaming.

Interdisciplinary teaming adds several important new dimensions to how proposals are planned, developed, and written, not the least of which are team dynamics and writing as a team. These are not trivial issues to address, but are necessary for a successful proposal. Too often the proposal development team assumes that if there are team members representing the core disciplines needed to address an interdisciplinary solicitation involved in the project, then that is sufficient for a successful proposal. ***Unfortunately, it doesn't work that way in practice.***

Interdisciplinary teams may have the appropriate disciplinary representation to address an interdisciplinary solicitation, but they still ***may function in practice as a siloed team*** unless early on in the proposal planning process they answer some key questions that must be addressed in the research narrative. These include: ***Why are we a team? What synergies and benefits result from our team configuration not otherwise possible? What are the key team research interactions and interdependencies needed for success? Does each team member understand the research role of every other team member? Does each team member understand how his or her research will be impacted and enabled by the research of other team members?, etc.***

Answering questions like these will provide the glue that binds together and integrates the proposal development and writing process. **Bottom line:** success in interdisciplinary team grant writing requires more than just all the required component parts (disciplines) being present—***it requires a clearly understood disciplinary synthesis among the team members that is then communicated in the research narrative to the reviewers.*** If this is not present, the task of writing a synergistic and integrated research narrative will be an impossible one. Therefore, it is key to a successful research narrative that the ***PI puts in place early on a plan for integrating multiple research narrative contributions from multiple authors from multiple disciplines.***

Moreover, interdisciplinary team proposals that include multiple research partners pose a particular challenge to the coherence of a project narrative. Individual team members typically contribute individual narrative statements featuring their prior and future research, ***but those statements too often fail to explain how that research will integrate with other team members' contributions to the proposed project.*** These "stand-alone" statements fail to describe how each research strand complements every other strand, adding up to an

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integrated set of contributions to the project's vision, goals, and objectives. These individual narrative contributions often do not address the overarching questions that motivate the research, nor do they describe each of the multiple research strands in a context that clearly demonstrates their relationship to the motivating questions or hypotheses.

Too often, these typically **descriptive only** contributions to a proposal narrative resemble a series of isolated numbers comprising the combination to a safe, **but lacking the key sequence required to open it**. In the case of a project narrative, the combination needed for funding must be a **logically ordered sequence** of questions, or hypotheses, or perhaps statements of need, depending on the agency and type of research, that explain the novel, significant, and specific features of the research activities described in the narrative and the value the team structure brings to the project in ways not otherwise possible.

Descriptions of research activities or capacities improperly sequenced and explained within the overarching context of a research vision, goals, and objectives **turn the narrative into something of a mystery for readers and reviewers**. You don't want reviewers noting to themselves and other panel members that *"it is not at all clear why all these descriptions about various research capacities are important and what exactly this research team intends to do."* However, this will be the result if the research narrative evolves, to use the current vernacular, as a collection of **"stove-piped" or "siloed" contributions by multiple authors**.

For example, a proposal addressing an issue related to sustainability may be comprised of research team members from geosciences; physical, biological, and agricultural sciences; engineering; computational sciences; and the social and behavioral sciences. Perhaps the research focus is on the sustainability of a coastal ecosystem impacted by climate change. In this case, it is easy to envision multiple research contributions by those with research expertise in climate, water, modeling, sensors, coastal biology, social and economic impacts of sustainability on affected stakeholders, and research expertise on one or more species in the coastal estuaries that serve as indicators of ecosystem health. Moreover, it is easy to see how researchers in one of the foregoing research areas important to the sustainability of coastal ecosystems may be tempted to write their narrative contributions as **"siloed text."**

This will most likely occur when the vision is still evolving as the research contributors draft their narrative contributions, or when the overarching questions motivating the research have yet to be fully defined, or are in the process of being re-defined. **The vagueness or incompleteness of the research vision can increase the likelihood that a first full draft of the proposal will read as a series of siloed statements unintegrated with one another.**

Moreover, it is often the case that the **research team members attempt to do too many important tasks simultaneously but in isolation from each other**. In these cases, finding time to draft text is often difficult enough, let alone adding the requirement of reading and considering others' contributions. This difficulty can be compounded by electronic communications among team members that fluctuates between periods of silence punctuated by a cascade of electronic messages, often including drafts of graphics, figures, and multiple track-edited versions of an evolving project description that can quickly become a blizzard, or rainbow, of track edit colors.

These issues all cry out for an orderly resolution grounded on a well-crafted proposal development schedule and a **plan for narrative integration among contributing authors**. This planning tool will help meld the vision and goals of the project and communicate them

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continuously via a defined production timeline to all of the contributing authors. This will better ensure that the text evolves in a way that not only describes the importance of each research-specific strand or research contribution **but also describes how it interrelates with every other research strand included in the project description**. It is not an easy task, but this integration holds the key to success. The team is well advised to find someone among its own members or from a campus research office who can **assist the PI in bringing informed coordination to the proposal development process**.

Another pitfall of a multiply-authored research narrative or project description lies in writing these **statements as if the authors were contributing to an edited collection or a journal issue rather than to the single, integrated statement** identified as the research vision. This occurs most often on interdisciplinary proposals that evolve ad hoc rather than from a well-planned proposal production schedule, or when the decision to submit these complex proposals occurs only a month or several weeks before the due date. In this last case, the proposal schedule can lead to a “fire drill” in which potential new research partners are added concurrently with the writing of the first drafts of the research narrative.

These situations can produce several drafts of the project description at a rapid rate as multiple contributions are added to the narrative. The complete draft of the project description may give the illusion of completeness, **but on closer examination lacks an overarching organizing theme or research vision that synthesizes the component contributions resulting in a coherent and logically sequenced whole**. Correcting this document after it has evolved can be difficult; unfortunately, such a draft is likely to amount to **nothing more than a siloed collection of research descriptions** loosely associated and lacking a narrative thread that can persuade reviewers of its coherence. Once a complete narrative structure has emerged, contributors resist making major renovations to it. However, if the collaborators understand that the first full draft of a research project narrative is best viewed as a preliminary set of loosely associated descriptions, then the principal investigator can call for major revisions designed to produce a more integrated statement.

Indicators of a failed or weak narrative may reveal themselves sufficiently before the due date to allow the time and effort required to transform a weak narrative into a competitive narrative. Perhaps the best indicator of a weak complete first draft of the research project description begins with a nagging sense of unease after reading it. It doesn't seem to convey a clear sense of what specifically is being proposed, what important questions are being addressed, or hypotheses posed, nor does it explain why the research is unique in the context of the disciplinary fields, nor why it is innovative or advances the fields in some way. It may also fail to convey a sense of how the multiple research descriptions meld to an integrated whole. This is a managed process and must be planned for during the planning and development stages of the proposal, so that by the time draft narrative sections are being written, all contributing authors know the expectations for an integrated research narrative.

The best solution to the above issues is to formulate a plan for the proposal's production that anticipates such core issues as partnership configurations, vision, and goals in a logical sequence that allows time for a draft narrative of the project description to evolve continuously. A poorly planned proposal has little likelihood of success. Walt Kelly's Pogo once famously observed, “We have met the enemy and he is us!” That observation perfectly fits a **poorly planned and poorly coordinated** proposal development effort. But preparation and

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continuous coordination and communications can save you from becoming your proposal's worst enemy by avoiding the issues discussed above. A well-planned and well-coordinated proposal development effort cannot turn ideas of modest importance into ideas of compelling significance, but it can give your ideas a chance to be realized. A well-crafted proposal will require continuous revisions to ensure that the project as a whole includes and exceeds the sum of its individual contributors.

The bottom line is that you must convince the reviewers that there is significant value in the interdisciplinary team structure and that there are important research interactions and synergies that will occur among the disciplinary partners not otherwise possible. For example, John Harrison was paid 20,000 pounds by the British government in 1761 (well over \$2 million in today's dollars) for his invention of the marine chronometer that made a very significant contribution to navigation by allowing the calculation of longitude, which, combined with latitude determined by sextant, for the first time permitted knowing a ship's precise location. You can think of the chronometer as an "interdisciplinary" mechanical system. ***It is not the individual parts of the chronometer that are important; it's how the parts work together.*** The same hold true for a research narrative describing an interdisciplinary team project.

Agency Models for Introduction and Background

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By [Mike Cronan](#), co-publisher

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Writing the *Introduction and Background* (or *Introduction and Overview*, or simply, the *Introduction*) section of the research narrative confronts the author with the **Goldilocks Dilemma**. While admittedly not as challenging as the dilemma facing astrobiologists attempting to determine the habitable zone around a star, this one is more challenging than the problem confronting Goldilocks whose porridge is either too hot or too cold and whose bed too large or too small. When it comes to the *Introduction and Background* section of the proposal, the research narrative must **capture the interest of reviewers early and quickly**, but early drafts of the section tend to run too long or too short, too detailed or too general, too irrelevant or too redundant, too lacking in the appropriate focus or context, or too much belaboring the obvious, etc.

For example, how far back should you begin an explanation of the importance of your science? It doesn't require offering a history of your discipline beginning with the ancient Greeks; if you are conducting high-precision, time-dependent scientific work, you need not explain the history of the cesium atom and the atomic clock nor reference English poet John Dryden's (1631-1701) famous line, "*till like a clock worn out with eating time.*" If you are writing a proposal in response to a solicitation to broaden the participation of women and minorities in STEM disciplines, you do not need to belabor the importance of diversity—after all, that is why the agency is funding the project. If you are writing a proposal to an agency funding a program on climate change and water sustainability, you needn't convince reviewers and program officers that climate change is a fact and that it impacts water sustainability. If buffers are not important to your proposed research, do not belabor buffers. **Bottom line: *Don't squander valuable space in the first page of the research narrative belaboring the obvious!***

A well-written proposal opens with a *Introduction and Background* section that tells reviewers and program officers what you are going to do; why you are going to do it; why it is important to do it; why you have the capacity to do it; the nature of your research rationale; and how, once completed, it will impact the field and bring value-added benefits to the agency research mission. These questions all must be answered in a specific context and in a way that contrasts your proposed research to the current state of the field at various scales. For example, demonstrate how it will impact the agency program area, the agency-wide mission, and the national state of knowledge on the topic.

For example, an agency may ask that you explain why your research is "*at the scientific forefront of the field or addresses a grand challenge area in engineering or science,*" or how your "*proposed research is aligned with the core research activities and priorities*" of the funding agency, particularly in the case of mission agencies like DOE, DOD, NASA, NOAA, etc. Similar requirements are common, regardless of funding agency or the scale and scope of the research project. They can be particularly challenging in large-team and center-level grants that require applicants to answer background and context questions that "**set the stage.**" Agencies use these statements to place the proposed research in a larger research context and

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thereby help reviewers and program officers to better understand how the research fits in a disciplinary field(s) and its value and impact in advancing the field(s), or an agency's mission objectives.

Given the above, it is often helpful in grant writing to look for models, e.g., funded proposals or other materials, that can help you write a stronger proposal. Reviewing the *Introduction and Background* section (or the generic equivalent) of funded proposals will be helpful in this regard. One other place to look for models is to the funding agencies themselves. In many cases, funding agencies write the equivalent of an Introduction and Background section in a funding solicitation (or BAA or Notice of Intent to Issue) to set the stage for the research vision, goals, and objectives of the agency that motivates the funding of the research, something similar to the task confronting the author writing the initial section of a research narrative.

In reviewing these agency models, you will find that they include a brief and concise description of the research to be funded, some background on the research area, a discussion of the current state of the field, the importance of the research to the agency mission, the role the research will play in impacting the field, etc. Basically, in many solicitations, the agency gives potential proposers a nice overview of the research context to which they must map in order to succeed at the agency. Moreover, this research overview often provides an excellent model for a better sense of what constitutes a well-written introductory section of a research narrative at the particular agency.

For example, in the recent DOE solicitation for [Next Generation Electric Machines: Megawatt Class Motors](#), the introductory section of the funding solicitation answers key questions about the research area, significance, background, context, impact on the field, etc. important for an applicant to understand—***the very points the proposer will want to make when responding to the solicitation***: “Manufacturing [defines the research] is the use of energy, equipment, information, services, and capital to convert raw materials, components, and parts into goods that meet market expectations. As an economic sector, manufacturing generates 12% of U.S. Gross Domestic Product (GDP) and employs 12 million Americans [importance of research]. The DOE Office of Energy Efficiency and Renewable Energy's Advanced Manufacturing Office (AMO) makes research, development, and demonstration (RD&D) investments in advanced manufacturing process and materials technologies [research context]. These technologies are foundational, pervasive, and promise crosscutting industrial applications and impact in reducing industry's energy footprint and greenhouse gas (GHG) emissions, as well as supporting the global competitiveness of clean energy products [significance, value, impact of research]. By targeting the development of energy-related advanced manufacturing technology, AMO's work ***can create completely new supply chains and stimulate significant economic growth and job creation*** [value of research].

“AMO's Next Generation Electric Machines (NGEM) program is an RD&D effort ***leveraging recent*** technology advancements in power electronics and electric motors to ***develop a new generation*** of energy efficient, high power density, high speed, integrated MV drive systems for a wide variety of critical energy applications. Improvements to these systems can be realized through the application of key enabling technologies, such as wide bandgap devices, advanced magnetic materials, improved insulation materials, aggressive cooling techniques, high speed bearing designs, and improved conductors or superconducting materials.

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Through this development program, **NGEM will facilitate a step-change that enables more efficient use of electricity, as well as reduced drive system size and weight, developing lasting capabilities for motor material development, design, and analysis that are cost-shared with industry stakeholders.**

This specific Funding Opportunity Announcement (FOA) is focused on developing MV integrated drive systems that leverage the benefits of state of the art power electronics (i.e., wide band gap devices) with energy efficient, high speed, direct drive, megawatt (MW) class electric motors for efficiency and power density improvements in three primary areas:

1. Chemical and petroleum refining industries
2. Natural gas infrastructure.”

Bottom line: the above offers a useful model for writing an introductory section. While it is solicitation specific, it is also sufficiently generic to provide an excellent instructional tool in how to craft the introduction section of the research narrative.

A final and abbreviated example comes from the recent NSF [Dear Colleague Letter - EAGERS for Cellular Biomanufacturing](#), which states: “Advanced biomanufacturing is **a field that builds upon groundbreaking discoveries** in engineering and biology to produce the **next generation of therapeutics, diagnostics, and manufacturing processes for biochemicals**. These include, but are not limited to, cell-based therapies, microdevices with cells organized to provide appropriate biological complexity, also referred to as organs-on-a-chip, as well as design methods of cellular catalysts. **Advanced biomanufacturing capitalizes on recent discoveries** in bioreactor technology, 3D additive manufacturing, micro and nanofabrication, novel biomaterials, stem cell technologies, cell reprogramming and transdifferentiation processes, systems and synthetic biology, genome editing, and mathematical modeling at the molecular, cellular, cell population, and tissue levels, to spur research and development, education, and industry growth and innovation.

“Cellular biomanufacturing is a critical component of advanced biomanufacturing. Cell-based therapies and diagnostics have the potential to revolutionize human healthcare in different contexts, including personalized medicine. Additionally, cells are used for the biomanufacturing of protein therapeutics. Processes with cells as products present major engineering challenges, and indeed new therapies and cell-based products may depend critically on robust and reliable manufacturing approaches at the cellular level.

“This Dear Colleague Letter (DCL) is aimed at identifying opportunities to **leverage and synthesize conceptual, scientific and technological innovation across disciplines** in order to promote developments in cellular biomanufacturing towards accelerating solutions to critical challenges in the field. Although some of the challenges are specific to particular types of cells, such as autologous cells, others are more generic and encompassing, applicable to both autologous and allogeneic cells. Projects are not limited to particular cell type(s); however, the project description should indicate the range of cell types for which the scientific questions or technological developments addressed in the proposal are relevant. Topics may include, but are not limited to...”

The above examples demonstrate how “**setting of the stage**” can be done in an “Introduction and Background” or “Introduction and Overview” section of the Research Project Description, although different authors and agencies may denote the section in different ways,

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depending on preference. But basically it comprises the first section of the research narrative in which you introduce your research by answering the above questions, or similar questions posed in the funding solicitation.

It is challenging to distill the core significance of your research into a concise, clear, and easily understood description that will convince reviewers and program officers to fund your project over others. However, describing the impact of your research in the context of the field and/or agency mission--at a program level, agency level, and national level--is more challenging yet. This crucial context that illuminates the importance of your research for reviewers and program officers is challenging to write effectively, particularly with respect to achieving a suitable proportion of primary to secondary information and of excessive to minimal information.

As is the case in all sections of a well-written research narrative, ***you must define a hierarchical narrative structure reflecting the relative (weighted) importance and order of the information you choose to provide*** reviewers and program officers within the page and section limits of the proposal. Moreover, while the possible information you could present to reviewers is open ended, agency constraints in the form of questions that must be answered will ***require significant information triage and culling*** to achieve an effective response within the proposal's page limits. This ***"what to say and what not to say"*** dilemma is the persistent challenge for anyone writing grants. However, it is particularly demanding when writing some variant of the generic ***"Introduction and Background"*** section of the research narrative.

Remember, the background section sets the stage for your research idea. ***Your research idea is the lead character on this stage*** and all other information serves as the illuminating backdrop to your proposed research. Moreover, many center-level grants give the applicant freedom to select core research topic areas, e.g., the NSF Engineering Research Centers or Science and Technology Centers, while other grants, many of those offered by mission agencies, are more focused on addressing a specific agency research objective, such as the currently open Specialty Crops Research Initiative by USDA/NIFA.

In this latter case, all proposals submitted will fall within a more narrow and common research area. In this case, writing the background section presents the additional ***challenge of avoiding a statement numbingly similar to those written by other applicants and thereby either annoying or boring the reviewers***. In effect, the more narrow the research objectives of the funding solicitation, the more likely that the background sections of all the proposals will overlap, presenting another challenge to writing a persuasive statement.

Of course, background sections will be poorly written, among other reasons, when writers resort to generic background information. This, in turn, gives writers the illusion of making narrative progress when, in fact, they are struggling to generate narrative text describing the importance of their research. No one who has written grants will deny that some panic can set in when staring at the initial blank page of a new project narrative. Nor can any author be blamed for beginning a project narrative with text that clearly will be deleted in future drafts but at least gets the narrative started. That said, once the project narrative starts to come to life, it is time to go back and cut and shape the background section to ensure that it does only what it needs to do and not more: to demonstrate the importance of the proposed research to advancing a field described carefully enough to give reviewers a sense of how it compares to current practice and to judge the value-added benefits it brings to the field or agency mission.

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Finally, a poorly structured background section will put reviewers to sleep. Do not introduce reviewers to your research by boring them with irrelevant, excessive, or generally known information. ***Opening a proposal with irrelevant and redundant information does not bode well for the attention reviewers will bring to the rest of your project narrative.***

The above models by DOE and NSF are but two of many that can be reviewed as you develop your own strategies for writing a winning Introduction and Background section to your research narrative.

Helping Reviewers Do the Math: Writing Proposals for Highly Mathematical Projects Without Losing Your Reviewers

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By Lucy Deckard, co-publisher

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It's late at night, and you're a reviewer. You're taking a plane tomorrow afternoon to serve on a panel at NSF, and you still have a stack of six proposals left to review. You've been preparing your lecture for a class you have to teach in the morning before you leave for the airport, and now you turn to those proposals. At this time of night, after a full day of work, you're not at the height of your intellectual powers or your patience. You start reviewing one of the proposals, and it looks rather interesting, but when you turn to page 3, it looks like this:

$$\frac{\partial}{\partial t} \iiint_V \rho dV = - \oint_S \rho \mathbf{u} \cdot d\mathbf{S}$$

$$\frac{\partial \rho}{\partial t} + \nabla \cdot (\rho \mathbf{u}) = 0$$

In the integral formulation of this equation, body forces here are represented by f_{body} , the body force per unit mass. Surface forces, such as viscous forces, are represented by \mathbf{F}_{surf} , the net force due to stresses on the control volume surface.

$$\frac{\partial}{\partial t} \iiint_V \rho \mathbf{u} dV = - \oint_S (\rho \mathbf{u} \cdot d\mathbf{S}) \mathbf{u} - \oint_S p d\mathbf{S} + \iiint_V \rho \mathbf{f}_{\text{body}} dV + \mathbf{F}_{\text{surf}}$$

$$\frac{D\mathbf{u}}{Dt} = \mathbf{F} - \frac{\nabla p}{\rho}$$

$$\rho \frac{Dh}{Dt} = \frac{Dp}{Dt} + \nabla \cdot (k \nabla T) + \Phi$$

This, in turn, leads to the expression based on the Taylor expansion:

$$\begin{aligned} \varphi = \varphi_b + (z+h) \left[\frac{\partial \varphi}{\partial z} \right]_{z=-h} + \frac{1}{2} (z+h)^2 \left[\frac{\partial^2 \varphi}{\partial z^2} \right]_{z=-h} \\ + \frac{1}{6} (z+h)^3 \left[\frac{\partial^3 \varphi}{\partial z^3} \right]_{z=-h} + \frac{1}{24} (z+h)^4 \left[\frac{\partial^4 \varphi}{\partial z^4} \right]_{z=-h} + \dots, \end{aligned}$$

where $\varphi_b(x,t)$ is the velocity potential at the bed. Invoking Laplace's equation for φ , as valid for incompressible flow, gives:

$$\begin{aligned} \varphi = \left\{ \varphi_b - \frac{1}{2} (z+h)^2 \frac{\partial^2 \varphi_b}{\partial x^2} + \frac{1}{24} (z+h)^4 \frac{\partial^4 \varphi_b}{\partial x^4} + \dots \right\} \\ + \left\{ (z+h) \left[\frac{\partial \varphi}{\partial z} \right]_{z=-h} - \frac{1}{6} (z+h)^3 \frac{\partial^2}{\partial x^2} \left[\frac{\partial \varphi}{\partial z} \right]_{z=-h} + \dots \right\} \\ = \left\{ \varphi_b - \frac{1}{2} (z+h)^2 \frac{\partial^2 \varphi_b}{\partial x^2} + \frac{1}{24} (z+h)^4 \frac{\partial^4 \varphi_b}{\partial x^4} + \dots \right\}, \end{aligned}$$

since the vertical velocity $\partial \varphi / \partial z$ is zero at the impermeable – horizontal bed $z = -h$. This series may subsequently be truncated to a finite number of terms.

$$\frac{\partial^2 \eta}{\partial t^2} - gh \frac{\partial^2 \eta}{\partial x^2} - gh \frac{\partial^2}{\partial x^2} \left(\frac{3}{2} \frac{\eta^2}{h} + \frac{1}{3} h^2 \frac{\partial^2 \eta}{\partial x^2} \right) = 0.$$

You turn the page, and there's more of the same. So, with five more proposals in the queue for

the night, what are you most likely to do?

- a) Laboriously go through the derivations to make sure you clearly understand what the PI is trying to say.
- b) Quickly skim the equations to try to get the gist before moving on to a page that's not filled with equations.
- c) Skip the equations and look in the subsequent pages for a summary of the points the PI is trying to make.
- d) Close the file and go out for a beer.

Clearly, the PI's expectation is that you will choose a), and the proposal will be at a disadvantage if you don't. However, depending on exactly how tired and grumpy you are, the chances that you will indeed choose a) are probably not great. So, what is a PI who is proposing a highly mathematical research project supposed to do?

Recognize that even when your discipline and that of your reviewers is in a highly mathematical field, it is usually a bad idea to include pages of derivations in your research proposal. Just as, in an experimental field, you wouldn't present long tables of raw data, but would instead present your hypotheses, questions and conclusions along with just enough data to illustrate and support your points, you should include just enough equations to provide examples of your approach and confirmation of any conclusions or assertions you're making.

What's Your Point?

Think about the points you want to make and how you can make them without including pages of equations. Generally, in a proposal you need to communicate several things:

- What you plan to achieve
- How you will achieve it
- The current state of the art and gaps in knowledge that you will be addressing
- What you've done so far
- How your approach is different from what others are doing
- Why the outcomes of your project are significant

Even in highly mathematical projects, all of these points can be made using words instead of, or in addition to, equations. In fact, if you depend only on equations to make these points, you often run the risk that, even when they do take the time to follow the math, reviewers will not come to the same conclusions you did based on the derivations you provide. For example, if you are discussing the current state of the art, you might provide a number of derivations from the literature, but if you don't describe in words the gaps or limitations that are motivating your proposed research, your reviewer may not identify those gaps based just on the equations.

Describing Prior Work

PIs often resort to long derivations when they are presenting preliminary results or prior work. Again, you're usually much better off if you describe the main points in words in the text along with just enough equations to support your point or provide key specifics. In the case of preliminary results, how are they relevant to your proposed project?

- Do they illustrate that your proposed approach is viable?
- Do they provide intriguing results that motivate your proposed project?

- Do they show that you have the skills to successfully accomplish what you're proposing? Make those points in words, including specifics. One helpful approach is to imagine you're sitting next to the reviewer going through the equations and explaining their significance. What would you say? Try putting those words in your text and then see if you can provide just the key steps in the derivation or key equations along with your explanation.

Describing Your Approach or Methodology

When describing your proposed approach, try describing your general methodology and then stepping through the project plan verbally. What will you need to derive or model first? If you're developing a model, describe what the inputs and outputs will be and the phenomena or processes that will be taken into account in the model. Can you give an example of a specific scenario that would be modeled?

It's especially important to point out **specific challenges** or **research questions** you'll need to address in order to successfully achieve your goals. For example, perhaps there are discontinuities at various scales that you'll need to bridge. Describe verbally the approaches you will use to bridge them. Perhaps you'll need to make some approximations in order to keep the calculations manageable. What are the risks and questions associated with making those approximations, and how will you investigate them? Perhaps there are certain parameters that will be difficult to quantify, and you will need to employ some innovative strategies to approximate them. These kinds of points are best made using words along with strategically placed equations. You may also cite your publications or that of others for reviewers who are want more details about a particular derivation.

All this is not to say that it's OK to be vague. Statements such as, "We will develop a theoretical framework to better understand X[broad phenomenon]" will just frustrate your reviewer unless you follow that statement with specifics. Below is an example of a highly mathematical approach described verbally, but specifically, without the use of lots of equations (*many thanks to Dr. Oleg Komogortsev for generously sharing excerpts from his successful CAREER proposal, submitted in 2012*):

To carefully model OPC distributions, a "dual approach" by Mood & Graybill [106] and Box & Tiao [107] will be used. In the dual approach, Bayesian posterior information is used to suggest functions of the data for use as population-based estimators. Prior distributions play an important role in Bayesian statistical modeling [108]. An "informative priors" approach will be used due to the complexity of the model being investigated in combination with small-to-moderate sample sizes. Specifically, in the case where sample size is small and models are complex, the informative priors approach provides a mechanism for achieving greater accuracy [108-110] in posterior summary estimates of parameters as opposed to using a diffuse, strictly non-informative approach (i.e., objective priors distributed uniformly over the distribution of a parameter). Assigning priors during model formulation will provide an analytical updating engine for the Markov chain Monte Carlo (MCMC) estimation process (e.g., the Gibbs sampler also known as an "alternating conditional sampler", Gelman, *et al.*, [111], p. 287). As an example, 9 semi-conjugate priors for OPC parameters (e.g. means) in the existing formulation and covariance $\xi \sim$ inverse-Wishart or, for example, negative binomial are able to be modeled as approximately multivariate normal ($\sim N(0, 4)$) or negative binomial. The values of 0 and 4 may be selected based on the distributional properties of the multivariate normal time series model [107, 112]. As a result, a confidence value will be

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returned when matching two biometric templates and will be indicative of confidence in liveness (on the scale specified by NIST standard [44]) and statistical likelihood of the templates being from the same person.

Reading this excerpt, it's clear that mathematical content hasn't been "dumbed down." Instead, the motivation, challenges, and advantages of specific methods and approaches are explicitly explained. This verbal explanation actually contains much more information and a much clearer explanation of what he will do and why than two pages of equations would.

So when you're writing your research proposal, if you find yourself tempted to include a page of equations, consider: What point are you trying to make? What does the reviewer need to understand about this derivation? Try stating those points in words, along with a few strategically chosen equations, and not only is your reviewer more likely to read your entire proposal, he or she is more likely to understand the information you're trying to communicate.

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[NCER Technical Working Group Meeting Summaries](#)

NCSEER convenes technical working groups periodically. A technical working group is an ad hoc group of experts on a particular topic who work together on specific goals. These meetings are often meant to encourage stakeholders to discuss the state of research on a topic and/or to identify gaps in research.

Practitioner Perspectives on Emerging Research Needs and Improving Relevance in Education Research, March 3, 2014 – Capital Place, Washington, D.C.

In March 2014, The National Center for Education Research (NCER) and the National Center for Special Education Research (NCSEER), in the Institute of Education Sciences (IES) at the U.S. Department of Education, convened a Technical Working Group (TWG) of practitioners to provide input on research needs in education and how research could be more relevant and useful to the field. Fifteen expert practitioners in the field of education were invited to attend, including individuals working in state education and legislative offices, districts, and schools as well as non-profit organizations and postsecondary institutions. The TWG discussion focused on five broad sessions: (1) making research available through effective dissemination; (2) research needs for elementary, middle, and high school; (3) research needs for early intervention; (4) research needs for post-secondary/career readiness; and (5) researcher-practitioner collaborations. This meeting summary covers all sessions of the technical working group and includes both presentations and discussions among participants. [View, download, and print the Technical Working Group Meeting Summary as a PDF file.](#)

Researcher Perspectives on Strengthening IES's Research Grant and Training Programs October 16, 2014 – Capital Place, Washington, D.C.

In October 2014, The National Center for Education Research (NCER) and the National Center for Special Education Research (NCSEER), in the Institute of Education Sciences (IES) at the U.S. Department of Education, convened a Technical Working Group (TWG). The purpose of this TWG meeting was to discuss critical education problems and issues on which high-quality research is needed, the development or adaptation of new methodological approaches for addressing these issues, the role of IES research training programs in preparing of the next generation of researchers, and ways to prioritize the use of limited funds to support credible research that impacts policy and practice. The TWG consisted of 17 experts in the field of education research who work in universities and research organizations. The TWG discussion focused on five broad sessions: (1) characteristics of influential research; (2) critical, unaddressed issues in education research; (3) advancing research methods; (4) improving IES's training programs; and (5) targeting resources. This meeting summary covers all sessions of the technical working group and includes both presentations and discussions among participants. [View, download, and print the Technical Working Group Meeting Summary as a PDF file.](#)

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Make the Match with NIH RePORTER

Since 2008, NIH's Research Portfolio Online Reporting Tools, better known as [RePORT](#), has provided easy access to info on NIH funded research. My office continues to look at new ways to enhance your access to important information through robust search tools, data visualization dashboards, and more. I'd like to highlight one of our newer tools today: **Matchmaker**.

[Matchmaker](#) allows you to enter manuscript abstracts, research bios, or other scientific text, and retrieve a list of similar projects from the RePORTER database. After you submit your text (up to 15,000 characters in length), Matchmaker will analyze it for key terms and concepts, then pull up the top 100 most-similar NIH-funded projects, ranked by match score.

You'll notice that it also returns several graphs to allow you to easily visualize the distribution of NIH institutes or centers funding these projects, what activity codes these projects use, and which study section the project was reviewed in. You can also click on these graphs to further refine your results as well. For example, you can click on a specific activity code and see how the study section or funding IC distribution changes. Exploring NIH's research portfolio can help you identify the best ICs to reach out to as you put together an application and where your application is likely to be reviewed. It can also help you identify collaborators, potential labs to move into if you're a trainee, and more. Check out the video below and have fun making your match.

Educational Grant Writing Web Resources

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How Can You Improve Undergraduate Education Through Science Outreach?

Dr. Linda Rayor, Cornell University, is coordinating a workshop on how to improve undergraduate education through teaching how to do effective science outreach. The announcement, links to more detailed information, and contact information for additional questions can be found below. Please feel free forward this on to other interested colleagues, as well.

Doing science outreach directly benefits college students' engagement and skill in STEM education. Formally training undergraduates in effective scientific outreach greatly enhances the probability that these students will go on to become STEM teachers or to continue to do informal science education that communicates the value of science to the public through their careers.

This 2.5 day NSF-funded professional development workshop on 10 – 12 October 2015 for faculty and college educators will help you organize a course in how to do effective scientific outreach, develop an outreach program, provide guidance on how to host a large community science outreach event, and help you engage with K-12 teachers and museums. The workshop, 3-nights hotel, and meals are free to participants.

The workshop will be delivered by science outreach experts from Cornell University's Naturalist Outreach Program, the Sciencenter, and Museum of the Earth at Cornell University in Ithaca, NY.

For more information see 'Improving undergraduate education through science outreach' (<https://blogs.cornell.edu/outreachworkshop/>; <http://blogs.cornell.edu/naturalistoutreach>) or contact Dr. Linda S. Rayor (LSR1@cornell.edu)

The ABC of Gender Equality in Education

Many countries have been successful in closing gender gaps in learning outcomes. But even when boys and girls are equally proficient in mathematics and science, their attitudes towards learning and aspirations for their future are markedly different and that has a significant impact on their decision to pursue further education and on their choice of career. The ABC of Gender Equality in Education: Aptitude, Behaviour, Confidence tries to determine why, in the 64 countries and economies covered, 15-year-old boys are more likely than girls, on average, to be overall low achievers, and why high-performing 15-year-old girls underachieve in mathematics, science and problem solving compared to high-achieving boys. As the evidence in the report makes clear, gender disparities in school performance stem from students attitudes towards learning and their behaviour in school, from how they choose to spend their leisure time, and from the confidence they have -- or do not have -- in their own abilities as students.

The High School Environment and the Gender Gap in Science and Engineering

Despite the striking reversal of the gender gap in education, women pursue science, technology, engineering, and mathematics (STEM) degrees at much lower rates than those of

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their male peers. This study extends existing explanations for these gender differences and examines the role of the high school context for plans to major in STEM fields. Building on recent gender theories, we argue that widely shared and hegemonic gender beliefs manifest differently across schools so that the gender-specific formation of study plans is shaped by the local environment of high schools. Using the National Education Longitudinal Study, we first show large variations between high schools in the ability to attract students to STEM fields conditional on a large set of pre-high school measures. Schools that are successful in attracting students to these fields reduce the gender gap by 25 percent or more. As a first step toward understanding what matters about schools, we then estimate the effect of two concrete high school characteristics on plans to major in STEM fields in college--a high school's curriculum in STEM and gender segregation of extracurricular activities. These factors have a substantial effect on the gender gap in plans to major in STEM: a finding that is reaffirmed in a number of sensitivity analyses. Our focus on the high school context opens concrete avenues for policy intervention and is of central theoretical importance to understand the gender gap in orientations toward STEM fields.

Understanding the STEM Pipeline

"I investigate the determinants of high school completion and college attendance, the likelihood of taking science, technology, engineering or math (STEM) courses in the first year of college and the probability of earning a degree in a STEM field. The focus is on women and minorities, who tend to be underrepresented in STEM fields. Tracking four cohorts of students throughout Florida, I find that large differences in math achievement across racial lines exist as early as elementary school and persist through high school. These achievement differences lead to higher drop-out rates in high school and a reduced probability of attending college for black students. However, conditional on immediately attending a four-year college after high school, black and Hispanic students are more likely than whites to take STEM courses during their first year in college. Increased exposure to Hispanic math and science teachers in middle and high school tends to increase the likelihood that Hispanic students take STEM courses during their first year in college, though pairing black students and black math/science teachers does not have the same positive effect. For all students, having high school math and science teachers with a degree in biology, chemistry or math (as opposed to education) is associated with a higher likelihood of taking STEM courses as college freshmen. When pre-college differences in income and math achievement are taken into account, black and Hispanic students are at least as likely as white students to successfully complete a STEM major. Racial/ethnic pairing of students and college instructors in first-year STEM courses does not increase the likelihood of majoring in a STEM field. In contrast to underrepresented minorities, women perform nearly as well as men on math achievement tests through high school and are more likely to finish high school and attend college than males. Among college students, however, women are less likely than men to take courses in the physical sciences in their first year and are less likely to earn a degree in physics or engineering, even after adjusting for pre-college test scores. Gender matching of students and math/science teachers in middle and high school tends to increase the likelihood that female college freshman will take at least one STEM course. However, conditional on first-year coursework, neither gender matching at the secondary or college levels appears to have any effect on the likelihood of completing a major in a STEM field."

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Gender Differences in Science, Technology, Engineering, and Mathematics (STEM) Interest, Credits Earned, and NAEP Performance in the 12th Grade

"As technical and scientific innovation continue to drive the global economy, educators, policymakers, and scientists seek to promote students' interest and achievement in the STEM fields to maintain the nation's competitive position (National Academy of Sciences 2006; National Science Board 2007; President's Council of Advisors on Science and Technology 2012). Many researchers have studied differences in male and female students' attitudes toward and performance in STEM courses and assessments. While some research shows that gaps in male and female performance on STEM-related assessments have narrowed or even closed (Lindberg et al. 2010), other research continues to report gender differences in student affective dispositions (i.e., interest) toward mathematics and science, as well as differences in student performance in mathematics and science, especially in math-intensive science fields (Ceci et al. 2014; White House Council on Women and Girls 2011). This Statistics in Brief describes high school graduates' attitudes toward STEM courses (specifically, mathematics and science), credits earned in STEM fields, and performance on the National Assessment of Educational Progress (NAEP) mathematics and science assessments in 2009."

Development of an Instrument to Assess Attitudes Toward Science, Technology, Engineering, and Mathematics (STEM)

"There is a need for more students to be interested in science, technology, engineering, and mathematics (STEM) careers to advance U.S. competitiveness and economic growth. A consensus exists that improving STEM education is necessary for motivating more students to pursue STEM careers. In this study, a survey to measure student (grades 4-6) attitudes toward STEM and STEM careers was developed and administered to 662 students from two STEM-focused and three comprehensive (non-STEM-focused) schools. Cronbach's alphas for the whole survey and subscales indicated a high internal consistency. Statistically significant difference in means between students attending the STEM-focused and comprehensive schools on the two subscales of the survey and the overall survey were found. However, the explained variance for these results was approximately 1%. The survey is a useful tool to assess efficacy of STEM education programs on student attitudes toward STEM and STEM careers."

A Study of STEM Assessments in Engineering, Science, and Mathematics for Elementary and Middle School Students

"The purpose of this study was to develop, scale, and validate assessments in engineering, science, and mathematics with grade appropriate items that were sensitive to the curriculum developed by teachers. The use of item response theory to assess item functioning was a focus of the study. The work is part of a larger project focused on increasing student learning in science, technology, engineering, and mathematics (STEM)-related areas in grades 4--8 through an engineering design-based, integrated approach to STEM instruction and assessment. The fact that the assessments are available to school districts at no cost, and represent psychometrically sound instruments that are sensitive to STEM-oriented curriculum, offers schools an important tool for gauging students' understanding of engineering, science, and mathematics concepts."

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A Framework for Quality K-12 Engineering Education: Research and Development

"Recent U.S. national documents have laid the foundation for highlighting the connection between science, technology, engineering and mathematics at the K-12 level. However, there is not a clear definition or a well-established tradition of what constitutes a quality engineering education at the K-12 level. The purpose of the current work has been the development of a framework for describing what constitutes a quality K-12 engineering education. The framework presented in this paper is the result of a research project focused on understanding and identifying the ways in which teachers and schools implement engineering and engineering design in their classrooms. The development of the key indicators that are included in the framework were determined based on an extensive review of the literature, established criteria for undergraduate and professional organizations, document content analysis of state academic content standards in science, mathematics, and technology, and in consultation with experts in the fields of engineering and engineering education. The framework is designed to be used as a tool for evaluating the degree to which academic standards, curricula, and teaching practices address the important components of a quality K-12 engineering education. Additionally, this framework can be used to inform the development and structure of future K-12 engineering and STEM education standards and initiatives."

Advancing the State of the Art of STEM Integration

"The authors reflect on the integration of the educational system focused on science, technology, english and mathematics (STEM) and its condition of implementation. The authors mention that STEM education allows students to participate in engineering design as a way to improve relevant technology and to analyze mathematical content."

STEM Integration: Evidence of Student Learning in Design-Based Curricula

This study focuses on student learning of engineering design practices and the development of engineering thinking skills during participation in design-based curricular activities and will seek to answer the question: "What evidence is present in students' engineering design project work of engineering learning?" Student teams working in a STEM integration curricular module implemented in a fifth grade science classroom were analyzed. This study employs case study methods as a means to deeply analyze each team's work through content analysis of student classroom artifacts and video analysis. We use the Framework for Quality K-12 Engineering Education, with a particular focus on process of design, STEM content, engineering thinking, and communication, as a lens for analyzing the engineering thinking involved in student learning. This research aims to develop an initial understanding of how to identify these engineering learning outcomes in classrooms, with the overall goal of developing engineering assessment tools for classroom teachers. Evidence of student learning outcomes for these key engineering components was found throughout student work and student interactions, though varying levels of learning were shown by each group. This study demonstrates that it is possible to identify student learning of engineering processes within a design-based curriculum.

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Dear Colleague Letter: Stimulating Research Related to the Science of Broadening Participation

Building on previous investments, the Directorate for Social, Behavioral & Economic Sciences (SBE) and the Directorate for Education & Human Resources (EHR) announce their interest in stimulating research related to the Science of Broadening Participation (SBP). The Science of Broadening Participation will employ the theories, methods, and analytic techniques of the social, behavioral, economic, and learning sciences to better understand the barriers that hinder and factors that enhance our ability to broaden participation in science, technology, engineering, and mathematics (STEM). The results of these efforts will inform approaches to increase the access, involvement, and retention of underrepresented groups in STEM and to strengthen our national STEM capabilities and competitive advantage. Ultimately, the SBP research will provide scientific evidence that STEM educators, STEM employers, and policy makers need to make informed decisions and to design effective programs and interventions.

SBE and EHR will continue their partnership to support SBP research proposals that will contribute to the overall understanding of the positive and negative factors impacting the participation of underrepresented individuals in STEM education and careers. SBP research proposals may focus on factors such as the following: Institutional and organizational factors (e.g., studies of organizational, structural or climate factors that impact STEM participation); Cultural, psychological, social, demographic and community factors (e.g., studies of how individual, behavioral, family, school or neighborhood factors affect STEM participation and achievement rates); Economic and policy-related factors (e.g., studies of economic factors that impact STEM participation and the relationship between broader participation and social innovation)

We anticipate that many of the fields represented within SBE and EHR can contribute to the Science of Broadening Participation. Some examples of potential research questions related to the SBP include but are not limited to:

- What are the underlying organizational, psychological and social issues affecting the different participation and graduation rates in STEM of women, men, persons with disabilities, and racial and ethnic minorities?
- Under which conditions do behavioral, economic, and socio-legal factors influence recruitment and retention in STEM education at the individual, meso, and macro levels?
- What aspects of preK-12, informal, and higher education learning environments or workplace culture moderate the factors impacting underrepresented minorities, women, and/or persons with disabilities?
- How do attitudes and stereotypes influence decisions to pursue STEM careers?
- What behavioral or economic processes result in outcomes that are associated with success in STEM?
- What theoretical approaches predict success in ensuring that young people from underrepresented groups do not lose interest in STEM during adolescence or other critical developmental transition periods?

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- What are the impacts of a diverse STEM workforce on scientific productivity, innovation and the national economy?

Dear Colleague Letter: Indicators for Monitoring Progress Toward Successful K-12 STEM Education

This Dear Colleague Letter is to announce that the National Science Foundation's Directorate for Education and Human Resources is interested in research and development activities around the 14 Indicators as described in 2013 in the National Research Council report, *Monitoring Progress Toward Successful K-12 Education: A Nation Advancing?* The report calls for a national indicator system that could be used by both policymakers and practitioners to improve STEM education. The report lists 14 Indicators that, if measured regularly, could catalyze such improvement. The indicators can be found at:

http://www.nap.edu/catalog.php?record_id=13509. While there are measures of some of these 14 indicators, the valid and reliable measurement of all these indicators is insufficiently developed to monitor the progress of K-12 STEM education in the US.

The purpose of this DCL is to encourage proposals to be submitted to the Promoting Research Innovations in Methodologies and Evaluation (PRIME) program ([NSF 15-540](#)) to conduct exploratory work in its early stages on untested but potentially transformative research ideas or approaches necessary to move forward to design and develop measures of one or more of these 14 indicators for use in monitoring and improving the STEM education system.

Since measures and the associated data for many of these indicators are not yet available, it is anticipated that many of the submitted Indicators-related projects may consist of:

1. Research that would lead to the development of consensus among STEM educators about the nature and operational definitions of one or more of these indicators;
2. A review and synthesis of the current state of the evidence base as they might map the development of measures of these indicators; and/or
3. Research and development to create and validate measures of one or more of these indicators, with an emphasis on the measures with the potential to support inferences at a national scale.

All submissions should begin with INDICATORS in the proposal title. Questions should be directed to one of the following program officers:

Karen King (kking@nsf.gov), Division of Research on Learning

Finbarr Sloane (fsloane@nsf.gov), Division of Research on Learning

Gul Kremer (gkremer@nsf.gov), Division of Undergraduate Education

Rebecca Kruse (rkruse@nsf.gov), Division of Research on Learning

Dear Colleague Letter: Cybermanufacturing Systems

With this Dear Colleague letter (DCL), the National Science Foundation (NSF) is announcing its intention to accept EARly-Concept Grants for Exploratory Research (EAGER) proposals in FY 2015 to support researchers who are pursuing novel, early-stage, multi-disciplinary, and high-risk/high-reward research on cybermanufacturing systems. Requests may be for up to \$300,000 and of up to two years duration. Approximately 25 EAGER awards will be made in FY 2015.

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Submission of EAGER proposals is requested by June 1, 2015, but earlier submissions are encouraged and decisions will be made on an ongoing basis until available funds are exhausted. **This DCL strongly encourages collaborative proposals between manufacturing and computer and information science and engineering researchers, and joint review of proposals among complementary NSF programs will be pursued when appropriate. It is anticipated that these collaborations will foster new research directions at the intersection of manufacturing and computer and information science and engineering, paving the way for larger-scale efforts in the future.** Proposers are also especially encouraged to implement, test, and improve the usability of system architectures in teaching environments in which students both use and contribute application software (apps).

Dear Colleague Letter - EAGERS for Cellular Biomanufacturing

Advanced biomanufacturing is a field that builds upon groundbreaking discoveries in engineering and biology to produce the next generation of therapeutics, diagnostics, and manufacturing processes for biochemicals. These include, but are not limited to, cell-based therapies, microdevices with cells organized to provide appropriate biological complexity, also referred to as organs-on-a-chip, as well as design methods of cellular catalysts. Advanced biomanufacturing capitalizes on recent discoveries in bioreactor technology, 3D additive manufacturing, micro and nanofabrication, novel biomaterials, stem cell technologies, cell reprogramming and transdifferentiation processes, systems and synthetic biology, genome editing, and mathematical modeling at the molecular, cellular, cell population, and tissue levels, to spur research and development, education, and industry growth and innovation. Cellular biomanufacturing is a critical component of advanced biomanufacturing. Cell-based therapies and diagnostics have the potential to revolutionize human healthcare in different contexts, including personalized medicine. Additionally, cells are used for the biomanufacturing of protein therapeutics. Processes with cells as products present major engineering challenges, and indeed new therapies and cell-based products may depend critically on robust and reliable manufacturing approaches at the cellular level.

The National Science Foundation (NSF) has placed a high priority on advanced manufacturing, including advanced biomanufacturing. The Chemical, Bioengineering, Environmental and Transport Systems (CBET) Division in the Engineering Directorate (ENG) at NSF seeks EARly-Concept Grants for Exploratory Research (EAGER) proposals that address key challenges in cellular biomanufacturing science and engineering, whether the intended use of the final cell product is in cell therapies, engineered tissues, or drug discovery and testing platforms that incorporate living cells, or whether the cells are used in novel protein production processes.

This Dear Colleague Letter (DCL) is aimed at identifying opportunities to leverage and synthesize conceptual, scientific and technological innovation across disciplines in order to promote developments in cellular biomanufacturing towards accelerating solutions to critical challenges in the field. Although some of the challenges are specific to a particular type of cells, such as autologous cells, others are more generic and encompassing, applicable to both autologous and allogeneic cells. Projects are not limited to particular cell type(s), however, the project description should indicate the range of cell types for which the scientific questions or

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technological developments addressed in the proposal are relevant. Topics may include, but are not limited to:

- Novel approaches to increase the efficiency and rate of stem cell differentiation towards the desirable phenotype.
- Methods for rapid, non-destructive characterization of cellular phenotype and potency.
- Culture configurations and bioreactor technologies for reproducible cell expansion/differentiation towards the targeted population size/phenotype.
- Novel cell separation technologies either for the starting biopsied material or for the final biomanufactured product.
- Development of robust correlations between easily measurable biomarkers and cellular functionality and potency.
- Innovative platforms addressing cell source variability in developing robust biomanufacturing processes based on autologous cells from various subjects.
- Design of stable mammalian cell lines that are less prone to evolutionary changes and that are suited for a more efficient manufacture of protein therapeutics.
- Computational models accounting for the stochastic variability of cells, which could be used for process tracking towards a final product within defined specifications.

These high-risk, high-impact, short-term projects must transcend approaches typically supported by the core research programs at NSF. Projects should have strong engineering and biological components, integrating and advancing both disciplines. Academic-Industry collaborations are encouraged. Although proposed studies should be potentially transformative and may be considered especially "high-risk, high-payoff," they should also be compatible with the time and budget limits of the EAGER funding mechanism. Specifically, requests may be for up to \$300K and of up to two years duration. For more information on EAGERS, please consult the [NSF Grant Proposal Guide](#).

DE-FOA-0001325 Research and Development Needs for Wind Systems Utilizing Controllable Grid Simulators and Full Scale Hardware in the Loop Testing

Complete information, including the full RFI, can be found on the EERE Exchange website at <https://eere-exchange.energy.gov>. Through a balanced portfolio approach, the U.S. Department of Energy (DOE) Wind and Water Power Technologies Office's (WWPTO's) Wind Power Program, herein referred to as the "Wind Program", makes strategic investments in the Power Systems Integration subprogram, including transformational technology innovations that seek to maximize generation from wind power resources while addressing key grid level integration, operations, and planning challenges. The Wind Program addresses technology needs and opportunities in wind integration, which would otherwise not be addressed by the private sector on its own. The purpose of this Request for Information (RFI) is to solicit feedback from industry, utilities (investor-owned, municipal, and electric cooperative), academia, research laboratories, government agencies, and other stakeholders on issues related to the use of controllable grid simulators to perform full scale wind-grid system research, development, and testing. Such research, development, and testing could include the application of Power Hardware-In-the-Loop (PHIL) testing capabilities to the wind technology market and the associated grid integration impacts. **Responses to this RFI must be submitted electronically to GridSimRFI@ee.doe.gov no later than 5:00pm (EDT) on April 27, 2015.**

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Responses must be provided as attachments to an email. Please identify your answers by responding to a specific question or topic if possible. Respondents may answer as many or as few questions as they wish. This is solely a request for information and not a Funding Opportunity Announcement (FOA). EERE is not accepting applications through this RFI. DOE will not respond to questions regarding this RFI.

Funding opportunity for US-Russia university partnerships: all academic fields

Eurasia Foundation invites accredited higher education institutions from Russia and the United States to submit joint proposals for creating new bilateral partnerships as part of the US-Russia University Partnership Program (UPP). The funding competition offers “Linkage” funding of up to \$41,000 for the implementation of new partnership projects in any academic field. Proposals must include at least one Russian and one US institution. All application materials for Linkage funding are due on **May 18th, 2015**. In order to access the application materials, higher education institutions must first register with the UPP database (<http://usrussiaupp.org/en/disclaimer>). For more information about funding opportunities and eligibility requirements, please visit the UPP website at <http://usrussiaupp.org/en/partnership-funding> or contact UPP staff at upp@eurasia.org. In order to receive the latest news and updates regarding the UPP initiative, please follow us on Facebook (<https://www.facebook.com/usrussiaupp>) and Twitter (<https://twitter.com/USRussiaUPP>).

Energy Department Publishes \$1 Million H2 Refuel H-Prize Competition Specs

The Hydrogen Education Foundation on April 3 announced that the technical testing specifications for the "H2 Refuel H-Prize" competition are now available on the H-Prize website. The H2 Refuel H-Prize is a \$1 million competition sponsored by the Energy Department's Fuel Cell Technologies Office. Potential contestants are encouraged to review these specifications in detail prior to submitting their designs by the October 29 deadline.

The H2 Refuel H-Prize is a two-year competition challenging U.S. engineers and entrepreneurs to develop the equivalent of home or community electric charging stations for hydrogen fuel cell electric vehicles (FCEVs). FCEVs are zero-emission electric vehicles, with driving ranges and refueling times similar to today's vehicles. Finalist entries to the competition will be evaluated on both technical and financial criteria to determine the winner of the \$1 million prize. To evaluate the system performance against the technical criteria, the Energy Department's National Renewable Energy Laboratory will collect data from the finalists' systems. The testing specification documents are intended to inform potential contestants about the type of data that will be collected as well as the requirements for compatibility with the data collection system. See the [Hydrogen Education Foundation news release](#) and the [H-Prize website](#).

Energy Department's Building America Program Seeks Feedback on Proposals

The Energy Department's Building Technologies Office is developing a new research-to-market plan, focused on substantially solving three key technical challenges during the next five years. Successfully meeting these critical challenges will help transform the market for new zero-energy-ready homes and will lead to significant improvement in the energy efficiency and performance of existing homes across the United States. The Energy Department has issued a request for information (RFI) to gather industry feedback for three technology-to-market

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roadmaps that address technical challenges for the following residential systems in low-load homes: high-performance, moisture-managed envelope; optimal comfort through heating, ventilation, and air conditioning; and indoor air quality and ventilation. Feedback from this RFI will be used to develop a new Building America Research-to-Market Plan and develop future Building America funding opportunity announcements. The deadline is April 30. See the [RFI](#) and the [Building Technologies Office website](#).

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Agency Reports, Workshops & Research Roadmaps

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Wind Vision: New Report Highlights a Robust Wind Energy Future

With utility-scale wind turbines installed in 39 states, wind energy accounts for 4.5% of our nation's annual electricity generation. At this level, wind energy already supports more than 50,000 industry-related jobs in manufacturing, construction, operations and maintenance, and supporting services, all while improving the environment and strengthening our economy. So, what could the United States energy picture look like in 2020, 2030, and 2050, and what is the role of wind? That's the question the Energy Department and an elite team of researchers, academics, scientists, engineers, and wind industry experts, set out to answer over the past two years. These experts revisited and built on the findings of the Energy Department's 2008 *20% Wind by 2030* report to envision a new future for wind energy through 2050. Taking into account every type of wind energy deployment (land-based, offshore, distributed), the new *Wind Vision* report defines the societal, environmental, and economic benefits of wind power in a scenario with wind energy supplying 10% of the country's electricity in 2020, 20% in 2030, and 35% in 2050, established through rigorous analysis and deployment scenario sensitivities. For the complete story, see the [EERE Blog](#).

Amid Challenges Facing Manufacturing Sector, U.S. Must Strengthen Innovation, Productivity, and Workforce Training

Given that globalization, technological advances, and changing business practices are dramatically transforming employment and operations across the board in manufacturing, U.S. companies, government, and educators should partner to strengthen workforce training and improve innovation and productivity to ensure manufacturers are "making value" for customers, says a new report from the National Academy of Engineering. Making value is the process of using ingenuity to convert resources into goods, services, or processes that create solutions, serving the welfare of humanity and the needs of society.

Manufacturing can no longer be considered separate from the value chain, the system of research and development, product design, software development and integration, and lifecycle service activities performed to deliver a product or service to market. Businesses focusing on the entire system help make value for their customers and are less likely to be disrupted by new technologies or increased competition from emerging economies around the world.

While technological advances offer companies new ways to understand customers' needs and in turn increase demand for their products, automation and streamlined operations are likely to supplant an increasing number of workers in a variety of occupations, the report says. By some estimates, almost 50 percent of U.S. jobs are at risk for disruption. For example, due to advances in automation and computer-aided design, engineering, and production, an automobile manufacturing plant can now be run by one-third as many people as in 1965, while the quality, sophistication, and timely delivery of vehicles have dramatically improved. Read more at [above URL](#).

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Opportunities for the Gulf Research Program: Community Resilience and Health: Summary of a Workshop

There are many connections between human communities and their surrounding environments that influence community resilience and health in the Gulf of Mexico. The impacts of the Deepwater Horizon oil spill on Gulf communities and ecosystems - coupled with the region's preexisting health challenges and environmental stressors - illustrate the need to better understand these connections. In the future, natural and man-made disasters, climate change impacts, and other environmental stressors will present complex challenges to the physical, mental, and social well-being of communities in the Gulf. Understanding the interrelationships among health, ecological, and economic impacts of disasters and other environmental stressors will be crucial to addressing these challenges.

Opportunities for the Gulf Research Program: Community Resilience and Health summarizes a Gulf Research Program workshop held on September 22-23, 2014, in New Orleans, Louisiana. The workshop examined opportunities to improve the health, well-being, and resilience of communities in the Gulf region through discussions with about 50 participants with diverse expertise and experience. These discussions identified perceived needs, challenges, and opportunities that align with the Gulf Research Program's mission and goals - particularly its goal to improve understanding of the connections between human health and the environment to support the development of health and resilient Gulf communities. This workshop is expected to lead to the development of additional Program activities and opportunities for the research community.

Frontiers of Engineering: Reports on Leading-Edge Engineering from the 2014 Symposium

This volume presents papers on the topics covered at the National Academy of Engineering's 2014 US Frontiers of Engineering Symposium. Every year the symposium brings together 100 outstanding young leaders in engineering to share their cutting-edge research and innovations in selected areas. The 2014 symposium was held September 11-13 at the National Academies Beckman Center in Irvine California. The topics covered at the 2014 symposium were: co-robotics, battery materials, technologies for the heart, and shale gas and oil. The intent of this book is to convey the excitement of this unique meeting and to highlight innovative developments in engineering research and technical work.

Review of the Edwards Aquifer Habitat Conservation Plan: Report 1

The Edwards Aquifer in south-central Texas is the primary source of water for one of the fastest growing cities in the United States, San Antonio, and it also supplies irrigation water to thousands of farmers and livestock operators. It is also the source water for several springs and rivers, including the two largest freshwater springs in Texas that form the San Marcos and Comal Rivers. The unique habitat afforded by these spring-fed rivers has led to the development of species that are found in no other locations on Earth. Due to the potential for variations in spring flow caused by both human and natural causes, these species are continuously at risk and have been recognized as endangered under the federal Endangered Species Act (ESA).

In an effort to manage the river systems and the aquifer that controls them, the Edwards Aquifer Authority and stakeholders have developed a Habitat Conservation Plan (HCP).

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The HCP seeks to effectively manage the river-aquifer system to ensure the viability of the ESA-listed species in the face of drought, population growth, and other threats to the aquifer. The National Research Council was asked to assist in this process by reviewing the activities around implementing the HCP. *Review of the Edwards Aquifer Habitat Conservation Plan: Report 1* is the first stage of a three-stage study.

This report reviews the scientific efforts that are being conducted to help build a better understanding of the river-aquifer system and its relationship to the ESA-listed species. These efforts, which include monitoring and modeling as well as research on key uncertainties in the system, are designed to build a better understanding of how best to manage and protect the system and the endangered species. Thus, the current report is focused specifically on a review of the hydrologic modeling, the ecological modeling, the water quality and biological monitoring, and the Applied Research Program.

The fundamental question that *Review of the Edwards Aquifer Habitat Conservation Plan: Report 1* addresses is whether the scientific initiatives appropriately address uncertainties and fill knowledge gaps in the river-aquifer system and the species of concern. It is hoped that the successful completion of these scientific initiatives will ultimately lead the Edwards Aquifer Authority to an improved understanding of how to manage the system and protect these species.

Educate to Innovate: Factors That Influence Innovation: Based on Input from Innovators and Stakeholders

Robust innovation in the United States is key to a strong and competitive industry and workforce. Efforts to improve the capacity of individuals and organizations to innovate must be a high national priority to ensure that the United States remains a leader in the global economy. How is the United States preparing its students and workers to innovate and excel? What skills and attributes need to be nurtured?

The aim of the Educate to Innovate project is to expand and improve the innovative capacity of individuals and organizations by identifying critical skills, attributes, and best practices - indeed, cultures - for nurturing them. The project findings will enable educators in industry and at all levels of academia to cultivate the next generation of American innovators and thus ensure that the U.S. workforce remains highly competitive in the face of rapid technological changes. Educate to Innovate summarizes the keynote and plenary presentations from a workshop convened in October 2013. The workshop brought together innovators and leaders from various fields to share insights on innovation and its education. This report continues on to describe the specific skills, experiences, and environments that contribute to the success of innovators, and suggests next steps based on discussion from the workshop.

Critical Role of Animal Science Research in Food Security and Sustainability

By 2050 the world's population is projected to grow by one-third, reaching between 9 and 10 billion. With globalization and expected growth in global affluence, a substantial increase in per capita meat, dairy, and fish consumption is also anticipated. The demand for calories from animal products will nearly double, highlighting the critical importance of the world's animal agriculture system. Meeting the nutritional needs of this population and its demand for animal products will require a significant investment of resources as well as policy changes that are

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supportive of agricultural production. Ensuring sustainable agricultural growth will be essential to addressing this global challenge to food security.

Critical Role of Animal Science Research in Food Security and Sustainability identifies areas of research and development, technology, and resource needs for research in the field of animal agriculture, both nationally and internationally. This report assesses the global demand for products of animal origin in 2050 within the framework of ensuring global food security; evaluates how climate change and natural resource constraints may impact the ability to meet future global demand for animal products in sustainable production systems; and identifies factors that may impact the ability of the United States to meet demand for animal products, including the need for trained human capital, product safety and quality, and effective communication and adoption of new knowledge, information, and technologies.

The agricultural sector worldwide faces numerous daunting challenges that will require innovations, new technologies, and new ways of approaching agriculture if the food, feed, and fiber needs of the global population are to be met. The recommendations of *Critical Role of Animal Science Research in Food Security and Sustainability* will inform a new roadmap for animal science research to meet the challenges of sustainable animal production in the 21st century. [[Read the full report](#)]

[**FY 2016 Budget Request to Congress for DOE's Office of Science**](#)

[**FY 2016 Budget Request to Congress for NSF**](#)

[**FY 2016 Budget Request to Congress for USDA**](#)

[**FY 2016 Budget Request to Congress for NIH**](#)

[**FY 2016 Budget Request to Congress for NOAA**](#)

[**FY 2016 Budget Request to Congress for NASA**](#)

[**FY 2016 Budget Request to Congress for Department of Education**](#)

[**FY 2016 Budget Request to Congress for NEH**](#)

[**Increases/Decreases: FY 2016 S&T Budget Requests**](#)

[**The President's 2016 Budget: Agency Fact Sheets**](#)

Listed in the table below are links to fact sheets for each agency.

- [**Corporation for National and Community Service**](#)
- [**Department of Agriculture**](#)
- [**Department of Commerce**](#)
- [**Department of Defense**](#)
- [**Department of Education**](#)
- [**Department of Energy**](#)

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- [Department of Health and Human Services](#)
- [Department Housing and Urban Development](#)
- [Department of Homeland Security](#)
- [Department of the Interior](#)
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- [National Intelligence Programs](#)
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New Funding Opportunities

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Content Order

New Funding Posted Since March 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 March 15 Newsletter

[Geomorphology and Land Use Dynamics](#)

The Geomorphology and Land-use Dynamics Program supports innovative research into processes that shape and modify landscapes over a variety of length and time scales. The program encourages research that quantitatively investigates the coupling and feedback among such processes, their rates, and their relative roles, especially in the contexts of variation in climatic, biologic, and tectonic influences and in light of changes due to human impacts. Such research may involve fieldwork, modeling, experimentation, theoretical development, or combinations thereof. **Proposals are accepted at any time.**

[Sedimentary Geology and Paleobiology \(SGP\)](#)

Sedimentary Geology and Paleobiology supports studies of: (1) the changing aspects of life, ecology, environments, and biogeography in geologic time based on fossil plants, animals, and microbes; (2) all aspects of the Earth's sedimentary lithosphere – its insights into the geological processes and rich organic and inorganic resources locked in rock sequences; (3) the science of dating and measuring the sequence of events and rates of geological processes as manifested in Earth's past sedimentary and biological (fossil) record; (4) the geologic record of the production, transportation, and deposition of modern and ancient physical and chemical sediments; and (5) understanding Earth's deep-time (pre-Holocene) climate systems. **Proposals are accepted at any time.**

[ED-GRANTS-032015-002 Office of Elementary and Secondary Education \(OESE\): Jacob K. Javits Gifted and Talented Students Education Program](#)

The purpose of this competition under the Jacob K. Javits Gifted and Talented Students Education Program (Javits) is to provide grants to State educational agencies (SEAs) to enable them to carry out a coordinated program of scientifically based research, demonstration projects, innovative strategies, and similar activities designed to build and enhance the ability

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of elementary and secondary schools nationwide to meet the special educational needs of gifted and talented students, particularly those from disadvantaged backgrounds or underrepresented groups. This grant competition implements the "special rule" in section 5464(c) of the Elementary and Secondary Education Act of 1965, as amended (ESEA), that requires any Javits program funds appropriated for a fiscal year in excess of the amount of such funds appropriated for FY 2001 (i.e., \$7.5 million) to be used to award competitive grants to SEAs, local educational agencies (LEAs), or both. Applications for grants under Javits, CFDA number 84.206A, must be submitted electronically using the Governmentwide Grants.gov Apply site. You may access the electronic grant application for Javits at www.Grants.gov. You must search for the downloadable application package for this competition by the CFDA number. Do not include the CFDA number's alpha suffix in your search (e.g., search for 84.206, not 84.206A). The telephone number for the Grants.gov Helpdesk is 1-800-518-4726 or e-mail: support@grants.gov. **Due May 4.**

Funding opportunity for US-Russia university partnerships: all academic fields

Eurasia Foundation invites accredited higher education institutions from Russia and the United States to submit joint proposals for creating new bilateral partnerships as part of the US-Russia University Partnership Program (UPP). The funding competition offers "Linkage" funding of up to \$41,000 for the implementation of new partnership projects in any academic field. Proposals must include at least one Russian and one US institution. All application materials for Linkage funding are due on **May 18th, 2015**. In order to access the application materials, higher education institutions must first register with the UPP database (<http://usrussiaupp.org/en/disclaimer>). For more information about funding opportunities and eligibility requirements, please visit the UPP website at <http://usrussiaupp.org/en/partnership-funding> or contact UPP staff at upp@eurasia.org. In order to receive the latest news and updates regarding the UPP initiative, please follow us on Facebook (<https://www.facebook.com/usrussiaupp>) and Twitter (<https://twitter.com/USRussiaUPP>). **Due May 18.**

ED-GRANTS-032015-001 Office of Postsecondary Education (OPE): Developing Hispanic-Serving Institutions (HSI) Program

Purpose of Program: The HSI Program provides grants to assist HSIs to expand educational opportunities for, and improve the academic attainment of, Hispanic students. HSI Program grants also enable HSIs to expand and enhance the academic offerings, program quality, and institutional stability of colleges and universities that are educating the majority of Hispanic college students and help large numbers of Hispanic students and other low-income individuals complete postsecondary degrees. Applications for grants under the HSI Program, CFDA number 84.031S, must be submitted electronically using the Governmentwide Grants.gov Apply site at www.Grants.gov. You may access the electronic grant application for the HSI Program at www.Grants.gov. You must search for the downloadable application package for this program by the CFDA number. Do not include the CFDA number's alpha suffix in your search (e.g., search for 84.031, not 84.031S). The telephone number for the Grants.gov Helpdesk is 1-800-518-4726 or e-mail: support@grants.gov. **Due May 19.**

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2015 EPA Greater Research Opportunities

Financial Support for Undergraduate Studies in Environmental Sciences is available from the National Center for Environmental Research, a unit of the EPA Office of Research and Development, which is seeking applications for its Greater Research Opportunities (GRO) Fellowships For Undergraduate Environmental Study. This fellowship program forms part of efforts to ensure that the United States meets its current and projected human resource needs in the environmental science, engineering, mathematics, and technology fields. The six specific areas of interest are: Natural and Life Sciences; Environmental Sciences and Interdisciplinary Programs; Engineering; Social Sciences; Physical Sciences and Earth Sciences; and Mathematics and Computer Science - EPA expects to award approximately 34 new fellowships. The fellowship provides up to \$20,700 per year of academic support and \$8,600 for internship support for a combined total of up to \$50,000 over the life of the fellowship. **Deadline, May 19.**

DARPA-BAA-15-36 Building Resource Adaptive Software Systems (BRASS)

DARPA is soliciting innovative research proposals in the areas of formal methods, program analysis, compiler design, and runtime and virtual machine implementation to realize tools for the construction of long-lived, survivable, and scalable adaptive software systems. The goal of the BRASS program is to realize foundational advances in the design and implementation of survivable, long-lived complex software systems that are robust to changes in the resources (logical or physical) provided by their operational environment. For further details see attached PDF, "[DARPA-BAA-15-36 BRASS](#)" **Due May 22.**

2015 EPA Science to Achieve Results (STAR) Fellowships for Graduate Environmental Study

The U.S. Environmental Protection Agency (EPA), as part of its Science to Achieve Results (STAR) program, is offering Graduate Fellowships for master's and doctoral level students in environmental fields of study. The deadline for submission of applications is May 26, 2015 at 11:59:59 PM. Subject to availability of funding and other applicable considerations, the Agency plans to award approximately 55 new fellowships in the Fall of 2015. The Fellowship Program provides up to \$44,000 per year of support per fellowship. Master's level students may receive a maximum of two years of support (\$88,000). Doctoral students may be supported for a maximum of three years (\$132,000), usable over a period of five years. **Due May 26.**

USDA-NIFA-SCRI-005035 Specialty Crop Research Initiative/Citrus Disease Research and Extension

The Specialty Crop Research Initiative (SCRI) Citrus Disease Research and Extension Program (CDRE) is authorized in the Agricultural Act of 2014 (H.R. 2642) to award grants to eligible entities to conduct research and extension activities, technical assistance and development activities to: (a) combat citrus diseases and pests, both domestic and invasive and including huanglongbing and the Asian citrus psyllid, which pose imminent harm to United States citrus production and threaten the future viability of the citrus industry; and (b) provide support for the dissemination and commercialization of relevant information, techniques, and technologies discovered pursuant to research and extension activities funded through SCRI/CDRE and other research and extension projects targeting problems caused by citrus production diseases and

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invasive pests. Pre-applications (Stakeholder Relevance Statement): **Due June 1. Full application August 14.**

Next Generation Electric Machines: Megawatt Class Motors

Manufacturing is the use of energy, equipment, information, services, and capital to convert raw materials, components, and parts into goods that meet market expectations. As an economic sector, manufacturing generates 12% of U.S. Gross Domestic Product (GDP) and employs 12 million Americans. The DOE Office of Energy Efficiency and Renewable Energy's Advanced Manufacturing Office (AMO) makes research, development, and demonstration (RD&D) investments in advanced manufacturing process and materials technologies. These technologies are foundational, pervasive, and promise crosscutting industrial applications and impact in reducing industry's energy footprint and greenhouse gas (GHG) emissions, as well as supporting the global competitiveness of clean energy products. By targeting the development of energy-related advanced manufacturing technology, AMO's work can create completely new supply chains and stimulate significant economic growth and job creation.

AMO's Next Generation Electric Machines (NGEM) program is an RD&D effort leveraging recent technology advancements in power electronics and electric motors to develop a new generation of energy efficient, high power density, high speed, integrated MV drive systems for a wide variety of critical energy applications. Improvements to these systems can be realized through the application of key enabling technologies, such as wide bandgap devices, advanced magnetic materials, improved insulation materials, aggressive cooling techniques, high speed bearing designs, and improved conductors or superconducting materials. Through this development program, NGEM will facilitate a step-change that enables more efficient use of electricity, as well as reduced drive system size and weight, developing lasting capabilities for motor material development, design, and analysis that are cost-shared with industry stakeholders.

This specific Funding Opportunity Announcement (FOA) is focused on developing MV integrated drive systems that leverage the benefits of state of the art power electronics (i.e., wide band gap devices) with energy efficient, high speed, direct drive, megawatt (MW) class electric motors for efficiency and power density improvements in three primary areas:

3. Chemical and petroleum refining industries
4. Natural gas infrastructure
5. General industrial applications. **Due June 3.**

Digital Projects for the Public National Endowment for the Humanities

Digital Projects for the Public grants support projects that significantly contribute to the public's engagement with the humanities. Digital platforms—such as websites, mobile applications and tours, interactive touch screens and kiosks, games, and virtual environments—can reach diverse audiences and bring the humanities to life for the American people. The program offers three levels of support for digital projects: grants for Discovery projects (early-stage planning work), Prototyping projects (proof-of-concept development work), and Production projects (end-stage production and distribution work). While projects can take many forms, shapes, and sizes, your request should be for an exclusively digital project or for a digital component of a larger project. **Due June 10.**

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DE-FOA-0001286 Research and Development Of Innovative Technologies for Low Impact Hydropower Development

A recent study by Oak Ridge National Lab has shown that there is up to 60 GW of new hydropower development potential available in the United States. Most of the available sites come with challenges with regard to environmental and social sustainability and cost effective development. To address these challenges, DOE's Water Program initiated a new technology program, [HydroNEXT](#) to focus on hydropower technology innovation that will foster development of potential new hydropower capacity in the U.S. The HydroNEXT effort continues in 2015, through this FOA, aimed at the development of suitable technologies to overcome environmental, social, and LCOE challenges. DOE will solicit innovative ideas to harness hydropower that can be rapidly built, removed, and replaced when necessary. Applicants will be encouraged to provide new concepts for alternative hydropower systems that will lower costs of civil infrastructure development, can be deployed in a maximum of 2 years with relatively low environmental impacts, and can be removed or replaced after their intended life is completed. These concepts and systems will be able to operate at a cost that is competitive with traditional sources of generation. The three topic areas covered by this FOA are outlined below: Topic Area 1: Design and laboratory testing of new rapidly deployable hydropower technologies that can be easily removed or replaced at the end of their useful life, including, but not limited to, water impounding structures, water conveying systems, and innovative pre-fabricated structures. Topic Area 2: Research on innovative methods and/or materials for construction of conventional hydropower facilities including, but not limited to, concrete alternatives, in-water construction, and innovative advanced tunneling methods. Topic Area 3: Design and laboratory testing of new and innovative conventional hydropower powertrain components such as composite and replaceable blade technologies for turbine runners, new generator technologies, and/or materials and coatings for powertrain components. The full Funding Opportunity Announcement (FOA) is posted on the EERE Exchange website at <https://eere-exchange.energy.gov> . Applications must be submitted through the EERE Exchange website to be considered for award. The applicant must first register and create an account on the EERE Exchange website. A User Guide for the EERE Exchange website can be found on the website <https://eere-exchange.energy.gov/Manuals.aspx> . Information on where to submit questions regarding the content of the announcement and where to submit questions regarding submission of applications is found in the full FOA posted on the EERE Exchange website. **Due June 15.**

Big Data Regional Innovation Hubs (BD Hubs): Accelerating the Big Data Innovation Ecosystem

To augment ongoing activities and to ignite new Big Data public-private partnerships across the Nation, NSF's Directorate for Computer and Information Science and Engineering (CISE) is seeking to establish a National Network of *Big Data Regional Innovation Hubs* (BD Hubs). Each BD Hub would be a consortium of members from academia, industry, and/or government. This solicitation aims to establish four Hubs across distinct geographic regions of the United States, including the Northeast, Midwest, South, and West, as defined later in the Program Description section. Each BD Hub should focus on key Big Data challenges and opportunities for its region of service. The BD Hubs should aim to support the breadth of interested local stakeholders within

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their respective regions, while members of a BD Hub should strive to achieve common Big Data goals that would not be possible for the independent members to achieve alone. To foster collaboration among prospective partners within a region, NSF is sponsoring a series of regional, intensive, one-day workshops (called "charrettes"). One charrette will be held in each geographic region to convene stakeholders, explore Big Data challenges, and aid in the establishment of that consortium. For more information on these charrettes, see the following webpage: <http://www.usenix.org/BDHubs15>. To facilitate discussion among interested parties, a HUBzero community portal has been established at <http://bdhub.info>. Interested parties may leverage this portal to communicate with members within their region or other stakeholders nationwide. **Due June 24.**

Humanities Initiatives National Endowment for the Humanities

NEH Humanities Initiatives at Hispanic-Serving Institutions, Historically Black Colleges and Universities, and Tribal Colleges and Universities are intended to strengthen the teaching and study of the humanities in subjects such as history, philosophy, and literature. These grants may be used to enhance existing humanities programs, resources, or courses, or to develop new ones. NEH Humanities Initiatives may 1) create opportunities for faculty members to study together, in order to improve their capacity to teach the humanities; 2) support new humanities programs (which may include but are not limited to new humanities minors, first-year seminars, and capstone courses), and enhance existing ones; 3) support humanities contributions to professional training (in such fields as business, law, economics, technology, and nursing and medicine; 4) develop bridge programs for at-risk and nontraditional students; 5) help institutions take advantage of humanities resources, especially in the digital humanities; and; 6) support collaborative projects in the humanities between the applicant institution and another institution, such as a college or university, a school or school system, a museum or library, or a historical or cultural society. **Due June 25.**

NSF Building Community and Capacity in Data Intensive Research in Education

As part of NSF's Cyberinfrastructure Framework for 21st Century Science and Engineering (CIF21) activity, the Directorate for Education and Human Resources (EHR) seeks to enable research communities to develop visions, teams, and capabilities dedicated to creating new, large-scale, next-generation data resources and relevant analytic techniques to advance fundamental research for EHR areas of research. Successful proposals will outline activities that will have significant impacts across multiple fields by enabling new types of data-intensive research. Investigators should think broadly and create a vision that extends intellectually across multiple disciplines and that includes--but is not necessarily limited to--EHR areas of research. **Due September 1.**

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

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the ARO sections of the Army Research Laboratory BAA.

(www.arl.army.mil/www/default.cfm?page=8). **Open to May 31, 2017**

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.**

URL Links to New & Open Funding Solicitations

Links verified: Saturday, October 04, 2014

- [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 \(NIH\)](#)

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- [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

Challenge Grants National Endowment for the Humanities

The mission of the NEH Office of Challenge Grants is to advance knowledge and understanding in the humanities by strengthening the institutional base of humanities teaching, scholarly research, public programming, and other humanities activities. Challenge grants are capacity-building grants, intended to support significant humanities activities of high intellectual quality and to help institutions secure long-term support for their humanities programs. Through these grants many organizations and institutions have been able to increase their humanities capacity and secure the permanent support of an endowment. Grants may be used to establish or enhance endowments or spend-down funds that generate expendable earnings to support and enhance ongoing program activities. Challenge grants may also provide capital directly supporting the procurement of long-lasting objects, such as acquisitions for archives and collections, the purchase of equipment, and the construction or renovation of facilities needed for humanities activities. Funds spent directly must be shown to bring long-term benefits to the institution and to the humanities more broadly. Grantee institutions may also expend up to 10 percent of total grant funds (federal funds plus matching funds) to defray costs of fundraising to meet the NEH challenge. Because of the matching requirement, these NEH grants also strengthen the humanities by encouraging nonfederal sources of support. Applications are welcome from colleges and universities, museums, public libraries, research institutions, historical societies and historic sites, scholarly associations, state humanities councils, and other nonprofit humanities entities. **Due May 5.**

Preservation and Access Education and Training National Endowment for the Humanities

The Preservation and Access Education and Training program is central to NEH's efforts to preserve and establish access to cultural heritage collections. Thousands of libraries, archives, museums, and historical organizations across the country maintain important collections of

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books and manuscripts, photographs, sound recordings and moving images, archaeological and ethnographic artifacts, art and material culture collections, electronic records, and digital objects. The challenge of preserving and making accessible such large and diverse holdings is enormous, and the need for knowledgeable staff is significant and ongoing. Preservation and Access Education and Training grants are awarded to organizations that offer national or regional (multistate) education and training programs. Grants aim to help the staff of cultural institutions, large and small, obtain the knowledge and skills needed to serve as effective stewards of humanities collections. Grants also support educational programs that prepare the next generation of conservators and preservation professionals, as well as projects that introduce the staff of cultural institutions to new information and advances in preservation and access practices. **Due May 5.**

National Science Foundation Research Traineeship (NRT) Program

This solicitation extends and broadens the scope of the NSF Research Traineeship (NRT) program launched in 2014. Proposals are invited in two tracks: the Traineeship Track (maximum 5 years, \$3.0 million), dedicated to the education of STEM graduate students through an innovative, evidence-based traineeship approach in high-priority interdisciplinary research areas; and the Innovations in Graduate Education (IGE) Track (2–3 years, up to \$300,000–\$500,000) dedicated solely to piloting, testing, and evaluating bold, new graduate-education approaches, models, and activities and to generate the knowledge required for their customization, implementation, and scaling. This solicitation is active for two years, and future NRT solicitations are anticipated. A letter of intent is recommended for both tracks. **Due May 6.**

USDA-NIFA-AFRI-004797 AFRI Food, Agriculture, Natural Resources and Human Sciences Education and Literacy Initiative

The AFRI Food, Agriculture, Natural Resources and Human Sciences Education and Literacy Initiative (AFRI ELI) focuses on developing the following: opportunities for undergraduate students at colleges and universities, including those from underrepresented ethnicities and economically disadvantaged groups at minority-serving institutions, community colleges, and other universities to obtain hands-on experience at land-grant and non-land-grant universities and USDA laboratories and obtain training to join the agricultural workforce or pursue graduate studies in food, agriculture, natural resources and the human sciences. technical and functional competence for predoctoral students; and the research independence and teaching credentials of postdoctoral students. **Due May 6.**

NOAA-NOS-OCS-2015-2004393 Joint Hydrographic Center

The purpose of this notice is to solicit proposals ([application pdf](#)) for a single cooperative agreement between NOAA and an institution of higher learning to operate and maintain a Joint Hydrographic Center as authorized in the Ocean and Coastal Mapping Integration Act and the Hydrographic Services Improvement Act. Proposals submitted in response to this announcement should advance the purposes of the Acts including research and development of hydrographic technologies necessary to ensure safe and efficient navigation; research and development of innovative ocean and coastal mapping technologies, equipment, and data

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products; mapping of the United States Outer Continental Shelf and other regions; data processing for nontraditional data and uses; advancing the use of remote sensing technologies, for related issues, including mapping and assessment of essential fish habitat and of coral resources, ocean observations, and ocean exploration; and providing graduate education and training in ocean and coastal mapping sciences. The program priorities for this opportunity support NOAA's mission goal of: "Resilient Coastal Communities and Economies" and the objective of "Safe, efficient and environmentally sound marine transportation." **\$31 million for one center. Due May 11.**

USDA-NIFA-AFRI-004916 Agriculture and Food Research Initiative - Food Safety Challenge Area

This AFRI Challenge Area promotes and enhances the scientific discipline of food safety, with an overall aim of protecting consumers from microbial and chemical contaminants that may occur during all stages of the food chain, from production to consumption. This requires an understanding of the interdependencies of human, animal, and ecosystem health as it pertains to foodborne pathogens. The long-term outcome for this program is to reduce foodborne illnesses and deaths by improving the safety of the food supply, which will result in reduced impacts on public health and on our economy. In order to achieve this outcome, this program will support single-function Research Projects and multi-function Integrated Research, Education, and/or Extension Projects, and Food and Agricultural Science Enhancement (FASE) Grants that address one of the Program Area Priorities (see Food Safety RFA for details). **Due May 13 and May 18 depending on program.**

20150610-HZ Humanities Open Book Program

NEH and Mellon are soliciting proposals from academic presses, scholarly societies, museums, and other institutions that publish books in the humanities to participate in the Humanities Open Book Program. Applicants will provide a list of previously published humanities books along with brief descriptions of the books and their intellectual significance. Depending on the length and topics of the books, the number to be digitized may vary. However, NEH and Mellon anticipate that applicants may propose to digitize a total that ranges from less than fifty to more than one hundred books. Awards will be given to digitize these books and make them available as Creative Commons-licensed "ebooks" that can be read by the public at no charge on computers, mobile devices, and ebook readers. **Due June 10.**

NOAA-NOS-IOOS-2016-2004378 FY 2016 Implementation of the U.S. Integrated Ocean Observing System (IOOS®)

The U.S. Integrated Ocean Observing System (IOOS®) is a national and regional partnership working to provide observations, data, and new tools and forecasts to improve safety, enhance the economy, and protect our environment. NOAA is requesting proposals for coordinated regional efforts that further the IOOS in two topic areas, 1) sustaining and enhancing comprehensive regional observing systems and 2) verification and validation of observing technologies for studying and monitoring coastal and ocean environments. NOAA invites applicants to submit proposals for one or both of these topic areas, described in detail below, and requests applicants submit separate applications for each topic area. For single topic

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proposals, clearly identify the topic area and present all required information such that merit reviewers can associate proposal elements (project description, partners, budgets) with the specific topic area. NOAA anticipates making multiple awards, subject to the availability of funds, in amounts ranging from \$1,000,000 to \$4,000,000 per year, for up to five years. **Due August 31.**

USDA-NIFA-AFRI-004915 Agriculture and Food Research Initiative - Foundational Program

The AFRI Foundational Program is offered to support research grants in the six AFRI priority areas to continue building a foundation of knowledge critical for solving current and future societal challenges. The six priority areas are: Plant Health and Production and Plant Products; Animal Health and Production and Animal Products; Food Safety, Nutrition, and Health; Renewable Energy, Natural Resources, and Environment; Agriculture Systems and Technology; and Agriculture Economics and Rural Communities. Single-function Research Projects, multi-function Integrated Projects and Food and Agricultural Science Enhancement (FASE) Grants are expected to address one of the Program Area Priorities (see Foundational Program RFA for details). **See application for various LOI dates. Proposals due September 30**

GCC-GRANT-SEP-15-001 Spill Impact Component Planning Grants Gulf Coast Ecosystem Restoration Council

This announcement provides guidance to the Gulf Coast States – defined as any of the States of Alabama, Florida, Louisiana, Mississippi, and Texas – or the Gulf Coast States’ administrative agents and the Gulf Consortium of Florida counties to apply for grants to fund planning activities to develop individual State Expenditure Plans (SEP) under the Spill Impact Component of the Resources and Ecosystem Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act of 2012 (RESTORE Act). The eligible entities may apply to the Council for a grant to use the minimum allocation available under the Spill Impact Component of the RESTORE Act for planning purposes. The submission process for this announcement is organized into two phases: (1) the submission of a planning SEP by a Gulf Coast State; and (2) the administrative application process, which includes the submission of all administrative grant application materials by the eligible entities. All planning activities proposed under this announcement are limited to the development of a comprehensive SEP, including conceptual design and feasibility studies related to specific projects. This announcement does not include engineering and environmental studies related to specific projects. It also does not include any pre-award costs incurred prior to August 22, 2014. **December 31, 2015**

Open Solicitations and BAAs

Research Interests of the Air Force Office of Scientific Research

AFOSR plans, coordinates, and executes the Air Force Research Laboratory’s (AFRL) basic research program in response to technical guidance from AFRL and requirements of the Air Force; fosters, supports, and conducts research within Air Force, university, and industry laboratories; and ensures transition of research results to support USAF needs. The focus of

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AFOSR is on research areas that offer significant and comprehensive benefits to our national warfighting and peacekeeping capabilities. These areas are organized and managed in three scientific directorates: Aerospace, Chemical and Material Sciences, Physics and Electronics, and Mathematics, Information and Life Sciences. **Open until superseded.**

DARPA-BAA-14-54 Biological Technologies EZ

The Defense Advanced Research Projects Agency (DARPA) is soliciting innovative research proposals of interest to the Biological Technologies Office (BTO). Of particular interest are those proposals from entities (both small and large business) that have never received Government funding, or who do not normally propose to Government solicitations. Proposed research should investigate leading edge approaches that enable revolutionary advances in science, technologies, or systems at the intersection of biology with engineering and the physical and computer sciences. Specifically excluded is research that primarily results in evolutionary improvements to the existing state of the art. BTO seeks unconventional approaches that are outside the mainstream, challenge assumptions, and have the potential to radically change established practice, lead to extraordinary outcomes, and create entirely new fields. **Open to July 23, 2015.**

Broad Agency Announcement for Research Initiatives at Naval Postgraduate School

The Naval Postgraduate School (NPS) is interested in receiving proposals for research initiatives that offer potential for advancement and improvement in the NPS core mission of graduate education and research. Readers should note that this is an announcement to declare NPS's solicitation in competitive funding of meritorious research initiatives across a spectrum of science and engineering, business, politics and public/foreign policy, operational and information sciences, and interdisciplinary disciplines that are in line with the NPS' graduate education and research mission. Additional information on the Naval Postgraduate School's graduate education and research mission is available at: General Information:

<http://www.nps.edu/About/index.html> ; NPS Strategic Plan:

<http://www.nps.edu/About/NPSStratPlan.html> ; Academic Programs:

<http://www.nps.edu/Academics/index.html> ; Research Programs:

<http://www.nps.edu/Research/index.html> ; Prior to preparing proposals, potential Offerors are strongly encouraged to contact an NPS point of contact (POC) whose program and research efforts best match the Offeror's field of interest. The academic and research programs links above can be used to locate an appropriate POC by exploring the information provided about the faculty members in NPS' schools, research institutes, and interdisciplinary centers and research groups. **Open to July 31, 2015.**

Small University Grants Open 5-Year Broad Agency Announcement

Open to August 26, 2015

DARPA-BAA-14-48 Strategic Technologies

DARPA is seeking innovative ideas and disruptive technologies that offer the potential for significant capability improvement across the Strategic Technology Office focus areas. This includes technology development related to Battle Management, Command and Control

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(BMC2), Communications and Networks, Electronic Warfare, Intelligence, Surveillance, and Reconnaissance (ISR), Position, Navigation, and Timing (PNT), Maritime, and Foundational Strategic Technologies and Systems. **BAA Closing Date: September 17, 2015**

ONRBAA15-001 Long Range BAA for Navy and Marine Corps Science and Technology

The Office of Naval Research (ONR) is interested in receiving proposals for Long-Range Science and Technology (S&T) Projects which offer potential for advancement and improvement of Navy and Marine Corps operations. Readers should note that this is an announcement to declare ONR's broad role in competitive funding of meritorious research across a spectrum of science and engineering disciplines. A brief description of the ONR Program Codes and the science and technology thrusts that ONR is pursuing is provided below. Additional information can be found at the ONR website at <http://www.onr.navy.mil/Science-Technology/Departments.aspx> . Potential Offerors are urged to check the program areas that they are interested in throughout the year for updates to thrust areas and research priorities on the ONR website at <http://www.onr.navy.mil>. Prior to preparing proposals, potential offerors are strongly encouraged to contact the ONR point of contact (POC). To identify the POC, follow the link for the appropriate code or division listed below and then click on the link to the thrust or topic area. Each thrust or topic area will provide a POC or e-mail address. **BAA Closing Date: September 30, 2015**

DHS-2014-OHA-BIOWATCH BioWatch Program: 2014-2015

The BioWatch Program is a cornerstone of the Department of Homeland Security's (DHS) comprehensive strategy for countering biological terrorism. The BioWatch Program is an early warning system that is designed to detect the intentional release of select aerosolized biological agents. The BioWatch Program's mission is to provide and maintain a continuous bio-terrorism air monitoring system in metropolitan areas and coordinate with state and local public health communities to prepare for and respond to a bioterrorist event. This mission is accomplished by serving as an early warning system which enhances the security of jurisdictions by providing the needed time to execute their comprehensive concept of operations plans to counter biological terrorism. The Biowatch Program is a critical part of an ongoing national effort to build and sustain preparedness which helps the United States to maintain momentum through targeted jurisdictional planning that highlights preventative actions necessary to allow for a proper and timely response and begin the process to recovery from a biological agent release. The BioWatch Evaluation Program (BWEP) will be conducted under the BioWatch Quality Assurance Program effective April 1, 2013. This program will consist of independent external audits (Quality Assurance) by Signature Science and internal audits (Quality Control) by BioWatch Systems Program Office field personnel. This approach will initially be conducted with a focus on adherence to the BioWatch Field Operations Standard Operating Procedure (SOP), Version 1.3 and will eventually evolve to encompass the Field Operations Quality Assurance Program Plan (QAPP). In order to ensure a robust QA / QC program the jurisdictions may be subject to a QA external audit and a QC internal audit during the same cooperative agreement cycle (year). **Closes September 30, 2015.**

DE-FOA-0001204 FY 2015 Continuation of Solicitation for the Office of Science

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The Office of Science 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-0001204, 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, 2015, 11:59 PM Eastern Time, or until it is succeeded by another issuance, whichever occurs first. This annual FOA DE-FOA-0001204 succeeds FOA DE-FOA-0000995, which was published October 1, 2013. **Open to September 30, 2015.**

Nuclear Energy University Programs - Fellowship and Scholarship

This program supports education and training for future nuclear scientists, engineers and policy-makers who are attending U.S. universities and colleges in nuclear-related graduate, undergraduate and two-year study programs. These are zero-dollar awards that will be funded as students apply through the Department of Energy, Office of Nuclear Energy. **Open until November 30, 2015.**

FY2011 – 2016 Basic Research for Combating Weapons of Mass Destruction (C-WMD) Broad Agency Announcement (BAA)

This BAA is focused on soliciting basic research projects that support the DTRA mission to safeguard America and its allies from WMD (e.g., ***chemical, biological, radiological, nuclear, and high-yield explosives***) by providing capabilities to reduce, eliminate, and counter the threat and mitigate its effects.

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.**

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

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Air Force Research Laboratory, Directed Energy Directorate

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.**

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

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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) Soldier/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.**

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Research Interests of the Air Force Office of Scientific Research

The Air Force Office of Scientific Research (AFOSR) manages the basic research investment for the U.S. Air Force (USAF). To accomplish this task, AFOSR solicits proposals for basic research through this general Broad Agency Announcement (BAA). This BAA outlines the Air Force Defense Research Sciences Program. AFOSR invites proposals for research in many broad areas. These areas are described in detail in Section I of the BAA, Funding Opportunity Description. AFOSR plans, coordinates, and executes the Air Force Research Laboratory's (AFRL) basic research program in response to technical guidance from AFRL and requirements of the Air Force; fosters, supports, and conducts research within Air Force, university, and industry laboratories; and ensures transition of research results to support USAF needs. The focus of AFOSR is on research areas that offer significant and comprehensive benefits to our national warfighting and peacekeeping capabilities. These areas are organized and managed in five scientific directorates: Dynamical Systems and Control (RTA), Quantum & Non-Equilibrium Processes (RTB), Information, Decision, and Complex Networks (RTC), Complex materials and Devices (RTD), and Energy, Power, and Propulsion (RTE). The research activities managed within each directorate are summarized in Section I of the BAA. **Open until superseded.**

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

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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.**

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.**

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