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By Katherine E. Kelly, PhD

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The Straw Man Proposal

By Mike Cronan, co-publisher

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There are many ways to plan, develop, and write a successful proposal, but no matter how much we may wish otherwise, every proposal invariably presents messy, often unanticipated challenges that must be overcome to compete in the review process. In a perfect world, we could adopt a perfect proposal production process, but in the imperfect and occasionally chaotic world of grant writing, the unexpected challenge is the norm and success often depends on finding a "workaround." Of course, the most difficult challenge is to organize and write a successful research narrative, an end goal with many approaches and detours, that depend upon the composition of the research team, the role of the principal investigator, and the various skill sets available in the research offices supporting the effort.

Moreover, as interdisciplinarity and teaming increase along with the number of "moving parts" to be described within a convincing research rationale, the challenge of writing the narrative becomes more complex. It is here that the principal question must be addressed: "*Who is going to write the research narrative*?" On small grants focused on a single disciplinary area, it is most often the PI, but on larger grants, multiple authors must make multiple decisions about who writes what. Sometimes the PI serves as the principal author who must integrate contributions from the research team, but that is not always the case.

For example, in some cases, particularly on large proposals with a very busy PI, an experienced research office professional may assist the PI in writing the first draft of the various proposal sections. ***This begins the critical transition from talking about a proposed effort to actually writing about what you propose to do***. This can be more challenging to some PIs than to others, such as when English is the PI's second language, a situation common to proposals in engineering and the physical and mathematical sciences.

Regardless of the reasons, the "*Straw Man Proposal*" (SMP) is just one of many strategies that can be used to initiate the writing process and overcome what may be commonly called "writer's block." The SMP is typically an imperfect and incomplete "first crack" at a narrative section that helps gets the narrative ball rolling, giving the research team a prompt to develop and refine. . Basically, the SMP can serve as the ***very rough first approximation of what the final narrative might look like after numerous iterations over a period of many weeks or even a month or more***. How this works will depend on what works best for the PI, on the experience of research office professionals, and on the PI's relationship with those professionals.

For example, on larger center-level proposals with many "moving parts," including multiple research strands, management plans, evaluation plans, milestone or Gantt charts, etc., the proposal narrative invariably begins with a page or two introducing the reviewers to the research vision, goals, objectives, rationale, and anticipated outcomes of the project. It will also address why the proposed research is significant, how it will be done, why the research team has the experience and expertise to perform the research, and what new knowledge generated by the project will advance the state of the art in the field or bring value-added benefits to the funding agency's mission.

While these few introductory pages contain less technical detail, they convey the conceptual foundation upon which the rest of the proposal narrative will rest. An expansion of these pages will represent a fully formed project description. These one or two pages also represent one of the key sections of a proposal in which the SMP strategy is best able to begin the process of describing the research being proposed.

In practice, the SMP process might start after some preliminary meetings in which the PI and the research project team begin to answer some key questions in response to the funding solicitation. The key value of the straw man is that it represents a first attempt at formulating the research narrative in writing rather than in verbal discussion, which is often notoriously vague and ephemeral. The SMP is really a narrative trial balloon, putting in practice the old expression, "Let's run it up the flagpole and see if anyone salutes."

It is important to point out that the SMP, or, as is more often the case, SMP sections, are not generated by a research office's attempt at a first draft of the technical narrative on the PI's behalf. That would be a fool's errand. However, it does represent one potential tool for lightening the PI's burden by taking the information gained in project development meetings and drafting it into some preliminary text. This early draft helps organize the narrative and crafts the general vision, goals, and objectives of the project that can then be responded to by the PI and the research team. This draft and response begins the process of numerous iterations that will lead to a well crafted and compelling proposal narrative, and hence one more likely to be funded.

Explain Your Rationale for Selecting Projects

By Mike Cronan, co-publisher
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One of the most neglected or insufficiently explained sections in the research narrative of all types of proposals is the rationale for selecting those project components (herein used **interchangeably** with such terms as research strands, thrust areas, research topics, etc.) that both address the applicants' expertise and meet a funding agency's research objectives. For example, a current CDC solicitation to establish Vector-Borne Disease Centers of Excellence requires applicants to address three objectives (specific aims) related to applied research, doctoral and post-doctoral training, and public health collaborations targeting such mosquito-borne diseases as the Zika virus and West Nile virus, among others.

Similarly, other recent solicitations from NSF and NIH related to Big Data and the Brain, or NSF and DOE solicitations related to the smart grid, or NSF and USDA solicitations related to the Food, Water, and Energy Nexus all share a common characteristic: all require a project team comprised of researchers from multiple disciplines or the same discipline but with various forms of expertise. Using the CDC example, multiple project teams, each of which is expert on a specific mosquito type and virus, may all be joined in a larger effort. Of course, ***explaining a rationale for selecting*** research strands, or research thrust areas, or research projects that, in aggregate synergistically complement each other, lies at the core of most large center proposals.

Regardless of the number of research project areas (sub-projects, or research stands, etc.) comprising one overall research project, ***reviewers will want to know why you selected these projects rather than other possible projects***. They will want to know the ***synergies possible*** among the selected projects and how the projects represent the best possible configuration to meet the goals and objectives of the funding solicitation.

Unfortunately, in some cases, the ***unstated reason for the absence of a rationale is that none exists***. Some research teams grow out of an open meeting attended by many researchers designed to gauge interest in a particular solicitation. A team emerges comprised of "volunteers" willing to work on the effort and incorporate their research with that of others into an overall project. Of course, this is a poor strategy for team formation, and in this example, the proposal may already be competitively cobbled because the selected projects comprised of "volunteers" do not lend themselves well to integration.

However, the more common reason for a missing or weak rationale is that the ***proposal was planned and developed in a somewhat siloed manner***. In some cases, participants' geographical locations or teaching schedules prohibit the team from meeting in person for narrative planning sessions. The sessions then develop largely through email and attached file exchanges, or by posting attached files to the cloud without sufficient attention to the quality of the contributions or how well they fit the research plan.

Too often the problem comes from not addressing the "rationale for the projects" question until the narrative text is near to a final iteration. But this is a ***key question that needs to be answered early on in the project planning process***, and needs to be considered well before the authors responsible for writing research sections begin writing. Failing to address

the rationale for selecting the research projects in the overall project description leaves it up to the reviewers to try and figure this out. However, they may not care to try and figure it out because they have 15 other proposals to read and ***can't and won't spend time on a critical unanswered question that proposal authors themselves ignored***.

The take away here is that you want to make the job of reviewing your proposal interesting rather than frustrating. If you are proposing multiple research projects to meet the multiple objectives or specific aims of the funding solicitation, explain why the projects (topics, strands, thrusts, etc.) you selected were chosen so the reviewers have a reason to closely read though multiple technical descriptions. ***Successful applicants must explain in the rationale why, how, and where the projects complement each other; how they align with the objectives of the solicitation, individually and in aggregate; and how they intersect with each other in ways that bring synergy to the overall project***.

The Proposal Majordomo's Role on Grants

By Mike Cronan, co-publisher

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A majordomo is a person who speaks, makes arrangements, or takes charge for another on a large project. In ordinary usage, the term refers to someone who oversees the day-to-day responsibilities, organization, and operational details of an important enterprise—basically, keeps it functioning smoothly and prevents it from running off the tracks as the result of poor planning and fuzzy communications.

For example, in Corrales, New Mexico, the term applies to community-operated watercourses and sluice gates overseen by "ditch commissioners," including the majordomo (ditch boss) that oversees water allocations for the village. The allocations are based on New Mexico acequia water law derived largely from custom and tradition in agricultural communities. When internal disputes arise over water allocations, the majordomo is the final arbiter.

As in allocating water in the arid Southwest, selecting a person to serve as the majordomo of a large proposal effort is critical, ***but too often neglected on many large projects***. In the absence of a proposal majordomo, these efforts can gradually descend into disorder as the due date nears and the pace of activities accelerates. Most PIs on larger team proposals recognize the need for a majordomo, but such a person is not always easy to identify. Some very well-funded PIs have such a person on their staff in recognition of their importance to ongoing proposal efforts.

The most logical place to locate a majordomo is in a university research office, or, at the college level, in a large research center or institute, where an individual may have assisted the PI by shepherding a large proposal through the planning, development, and writing stages. Anyone with a border collie will recognize the key attributes of the proposal majordomo—smart, focused, informed, organized, and always on task.

Those who have worked on large projects ***without a proposal majordomo*** will recognize the consequences of proceeding without one:

- a lack of organization leading to confusion about who does what and when,
- an absence or vagueness concerning internal project deadlines,
- confusing communications leading to redundant efforts,
- an overlooking of assigned tasks that "slip through the cracks," and
- a frantic and chaotic final period, when the proposal team wonders whether or not the project will be submitted on time.

By contrast, those who have participated on large projects ***with an experienced majordomo*** on the team will recognize their contribution to a successful and satisfying team effort—

- team meetings are organized and scheduled well in advance,
- key proposal documents are distributed to the team,

- a team schedule and task assignment table is developed, distributed, and updated as needed,
- notes are taken at meetings and distributed to the team quickly,
- tasks assigned to individual team members are noted and tracked for timeliness,
- team communication protocols are established,
- team members who miss deadlines are prompted,
- multiple narrative drafts are distributed to the team on an agreed upon schedule,
- narrative and graphical contributions of the team are completed as scheduled to allow the next draft of the narrative to be prepared, etc.

Most importantly, ***the proposal majordomo allows the PI and the research team to complete the writing of a successful research narrative unencumbered*** by attending to a cascade of organizational tasks and organizational communications among team members. The proposal majordomo is an often unheralded member of the proposal development team that makes an enormous contribution to a successful research narrative. ***That role often remains hidden from view by all but the PI and key members of the research team, but it is a critical one to a "well oiled" proposal development process***.

The Role of the Project Evaluator on the Writing Team

By Mike Cronan, co-publisher

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Too often projects that require a project evaluator fail to take full advantage of the contribution the evaluator can make in planning, developing, and writing the project description. In the most common scenario, the project evaluator isn't even identified until the proposal narrative is fairly well advanced and the project's vision, goals, objectives, and activities are close to finalized. In this scenario, the project evaluator is brought on board and asked to write an evaluation section for the proposal based on a draft. Treating the project evaluator like a "red-haired stepchild" puts a proposal at a competitive disadvantage, particularly at NSF where so many projects require an outside evaluator and where metrics, outcomes, and evidence-based models are the coin of the realm (see *Developing Proposals for "Institutional Transformation"* in the September, 2016 issue).

Moreover, many PIs are poorly informed about evaluation, and when it is required on a proposal, may pass that task off to someone else on the proposal support team. This often means that someone in a research support office becomes tasked with identifying and working with a project evaluator. Unfortunately, it can be difficult to find an evaluator with the necessary experience and expertise, particularly as that relates to the specific program area of the proposal and knowledge of a particular funding agency's evaluation preferences (see American Evaluation Association). Consequently, proposals that could benefit from a strong evaluation section end up with an anemic evaluation resembling an often-copied mimeograph hastily stuck on to the narrative close to the due date.

Two typical situations have become common to the poor selection and/or engagement of a project evaluator. In the first instance, the evaluator ***represents a mismatch*** between the evaluator's experience and expertise and the funding agency's expectations for a robust evaluation section. This is critically important at NSF, for example, where the project evaluator must make a strong contribution to the proposal narrative's competitiveness. In the second instance, the project evaluator is well selected but is asked to engage only when the narrative has become a *fait accompli*. This largely precludes the important opportunity offered by engaging the project evaluator early in the process when she can comment on evolving proposal drafts rather than responding to a narrative in its final stages.

There are many competitive advantages to involving the project evaluator in the research narrative review from the get go. For example, early involvement can help better refine such key proposal statements as defining the vision, goals, objectives, and activities of the project that will, in turn, be translated into program evaluation metrics in the evaluation section, particularly as they relate to project outcomes. Therefore, it is important for those writing the proposal narrative to ***frame and describe the project's goals, objectives, and activities with the concise language that best maps them to evaluation metrics***. In the absence of this matching, the narrative may define, describe and order goals, objectives, and activities that misalign with the evaluation metrics, resulting in a narrative with a disjoint between the project plan and the project evaluation.

Moreover, engaging the project evaluators early on in the writing of the project narrative ***helps ensure a consistently logical proposal organization***. For example, this will ensure that a discussion of the project objectives in the project plan will match, by definition and order, the discussion of objectives, metrics, and outcomes in the evaluation plan. In fact, many agencies, particularly USDA/NIFA, but also NSF and others, are increasingly recommending the use of logic models as part of the evaluation section. In addition, this system also helps to organize the entire proposal to ensure an internal consistency to the project narrative.

Bottom line: If you have found a good project evaluator, don't treat them like "a red-headed stepchild"; instead, get them involved in reviewing the project narratives early on to gain a significant competitive advantage.

SBIRs and STTRs: What are they and how can faculty use them?

By Lucy Deckard, co-publisher
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Most faculty have probably heard of Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) grants, but they may be unsure of how grants meant for small businesses can help fund their academic research. While SBIRs and STTRs focus on research and development of innovations that can eventually be commercialized by small businesses, many academic researchers have found that they can be a useful addition to their research funding portfolios. However, it's important to understand their uses and limitations before deciding to pursue these grants. Below, we provide a short description of what SBIR and STTR grants are, the rules associated with who can apply, and how they can be used by faculty researchers to help fund their research.

What are SBIRs and STTRs?

While the SBIR/STTR program is overseen by the Small Business Administration (SBA), it is actually funded by Federal agencies that fund extramural research. Congress requires that all Federal agencies that fund over $100 million in extramural R&D each year devote 2.6% of their R&D budget to SBIRs and that all agencies with over $1 billion in extramural R&D devote 0.35% (growing to 0.4% in 2017) of their research budget to STTRs grants.

As a result, 11 Federal agencies currently fund SBIRs:

- Department of Agriculture
- Department of Commerce - National Institute of Standards and Technology
- Department of Commerce - National Oceanic and Atmospheric Administration
- Department of Defense
- Department of Education
- Department of Energy
- Department of Health and Human Services (NIH)
- Department of Homeland Security
- Department of Transportation
- Environmental Protection Agency
- National Aeronautics and Space Administration
- National Science Foundation

A total of 5 Federal agencies currently fund STTRs:

- Department of Defense
- Department of Energy
- Department of Health and Human Services (NIH)
- National Aeronautics and Space Administration
- National Science Foundation

Each of these agencies will fund projects that align with their missions, and specific rules such as maximum funding amount and project periods vary among agencies. Many agencies will designate **broad topic areas** of interest for SBIR grants each year. For example, NSF's SBIR/STTR Technology Topic Areas are listed here and USDA's areas of interest are listed here. You can find a table of 2015 budget amounts by agency here.

SBIR/STTR Programs are structured in phases.

- **Phase I** SBIR typically funds proof-of-concept/feasibility-type projects. The funding amounts are typically relatively low (typically $150K - $225K max.), and the funding periods are relatively short (typically 6-12 months). Most teams approach Phase I grants as simply a stepping stone to a Phase II grant.
- **Phase II** grants typically funds projects focus on continuing the research and development started in Phase I, and laying the groundwork for commercialization. The funding amounts are higher (up to $1 million), and the funding periods are longer (typically 2 years).

Some agencies fund **Phase III** projects, which focus more heavily on commercialization of the innovations developed in the Phase II grant, but they are not supported by the SBIR/STTR program.

Who Can Apply?

Both SBIRs and STTRs require the participation of a **small business**, which is defined as a company that is for profit, US owned and operated, which employs under 500 people. Interestingly, the company does not yet have to be formed at the time of application. Most companies that receive SBIR or STTR grants are focused primarily on R&D. The average size of the company is 9 people. SBIRs and STTRs differ in the role of the small business.

For SBIR grants, the PI must be primarily employed by the small business (***which means the PI cannot have a full-time job with another organization***). However, the small business can team with others such as faculty researchers employed at a university. For Phase I SBIRs, a minimum of 2/3 of the effort (which may be measured in terms of dollars or labor hours, depending on the agency) must be performed by the small business awardee. For SBIR Phase II grants, a minimum of ½ of the research effort must be performed by the small business awardee.

For STTR grants, the awardee must be the small business. However, in contrast to the SBIR, STTRs are set up expressly to promote technology transfer from universities to small businesses. As a result, STTRs require collaboration with a non-profit research institution (typically a university partner), and the PI can be employed either by the small business or by the university. The small business must perform at least 40% of the work, and the research institution must perform at least 30% of the work. The remaining 30% of the work may be performed by the small business, the research institution, or another entity.

For more information, see the SBIR/STTR eligibility FAQs and SBIR and STTR Critical Differences.

How Can Faculty Use SBIRs and STTRs?

As a faculty researcher, in order to apply for SBIRs and STTRs you must team with a small business. The innovation may have been developed by the small business, and your role may be providing expertise or capabilities that the small business doesn't have (such as testing or modeling capabilities). In this case, the SBIR grant can be a way to help fund a student and deepen your collaboration with small business partners. It may help pave the way for future employment for your student, and you may learn more about the needs and requirements of commercial stakeholders in your field.

Alternatively, the innovation may be an outgrowth of your own research, and you may be working to transfer the outcomes to a small business. A faculty researcher may be part owner of the small business and still apply for an SBIR as long as a full-time employee of the business (for example, a former student or postdoc) serves at PI. These kinds of grants are most appropriate for research that will yield innovations with commercialization potential, so they clearly aren't meant for all types of research. As a faculty researcher, you will need to think hard about whether your research fits this criterion. As part of this process, if you are funded by NSF, you may want to consider participating in the I-Corps program. As part of the process, they will help train you, a graduate student, and a business mentor on how to evaluate if your technology is commercializable, if there is a market for it, and what potential customers actually want and need.

If you are the inventor, an important first step is to make sure your intellectual property (IP) around your innovation has been protected. If you have not yet talked to the office on your campus that helps manage IP, be sure to do that as soon as possible. They will help guide you through filling out an invention disclosure and pursuing protection for your invention.

If you are unsure whether to go down the road of commercializing an innovation stemming from your research, remember that if you are successful you do not have to quit your job in academia to run a business. Many small businesses use SBIR/STTR grants to develop innovations to the point where larger companies are interested in purchasing them. Talk to your commercialization office to about your options before you decide whether these grants are a good fit for you.

Don't Let Your Proposal Wear a Disguise on Halloween

Reprinted from October, 15, 2015

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

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

The Oblivious Mask Trio

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

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

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

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

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

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

The Poor Writing Disguise

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

The Cloak of Ambiguity

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

The Boiler Plate Costume

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

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

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

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

The Mystery Novel Disguise

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

The Research Topic 101 Mask

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

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

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

The Black Hole Disguise

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

The Stove-Pipe Disguise

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

The Recycled Proposal Mask

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

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

The Silo Disguise

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

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

The "Trust Me" Mask

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

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

Wearing an NIH Costume to an NSF Costume Party

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

The Claiming Rather than Explaining Mask

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

I Love Being in the Weeds Mask

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

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

The All Hat and No Cattle Disguise

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

The No-Value-Added Mask

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

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

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

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

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

The Overly Ambitious Disguise

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

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

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

The Solipsist Disguise

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

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

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

The Slogan Mask

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

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

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

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

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

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

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

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

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

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

The Freddy Krueger Mask

In the seemingly endless series of Freddy Krueger movies beginning with *Nightmare on Elm Street*, the victims all have recurring nightmares and die in their sleep. Program officers and reviewers might also welcome this fate when the "Freddy Krueger Proposal" is submitted

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

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

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

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

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

The "I am a Researcher not a Wordsmith" Mask

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

and usage equivalent to that of writing a computer program with zero tolerance for coding errors.

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

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

The Unbalanced Disguise

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

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

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

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

Balance, proportion, and emphasis in the project description need to be continuously monitored during the writing and internal review process with each thoughtful iteration of the narrative. It is not unusual that initial proposal drafts develop a significant amount of imbalance. This needn't hamper the proposal's success as long as the authors recognize that each subsequent draft of the proposal requires a new rebalancing to account for the revised text.

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

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

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

The "I Really Need this Grant" Mask

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

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

Moreover, without guidance from a university research office or members of a university community, some faculty or professional staff without sufficient experience in reading a solicitation closely, or an understanding of the mission and culture of a particular agency, may mistake a research proposal solicitation for an infrastructure support solicitation. This can often be exacerbated when reduced or flat budget appropriations force some university offices

to adopt unrealistic expectations of finding grant funding to support personnel and administrative infrastructures. Or, this can happen when faculty with a history of internal support for various programmatic infrastructures are forced to look elsewhere for funding due to budget cuts and fiscal redirections. In other cases, it may occur when faculty or professional staff in university offices with a history of funding from need-based agencies and foundations are looking for a new revenue stream to support expanded programs, or for those programs that are being defunded.

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

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

Research Grant Writing Web Resources

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NIH Peer Review Online Briefings for Fellowship and R01 Grant Applicants, and Basic Research Grant Applicants and Reviewers

The purpose of this Notice is to inform NIH grant applicants, their mentors, and reviewers about three online video briefings the NIH Center for Scientific Review (CSR) will host in November and December 2016. CSR is the portal for NIH grant applications and their review for scientific and technical merit.

Each Briefing Will Have a Different Focus

- Fellowship and R01 grant applicants: The first two briefings will provide these applicants key information that could help them better navigate the NIH peer review process.
- Basic research grant applicants and reviewers: The third briefing will reaffirm NIH's commitment to basic research and help applicants and reviewers better do their part in proposing and reviewing basic research.

How Can I Request More Funding for My Current Project?

If you're currently a grantee, there are two paths for seeking additional funding for an active project, depending on the project needs. If you need to address unforeseen cost increases within the scope of your approved project aims, then you would want to consult with the NIH program and grants management officials assigned to your award (they are listed with their contact information in the eRA Commons) and determine any NIH institute or center-specific submission deadlines or eligibility criteria. Learn more about administrative supplements. If you need to request increased support within your current budget period for expanding your project beyond its approved scope or research protocol, then you can submit an application for a competing revision. Know that you cannot submit a revision application before you receive your grant award and you cannot request restoration of a budget that was administratively reduced by the funding agency. Learn more about competing revisions.

What's My (Application) Type?

If remembering the difference between a renewal and a revision has you stumped, we have a page on types of applications that can help. Knowing what type of application you are submitting is important for a number of reasons. The type determines the rules we enforce for submission, the due date, even whether you are allowed to submit to a specific funding opportunity announcement (see section II of the FOA under "Application Types Allowed"). You may have noticed that the type also determines the first digit in the application number. Follow the links from the Types of Applications page to learn about requirements for competing revisions, administrative supplements, even resubmissions.

NIH Center for Scientific Review Hosts Webinars on Peer Review

The NIH Center for Scientific Review (CSR) is the portal for receipt and referral of NIH grant applications, and, for the majority of those applications, carries out the peer review process for

assessing scientific and technical merit. In November and December, CSR will host three different "online briefings" on peer review for: fellowship grant applicants; R01 applicants; and researchers who are proposing and/or reviewing basic science applications. All of the briefings will be approximately one hour long, including a 30 minute question and answer period. For more information and to register for each webinar, visit the CSR event website.

Educational Grant Writing Web Resources

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Best Practices in Teachers' Professional Development in the United States

This paper discusses best practices in teachers' professional development (PD) in the United States (U.S.). We begin by presenting a conceptual framework for effective professional development, which suggests five key features that make professional development effective--content focus, active learning, coherence, sustained duration, and collective participation. We then describe the findings from recent U.S. research that has tested the five features, with an emphasis on the results of rigorous randomized control trials. We discuss several insights gained from this work and that have helped refine the framework. They are that (a) changing procedural classroom behavior is easier than improving content knowledge or inquiry-oriented instruction techniques; (b) teachers vary in response to the same PD; (c) PD is more successful when it is explicitly linked to classroom lessons; (d) PD research and implementation must allow for urban contexts (e.g., student and teacher mobility); and (e) leadership plays a key role in supporting and encouraging teachers to implement in the classroom the ideas and strategies they learned in the PD. We then examine three major trends in how professional development for teachers is evolving in the U.S.--a move away from short workshops, linking teacher PD to evaluations, and the use of video technology to improve and monitor the effects of PD. Finally, we discuss the challenges faced by districts and schools in implementing effective professional development.

Focusing on Mathematical Knowledge: The Impact of Content-Intensive Teacher Professional Development

A popular strategy for improving student achievement in math is to provide teachers with professional development (PD) that deepens their conceptual understanding of math. This report examines the effectiveness of such a PD program. The PD program included an 80-hour summer workshop (Intel Math) that focused on grades K-8 math, as well as 13 additional hours of collaborative meetings focused on analyzing student work and one-on-one coaching based on observations of teachers' lessons. More than 200 4th-grade teachers from six districts in five states were randomly assigned to either a treatment group that received the study PD or a control group that did not. The study PD had a positive impact on teachers' math knowledge and on their use and quality of mathematical explanations in class. However, the study PD did not have a positive impact on student achievement.

Evaluating Mathematics Teachers' Professional Development Motivations and Needs

While there is widespread agreement that one-size-fits-all professional development (PD) initiatives have limited potential to foster teacher learning, much existing PD is still designed without attention to teachers' motivations and needs. This paper shows that the strengths and weaknesses of middle school mathematics teachers that engage in PD may significantly vary. We present three representative cases that illustrate this diversity. The cases were selected from a cohort of 54 grades 5-9 mathematics teachers in the northeastern United States. The results show that: 1) these three teachers dramatically differed in their motivations

and self-perceived needs regarding mathematical content, classroom instruction, and student thinking; 2) their perceptions were closely aligned with the results of our own assessments; and 3) the motivations and needs of these three teachers reflected the general trends identified in the cohort of 54 teachers. We conclude that "giving teachers voice" is essential when designing and implementing PD.

Creating a Model of Acceptance: Preservice Teachers Interact With Non-English-Speaking Latino Parents Using Culturally Relevant Mathematics and Science Activities at Family Learning Events

The following describes a culturally relevant mathematics and science content program implemented by preservice teachers (PSTs) at Family Math/Science Learning Events (FM/SLEs) conducted through two different university programs in south Texas. These experiences are required course activities designed to inform PSTs of the importance of interacting with Latino families' culture and language in after school settings. Data were collected from elementary PSTs attending FMLEs and include interactions recorded during the FMLE and interviews with Latino non-English-speaking parents after the event. Anecdotal data were also included from parents' interviews collected during culturally relevant Family Science Learning Events. Researchers investigated the following questions: (1) what did Latino parents and PSTs report learning from the FMLE and, (2) how do perceptions toward Latino parents change when PSTs are given the opportunity to interact with and interview Latino parents? Results show that PSTs perceptions of Latino parents can be changed through these events. Implications for teacher preparation programs include providing PSTs with opportunities for participation in FM/SLEs that incorporate planning and teaching culturally relevant math and science activities. The following model of acceptance requires PSTs to identify and reconstruct misconceptions and perceptions of parents, especially non-English-speaking Latino parents.

Agency Research News

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NIFA Launches ezFedGrants

This fall, NIFA is launching a phased roll out of ezFedGrants, a new grants management system. NIFA and other USDA agencies are adopting ezFedGrants as part of a USDA-wide grants modernization effort to lower costs, streamline the award process, reduce errors, and provide self-service capabilities for applicants and grantees. NIFA staff will begin to use ezFedGrants to process all 2017 capacity program applications starting in fall 2016. Fiscal year 2017 capacity grant applicants will use ezFedGrants to check their application status (starting in November 2016). Institutions also will use ezFedGrants to submit their Federal Financial Report (SF425) electronically when they are due in December 2017. In the future, ezFedGrants will be used for more grant management functions. Visit NIFA website for ezFedGrants training and informational tools for grantees transition to the new system. If you have any questions about ezFedGrants, please send an email to grantsmod@nifa.usda.gov.

Dear Colleague Letter: FY 2017 Innovations at the Nexus of Food, Energy and Water Systems (INFEWS) Funding Opportunity on Nitrogen, Phosphorus, and Water

In 2010, NSF established the Science, Engineering, and Education for Sustainability (SEES) investment area to lay the research foundation for decision capabilities and technologies aimed at mitigating and adapting to environmental changes that threaten sustainability. Some SEES investments advanced a systems-based approach to understanding, predicting, and reacting to stress upon, and changes in, the linked natural, social, and built environments. In this context, the importance of understanding the interconnected and interdependent systems involving food, energy, and water (FEW) has emerged. In 2015, NSF Issued a Dear Colleague Letter (DCL): SEES: Interactions of Food Systems with Water and Energy Systems to accelerate fundamental understanding and stimulate basic research on the connections and interdependencies among these three systems.

Through this Dear Colleague Letter (DCL), issued by the Divisions of Chemistry (CHE) and Materials Research (DMR) in the Directorate for Mathematical and Physical Sciences and the Division of Chemical, Bioengineering, Environmental and Transport Systems (CBET) in the Directorate for Engineering, the NSF aims to specifically focus on advancing knowledge of the nitrogen and phosphorus cycles; the production and use of fertilizers for food production; and the detection, separation, and reclamation/recycling of nitrogen- and phosphorus-containing species in and from complex aqueous environments.

Humanity is reliant upon the physical resources and natural systems of the Earth for the provision of food, energy, and water. It is becoming imperative that we determine how society can best integrate across the natural and built environments to provide for a growing demand for food, water and energy while maintaining appropriate ecosystem services. Factors contributing to stresses in the food, energy, and water systems include increasing regional, social, and political pressures as result of land use change, climate variability, and heterogeneous resource distribution. These interconnections and interdependencies associated

with the food, energy and water nexus create research grand challenges in understanding how the complex, coupled processes of society and the environment function now, and in the future. There is a critical need for research that enables new means of adapting to future challenges. The FEW systems must be defined broadly, incorporating physical processes (such as built infrastructure and new technologies for more efficient resource utilization), natural processes (such as biogeochemical and hydrologic cycles), biological processes (such as agroecosystem structure and productivity), social/behavioral processes (such as decision making and governance), and cyber elements. Investigations of these complex systems may produce discoveries that cannot emerge from research on food or energy or water systems alone. It is the synergy among these components, in the context of sustainability that will open innovative science and engineering pathways to produce new knowledge and novel technologies to solve the challenges of scarcity and variability. This DCL, which is part of the Innovation at the Nexus of Food, Energy, and Water Systems (INFEWS) portfolio, addresses emerging science, technology, and engineering relevant to food, energy and water systems.

The availability of **nitrogen**, **phosphorus**, and **water** are the three main factors that limit our ability to produce enough food to feed the growing population of the planet. The **nitrogen** cycle is one of the most significant biogeochemical cycles on Earth, as nitrogen is an essential nutrient for all forms of life. Although freely available in the atmosphere as dinitrogen, access to fixed forms of nitrogen constitutes, in many cases, the most limiting factor for plant growth. The industrial production of ammonia for fertilizers via the current Haber-Bosch process is an energy intensive process that consumes 1-2% of the world's annual energy supply. For these reasons, the need for advanced catalytic methods for the reduction of dinitrogen to ammonia remains a requirement for sustainability in the food, energy and water systems cycle. Similarly, **phosphorus** is also essential to plant and animal nutrition. Approximately 80% of the world's economically-viable phosphorus is obtained from "phosphate rock" that is localized in a single place. Phosphate rock is a more concentrated commodity than petroleum, and like petroleum, the world's supply of phosphorus is threatened by political instability and monopolistic economic practices. Management of phosphorus is a bit of a paradox because, while the world may face a shortage of phosphorus-containing fertilizer later this century, many regions are currently afflicted with an oversupply in both inland and coastal waters causing algal blooms that can produce extremely dangerous toxins that can sicken or kill people or animals, create dead zones in the water, raise treatment costs for drinking water, and hurt industries that depend on clean water. The ability to provide field-deployable, inexpensive, and environmentally-and energetically-sustainable sensors for real-time application and monitoring of nitrogen or phosphorus-containing species to agriculture while reducing the amount of these species in waste or run-off streams would benefit food production, benefit water quality, and result in significantly less energy consumption.

The increased demands for fresh **water** for crops/livestock and energy production will significantly add to the current stress on non-renewable groundwater resources. It is estimated that seven billion people in sixty countries will experience water scarcity by 2050 at current rates of water usage. This will place additional stress on both food supplies and energy consumption rates. These needs necessitate scientific and technological innovations that will address global problems that center on fresh water. In particular, the food production system generates waste streams that are characterized by high concentrations of organic matter,

nitrogen- and phosphorus-containing species in water. New approaches are needed to overcome the cost of inefficient and energy-intensive detection, sequestration, and removal/recycling of such species while also preserving water quality.

This component of the NSF Innovations at the Nexus of the Food, Energy and Waters Systems (INFEWS) investment is designed to advance a new understanding of the role of the chemistry of nitrogen, phosphorous, and water in the nexus of food, energy and water systems, "INFEWS: N/P/H2O." While fundamental science and engineering research will underpin solutions to these areas of national and international need, it must also be recognized that technological innovations themselves require resources for development and deployment. Ostensible solutions to the challenge of N, P, and water supply cannot be premised on the assumption that energy, chemical feedstocks, and other required resources will be available in great abundance. In FY 2017, the topics of interest in INFEWS: N/P/H2O include innovative, fundamental research to:

1. advance catalytic methods for the reduction of dinitrogen to ammonia that permit reductions in the energy requirements for fertilizer production;
2. develop new sensing modalities that will lead to field-deployable, inexpensive, and environmentally and energetically sustainable sensors for real-time monitoring of nitrogen- or phosphorus-containing species as they move, via agricultural run-off, to other water systems; and
3. develop methods for the selective and efficient detection, sequestration/separation, and recycling of nitrogen and phosphorous species from water (For proposals submitted to CHE, proposals should focus on gaining an understanding of the supramolecular recognition and binding of environmentally-relevant nitrogen- and phosphorus-containing species.); and
4. develop new materials to optimize the availability of N and control the utilization of P while managing effluents within the context of sustainable energy and preservation of our natural resources.

Proposals in response to this investment area should be submitted to the existing program of interest in â€“CHE, DMR and CBET within the existing submission windows (deadlines) of the programs. The proposal title must begin with "INFEWS N/P/H2O:". Other than the proposal title, the cover page should be prepared as a regular unsolicited proposal submission to the program. The most competitive proposals will address how the project conceptually advances innovations at the nexus of the food, energy, and water systems and sustainability of the proposed solution, i.e., the monetary and energetic costs for translation and scale-up. Proposals are welcome from either multiple or single investigators. Interdisciplinary proposals that involve principal investigators traditionally supported by the three participating divisions (CHE, DMR, and CBET) are also welcome. Such proposals should be submitted to the most relevant program in CHE, DMR, or CBET. CHE and DMR welcome proposals responding to this Dear Colleague Letter (DCL) in all programs, while CBET welcomes proposals responding to this DCL in the Environmental Engineering, Environmental Sustainability, or Catalysis and Biocatalysis Programs. Please consult the Divisional webpages for more details on specific interests.

The challenges at the food, energy, and water nexus are frequently international, and experts around the globe have relevant expertise and resources. Proposals including

international collaboration are encouraged when those efforts enhance the merit of the proposed work. The U.S. team's international counterparts generally should have support or obtain funding through their own national or regional sources.

Proposals may be submitted in combination with other solicitations. For example, if there are strong collaborations with industry, the Dear Colleague Letter: Grant Opportunities for Academic Liaison with Industry (GOALI) can be used in conjunction with this effort. Similarly, proposals may be submitted in combination with the Faculty Early Career Development (CAREER) Program, Facilitating Research at Primarily Undergraduate Institutions: Research in Undergraduate Institutions (RUI) and Research Opportunity Awards (ROA) solicitation. These proposals should be submitted to the appropriate solicitation and add INFEWS to the title (For example, RUI: INFEWS N/P/H2O: Name of your proposal). Other mechanisms such as EAGER and INSPIRE may also be appropriate, but principal investigators are required to check with the cognizant program officers for additional guidance. For general questions about INFEWS, email the listed representatives in either CHE, DMR, or CBET.

To see examples of awards made under the Food-Energy-Water investment area, visit the NSF Award Abstracts Database, and enter 'food, energy, and water' in the 'Search Award for:' dialogue field. Alternatively, please visit the webpages of the disciplinary programs of interest in the participating divisions. Under each program, find the link to recent awards made in that program and look for those that contain `FEW' in the proposal title.

Dear Colleague Letter: Life STEM

The National Science Foundation (NSF) has established inclusiveness as one of its core values. The Foundation seeks and embraces contributions from all segments of the science, technology, engineering, and mathematics (STEM) community including underrepresented groups and minority serving institutions. NSF currently invests in a number of programs targeting underrepresented populations and institutions. This Dear Colleague Letter (DCL) describes another opportunity to build on the Agency's longstanding efforts of inclusiveness by providing a mechanism for researchers to create, implement, and evaluate innovative models of intervention in STEM (with particular attention to life science and bioscience), beginning in elementary school through undergraduate studies.

Through this DCL, NSF invites eligible organizations to submit research proposals that create, implement, and evaluate models of intervention that will advance the knowledge base for establishing and retaining underrepresented minorities in STEM fields with particular attention to life science and the biosciences. Researchers from minority-serving institutions, including Historically Black Colleges and Universities, Hispanic-Serving Institutions, and Tribal Colleges and Universities, are particularly encouraged to apply. Proposals should partner eligible organizations with local elementary, middle or high schools to foster collaborative relationships between K-12 science educators and the research community. The activities may occur in formal and/or informal settings. Proposals may address science topics and activities related to curriculum development, teacher support, and student engagement. Proposals should describe effective methods to disseminate findings broadly to the K-16 science education community.

Researchers are invited to submit proposals to one of the following programs, in accordance with NSF's *Proposal and Award Policies and Procedures Guide* (PAPPG) and

individual program solicitation requirements. Regardless of the program, the title of each proposal should begin with "Life STEM."

- For PreK-12 learning environments, submit to:
  - Discovery Research PreK-12 (DRK-12, NSF 15-592) due date December 7, 2016
  - Innovative Technology Experiences for Students and Teachers (ITEST, NSF 15-599) August 10, 2017
  - Advancing Informal STEM Learning Program (AISL, NSF 15-593) due November 8, 2016
- For undergraduate learning environments, submit to:
  - Improving Undergraduate STEM Education (IUSE, NSF 15-585) due November 2, 2016/January 11, 2017.
  - HBCU Undergraduate Program (HBCU-UP, NSF 16-538) due November 22, 2016. Researchers who have met the Letter of Intent requirement for the HBCU-UP solicitation may choose to submit a proposal that focuses on or incorporates life science or bioscience in alignment with the specifications in NSF 16-538.

Through this DCL, researchers may also submit EArly-concept Grants for Exploratory Research (EAGER) proposals to explore new directions or appropriate extensions of disciplinary-based research activities. EAGER proposals must conform to the guidelines for preparation of such a proposals (including the requirement to discuss the proposal with a program officer prior to submission) as specified in the Chapter II.D.2 of the PAPPG. EAGER proposals have a maximum size of $300,000 and a maximum duration of two years. All EAGERS in response to this DCL should be submitted by January 31, 2017. The title of the proposal should be prefixed with "Life STEM EAGER."

Researchers interested in submitting proposals or have questions pertaining to this DCL may contact: Celestine Pea, Program Officer, cpea@nsf.gov.

This DCL is expected to be in effect from October 1, 2016, to September 30, 2017. All proposals should be submitted in accordance with NSF's PAPPG and individual program solicitation deadlines listed in this letter.

Dear Colleague Letter: Opportunities for Research in Smart & Connected Communities

The National Science Foundation's (NSF) Directorates for Computer and Information Science and Engineering (CISE), Education and Human Resources (EHR), Engineering (ENG), Geosciences (GEO), and Social, Behavioral and Economic Sciences (SBE) wish to notify the community of various opportunities to support, foster,and accelerate fundamental research and education that addresses challenges in enabling Smart & Connected Communities (S&CC). This DCL amplifies and extends NSF's broader efforts in Smart & Connected Communities, and aligns with the National Smart Cities Initiative and the President's Council of Advisors on Science and Technology (PCAST) report on *Technology and the Future of Cities*.

Since the White House announced the Smart Cities Initiative in September 2015, NSF has been working with diverse community stakeholders to formulate research directions and create new funding opportunities. In Fiscal Year (FY) 2016, NSF's investments have enabled pursuit of fundamental understanding and basic research in frameworks that: (a) integrate and operate on data from multiple sources at multiple temporal and spatial scales; (b) involve new sociotechnical systems that are interconnected and interdependent; and (c) develop and test

new technologies for innovative applications and services to enable more livable, workable, and sustainable communities.

Looking forward, NSF envisions a multi-pronged strategy to build on its FY 2016 investments. This strategy is intended to advance both disciplinary and multidisciplinary science and engineering foundations as well as build research capacity to improve understanding of local communities and advance discoveries and innovation that will ultimately enhance the quality of life within them. In particular, for FY 2017, NSF envisions a portfolio of funding opportunities and activities that include (but are not limited to):

- Developing integrative social and technological research foundations for S&CC through strong, multidisciplinary efforts that may span institutions, stakeholder groups, and application areas;
- Coupling research with community engagement to inform research directions and enable greater community impact;
- Supporting research through NSF's core and cross-cutting programs to enable and address solutions to current and future challenges;
- Piloting and evaluating novel solutions to local community challenges — with attention to privacy, security, and quality of life of individuals within communities;
- Efforts to understand population characteristics and factors that inhibit or advance participation in technology;
- Capacity-building activities to develop collaborations and partnerships through short-term planning activities and longer-term research direction-setting within the research and stakeholder communities, and to engage students and learners of all ages in addressing challenges relevant to S&CC;
- Supporting and building international partnerships that leverage research strength and capacity in other parts of the world; and
- Workshops that bring together diverse stakeholders including academics, community members, Federal agency partners, and others to identify strategic gaps, synergistic opportunities, and avenues for effective transition of research to practice.

Dear Colleague Letter: Advanced Measurement Systems for Experimental Determination of Complex Biomaterial Properties

Through this Dear Colleague Letter (DCL), the Division of Civil, Mechanical and Manufacturing Innovation (CMMI), Directorate for Engineering (ENG), announces its intention to support research on advanced measurement systems for experimental determination of complex biomaterial properties through its Biomechanics and Mechanobiology (BMMB) and Mechanics of Materials and Structures (MoMS) core programs.

Rapid advances in photonic, acoustic, imaging, electronic and manipulative technologies have recently created an unprecedented potential to study biomaterials at multiple scales and high resolution. Combined with computation methods, it is now possible to identify the material property distributions of perturbed living organisms. These technological advances have the potential to revolutionize our understanding of the mechanics of biological materials from the molecular scale to in vivo measurement.

The BMMB and MoMS Programs of CMMI welcome proposals as part of their existing programs (https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13523&org=CMMI ,

https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13355&org=CMMI) that advance developments at all levels for the experimental determination of complex biomaterial properties tested in situ. Proposals for these advances include (but are not limited to) research that specifically addresses determination of dynamic elastic and failure mechanical properties of the brain, bone, individual cells, tissue, and other biological material systems. Development and validation of mathematical and/or computational techniques for inverse identification of complex and/or novel material model property distributions are included in this call.

This DCL calls attention to the inclusion of these topics within the scope of the existing CMMI BMMB and MoMS programs. Proposals submitted in response to this DCL will be jointly reviewed by these programs in competition with other proposals; this is neither a special competition nor a new program, and proposals will be funded as part of the core programs' budgets. For joint consideration by both programs proposals submitted in response to this DCL should be synergistic with both BMMB and MoMS approaches and must contain research components as described by the two (BMMB and MoMS) program solicitations. Proposal ideas that do not fit within the BMMB and MoMS program descriptions but appear to address topics related to this DCL should be submitted to other relevant NSF programs.

Proposals relevant to this DCL must be submitted during the regular CMMI proposal submission windows, following the Proposal and Award Policies and Procedures Guide (PAPPG) proposal preparation guidelines (https://www.nsf.gov/publications/pub_summ.jsp?ods_key=papp). For further information, interested PIs may contact Kara Peters (Program Director, MoMS, telephone (703) 292-7060, email kpeters@nsf.gov) and David Fyhrie (Program Director, BMMB, telephone (703) 292-7088, email dfyhrie@nsf.gov).

Dear Colleague Letter: Collaborative Funding Opportunities in the Division of Chemical, Bioengineering, Environmental, and Transport Systems (CBET)

The Division of Chemical, Bioengineering, Environmental, and Transport Systems (CBET) will consider proposals for collaborative funding with the Electric Power Research Institute (EPRI), the Water Environment & Reuse Foundation (WE&RF) [formerly the Water Environment Research Foundation], and/or the Water Research Foundation (WRF). For a proposal to be considered for collaborative funding, the proposal must be submitted to the appropriate NSF-CBET program as an unsolicited proposal during the CBET unsolicited submission window, which is October 1, 2016 – October 20, 2016. The same dates will apply in future years. Proposals will be reviewed as part of the unsolicited program(s). Proposals must follow guidelines for the CBET program to which they are submitted. Proposals will be evaluated according to the NSF criteria of intellectual merit and broader impacts.

Each collaborating organization has outlined its particular science and engineering interests, which are summarized below. Additional details can be found on the organizational website for the organization, which is given below.

Electric Power Research Institute

The key research questions and proposals that EPRI would potentially support focus on the connection between electricity generation and utilization and water availability and use, as well as the connection between electricity generation/utilization and food production. The

proposal should contain a clear focus on the larger goals of water use optimization described here:

•Ideas which focus on developing alternative water sources and optimizing water use in power plants for water conservation purposes;

•Novel, energy efficient technologies or methods for water and wastewater treatment, transport, industrial processes, and agriculture to reduce water demand and conserve electricity;

•Novel, energy efficient technologies or methods for residential and commercial buildings, and industrial processes;

•Technologies that simultaneously optimize water and energy use and thereby reduce greenhouse gas emissions; and,

•Innovations which maximize the use of cheap, available energy (including low grade heat sources at thermal power plants) and water inputs using system integration.

EPRI anticipates funding for the next two years in support of this collaborative initiative as funds allow. Proposers wishing to be considered should visit the information and white paper on the EPRI website (http://www.epri.com/Pages/NSF-EPRI-Collaboration-on-Water-Use-Optimization-.aspx) which gives specific details on EPRI's research interests in water.

Water Environment & Reuse Foundation

The Water Environment & Reuse Foundation (WE&RF) would potentially support research and new technology development and demonstration projects that enhance the quality and reliability of water for natural systems and communities with an integrated approach to resource recovery and reuse. The key research questions and proposals that WE&RF would potentially support will focus on intensification and resource recovery (IR^2) at wastewater, reuse and stormwater facilities. The goal will be to improve basic science and engineering and to accelerate the development, demonstration, and implementation of innovative, cost-effective technologies to enhance management and recovery of water, nutrients, energy, heat and other valuable products at water resource recovery facilities.

Specific examples of areas of interest include, but are not limited to, the following:

•Nutrient Removal and Recovery: Including processes for intensified mainstream biological nutrient removal, macro and micro nutrient recovery (nitrogen, phosphorus, potassium), etc.

•Energy from Wastewater: Including processes for wastewater carbon diversion and enhanced energy recovery, digestion enhancement, conversion of sludge or biosolids to energy, and novel means of recovering various forms of energy contained in wastewater (e.g., chemical, thermal, kinetic).

•Water for Reuse: Including processes for cost-effective advanced water treatment for production of water for potable or non-potable use, removal of compounds of emerging concern, etc.

•High Rate Treatment: Including processes for higher throughputs and cake solids in dewatering, improving dewaterability, high rate wet weather treatment, high intensity filtration, etc.

•Integrated Water Management: Including research that facilitates change by acting as a catalyst and providing the technical support for a paradigm shift in water management for cities

and towns toward sustainable systems that integrate wastewater, stormwater, drinking water and source water, as well as other infrastructure (e.g., energy, transportation, parks, etc.).
•"One Water" framework: Including integrated planning for municipal stormwater and wastewater; institutional issues for sustainable water management; incorporating urban planning and design into integrated water management; integrating with alternative water sources, reclaimed water and stormwater reuse.
•Food-Water-Energy Nexus: Including research that provides communities with technical and management tools to better manage the paradigm shift where water is understood to be integral to food and energy, while advancing a shift to the "circular economy."
•Other products: Including processes for capturing or producing other valuable products from wastewater such as chemicals, bioplastics, etc.

WE&RF anticipates funding up to $500,000 a year for the next two years in support of this collaborative initiative. Proposers wishing to be considered should visit the "research areas" on the WE&RF website (www.werf.org), which gives specific details on programmatic research interests in water.

Water Research Foundation

There is a growing awareness in the US and worldwide about the stresses being placed on water supplies and other natural resources by increasing population, changing climate, aging water infrastructure and increasing competition for finite resources. The challenges are spurring a move to a "one water" approach in which water from all sources is managed holistically and cooperatively to meet social, environmental, and economic needs.

The key research questions and proposals that WRF would potentially support focus on all aspects important to water, wastewater/resource recovery, recycled water, and stormwater systems which can be applied to advance and optimize protection of public health and the environment through innovative technologies, management and financing. Examples include, but are not limited to, the following:
•Watershed protection/source water quality issues aimed at optimizing source water quality, to include nutrient control;
•Innovative water, wastewater, and reuse treatment processes and technologies;
•Innovative stormwater management, including green infrastructure;
•Resource recovery;
•Evaluation of alternative water supplies and integrated water resources – fit for purpose treatment;
•Water reuse/water recycling;
•Energy efficiency and integrated water-energy planning;
•Drought management and impacts from climate change;
•Waterborne pathogens in distribution and plumbing systems; biofilms;
•Water distribution system water quality;
•Sensors and sensor technology to optimize treatment, collection, distribution, conveyance and operations;
•Cyanobacterial blooms and cyanotoxins.

WRF anticipates funding up to $500,000 a year for the next two years in support of this collaborative initiative. Proposers wishing to be should visit the WRF website (www.waterrf.org) for the Focus Areas and research interests in water.

Dear Colleague Letter: National Science Foundation, Directorate for Social, Behavioral & Economic Sciences (NSF/SBE) and US-Israel Binational Science Foundation (BSF) Opportunity for Collaborations in Economics and Psychology

To facilitate the support of collaborative work between US groups and their Israeli counterparts, NSF's Directorate for Social, Behavioral & Economic Sciences (SBE) and the BSF signed a Letter of Intent that outlines a review process for projects in Economics and Psychology. Israeli researchers are invited to read the BSF solicitation: http://www.bsf.org.il/ElectronicSubmission/GatewayFormsAndGuidelines.aspx?PageId=7&innerTextID=0 .

For 2017, NSF/SBE-BSF proposal submissions will only be accepted once a year, during the summer 2017 round of program deadlines. International collaborations are invited to submit proposals in the areas described in the following SBE programs:

Division of Behavioral and Cognitive Sciences Core Programs:

- Social Psychology (PD 98-1332)
- Perception, Action, and Cognition (PD 09-7252)
- Cognitive Neuroscience (PD 15-1699)
- Developmental and Learning Sciences (PD 08-1698)

Division of Social and Economic Sciences Core Programs:

- Economics (PD 98-1320)
- Decision, Risk and Management Sciences (PD 98-1321)

NOTE: Only proposals focused on Decision Science are eligible to submit to this call. Proposals on Risk and Management Science are not eligible to participate in this collaborative opportunity.

Proposals will be submitted to NSF, and the Israeli institution will submit a parallel proposal to BSF immediately afterwards. The proposals will be reviewed in competition with other proposals received for the same funding round by NSF using NSF's merit review process. It is important to note that there are no separate NSF funds available for these efforts; proposals must compete with all other proposals within the NSF program and must succeed on the strengths of their intellectual merit and broader impact. BSF will check the role of the Israeli scientist and her/his eligibility at the onset of the process, but will not conduct a parallel review and will not rank proposals; BSF is likely to fund any Israeli whose research partner is funded by NSF.

Agency Reports, Workshops & Research Roadmaps

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Preparing for the Future of Artificial Intelligence

Advances in Artificial Intelligence (AI) technology have opened up new markets and new opportunities for progress in critical areas such as health, education, energy, and the environment. In recent years, machines have surpassed humans in the performance of certain specific tasks, such as some aspects of image recognition. Experts forecast that rapid progress in the field of specialized artificial intelligence will continue. Although it is very unlikely that machines will exhibit broadly-applicable intelligence comparable to or exceeding that of humans in the next 20 years, it is to be expected that machines will reach and exceed human performance on more and more tasks.

As a contribution toward preparing the United States for a future in which AI plays a growing role, this report surveys the current state of AI, its existing and potential applications, and the questions that are raised for society and public policy by progress in AI. The report also makes recommendations for specific further actions by Federal agencies and other actors. A companion document lays out a strategic plan for Federally-funded research and development in AI. Additionally, in the coming months, the Administration will release a follow-on report exploring in greater depth the effect of AI-driven automation on jobs and the economy.
The report was developed by the NSTC's Subcommittee on Machine Learning and Artificial Intelligence, which was chartered in May 2016 to foster interagency coordination, to provide technical and policy advice on topics related to AI, and to monitor the development of AI technologies across industry, the research community, and the Federal Government. The report was reviewed by the NSTC Committee on Technology, which concurred with its contents. The report follows a series of public-outreach activities spearheaded by the White House Office of Science and Technology Policy (OSTP) in 2016, which included five public workshops co-hosted with universities and other associations that are referenced in this report.

OSTP also published a Request for Information (RFI) in June 2016, which received 161 responses. The submitted comments were published by OSTP on September 6, 2016.
Consistent with the role of Big Data as an enabler of AI, this report builds on three previous Administration reports on Big Data referenced in this report. In the coming years, AI will continue to contribute to economic growth and will be a valuable tool for improving the world, as long as industry, civil society, and government work together to develop the positive aspects of the technology, manage its risks and challenges, and ensure that everyone has the opportunity to help in building an AI-enhanced society and to participate in its benefits.

U.S. Department of Education, White House Initiative on Educational Excellence for Hispanics Release College Planning Resource Guide

The U.S. Department of Education and the White House Initiative on Educational Excellence for Hispanics (Initiative) today released the ¡Gradúate! 2.0: A College Planning Guide to Success. The guide provides Hispanic students and families with information and resources to help navigate the process of going to college. "This guide is a continuation of the historic investments the Obama Administration has made since day one to advance Latino student

success from cradle to career," said U.S. Secretary of Education John B. King Jr. "It will help us continue the dialogue on the importance of promoting a college going culture across the country."

Over the next decade, the share of jobs requiring some level of higher education is expected to grow even more rapidly, with 11 of the 15 fastest-growing occupations requiring a postsecondary education. In today's economy, higher education is a necessity for individual economic opportunity and America's competitiveness in the global economy.

- College graduates with a bachelor's degree typically earn 66 percent more than those with only a high school diploma; and are also far less likely to face unemployment.
- Over the course of a lifetime, the average worker with a bachelor's degree will earn approximately $1 million more than a worker without a postsecondary education.

The good news is that Latinos are graduating high school and enrolling in college at the highest rates in the country's history, and as of 2012, Latinos are the largest minority group in our nation's colleges and universities. Yet, only 23 percent of Hispanic adults age 25 and older have an associates degree or higher and only 12 percent have an advanced degree, such as a master's or doctorate. There is a growing need to support more Hispanic students in completing high school and pursuing postsecondary education. As such, the guide outlines the steps that students should take throughout high school leading up to their first day of college. The guide includes:

- Preparing for College: Provides key resources and information students may find helpful in high school and the early stages of the college application process. It also includes tips and tools when it comes time to research different types of colleges and universities and begin building a list of institutions to apply to.
- Process of Applying & Enrolling: Once students build and narrow a list of colleges and universities, the guide provides students with information on the process of applying for colleges including what is required for a college application and tips about the different college entrance exams and fee waiver information.
- Paying for College: Provides descriptions of the various financial aid resources available to help students pay for college and an understanding of the different types of financial aid awards and packages. This is in addition to the financial aid information found in the first edition of the Initiative's ¡Gradúate! Financial Aid Guide to Success.
- Preparing for the First College Semester: Provides information that can help you navigate your first semester of college including what you should know about on and off campus living, summer orientation and placement tests.

"The release of the ¡Gradúate! 2.0 Guide is in honor of all the first generation college students who are paying it forward for the next generation of Latino leaders," said Alejandra Ceja, executive director for the Initiative. "It is a culturally relevant resource for students, families and educators that will help us ensure information does not become a barrier to enrolling and graduating from college."

In 2014, the Initiative released the first ever ¡Gradúate! Financial Aid Guide to Success in both English and Spanish. The guide provides helpful tips on filling out the Free Application for Federal Student Aid and other key financial resources available to better support Hispanics, including Deferred Action for Childhood Arrivals and students who are not U.S. citizens, in their efforts to access a postsecondary education. In addition, fact sheets on College Access: Ensuring

Equality of Opportunity for Latinos and *College Completion: Ensuring Equality of Opportunity for Latinos* are now available.

Pursuing high-quality postsecondary education is one of the most important investments a student can make, and is the surest path to the middle class in our country. Americans with college degrees are more likely to live healthier lives, be more civically engaged in their communities, have good-paying jobs, and experience greater job security. This country's students, families, and economic strength depend on a higher education system that helps everyone succeed. Achieving this goal requires making college more accessible and affordable—especially for historically underserved students—and ensuring that students graduate in a timely way with a meaningful degree that sets them up to thrive in careers and life.

That is why the Obama Administration has taken strong actions since 2009 to offset the rising costs of higher education, including expanding Pell Grants—federal financial aid offered to undergraduate students from lower-income families—and making student debt more manageable. As the Administration works to increase college opportunity, value, and affordability, we continue to see signs of progress in expanding opportunity for low-income and disadvantaged students. Black and Hispanic students earned over 270,000 more undergraduate degrees in 2013-14 than in 2008-09.There were a million more black and Hispanic students enrolled in college in 2014 than in 2008.

New Funding Opportunities

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Content Order

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

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

New Funding Solicitations Posted Since September 15 Newsletter

Hertz Graduate Fellowships in Applied Physical, Biological and Engineering sciences
The Graduate Fellowship Award is based on merit (not need) and consists of a cost-of-education allowance and a personal-support stipend. The cost-of-education allowance is accepted by all of the participating schools in lieu of all fees and tuition. Hertz Fellows therefore have no liability for any ordinary educational costs, regardless of their choice among participating schools. **Due October 28.**

NOAA Joint Hurricane Testbed , Hazardous Weather Testbed, Hydrometeorology Testbed
This funding opportunity is being issued by the NOAA OAR Office of Weather and Air Quality (OWAQ). There will be three separate competitions resulting from this announcement, one for each of the three high impact weather testbeds supported by OWAQ's U.S. Weather Research Program (USWRP): Joint Hurricane Testbed (JHT), Hazardous Weather Testbed (HWT), and the Hydrometeorology Testbed (HMT). These funding competitions will focus on new applied research, development, and demonstration of high impact weather and water research. The ultimate goal (after the award ends and assuming NWS decides to accept it) would be NWS's transition of project outcomes to operational weather and water forecasting services in three to five years from now. The High Impact Weather Testbed program, a component of the USWRP, supports projects that transition applied research to operations and services through close collaboration with NOAA. Its focus is on mature projects that are ready or nearly ready to be tested in a NOAA quasi-operational forecasting environment through one of the above testbeds. It is in these testbeds where project outcomes, such as new data or products, improved analysis techniques, or better statistical or dynamic models and forecast techniques, will be presented to operational forecasters in a quasi-operational environment (a testbed) and evaluated for potential future implementation in the NWS forecast offices at the local, regional, and/or national center levels to improve services to the public. NOAA's National Weather Service (NWS) is also announcing another separate federal funding opportunity that is a

companion to this funding opportunity and similarly supports projects to transition new research to NWS operations through the Collaborative Science, Technology, and Applied Research (CSTAR) Program. Please search for funding opportunity number NOAA-NWS-NWSPO-2017-2004957 in grants.gov. The current OAR testbed funding opportunity supports mature projects that are ready or nearly ready for testbed collaborations and demonstrations, while testbed demonstrations are not required with the CSTAR funding opportunity. **Due January 4.**

DARPA Young Faculty Award in Physical Sciences, Engineering, Materials, Mathematics, Biology, Computing, Informatics, Social Science, Manufacturing relevant to Defense Sciences Office

DARPA is soliciting innovative research proposals in the areas of physical sciences, engineering, materials, mathematics, biology, computing, informatics, social science, and manufacturing of interest to DARPA's Defense Sciences Office (DSO), Microsystems Technology Office (MTO), and Biological Technologies Office (BTO). Further detail regarding the specific technical areas of interest can be found under Section I.E "Topic Areas (TAs)." Proposed research should investigate innovative approaches that enable revolutionary advances in science, devices, or systems. Specifically excluded is research that primarily results in evolutionary improvements to the existing state of practice. **Due January 18.**

Biosystems Design to Enable Next-Generation Biofuels and Bioproducts

Biological and Environmental Research (BER) of the Office of Science (SC), U.S. Department of Energy (DOE) hereby announces its interest in receiving applications for research of interest to the Genomic Science Program (http://genomicscience.energy.gov) in the following research areas:

a) Integrating large-scale systems biology data to model, design, and engineer microbial systems for the production of biofuels and bioproducts: Interdisciplinary approaches to develop innovative, high-throughput modeling, genome-wide design and editing, and engineering technologies for a broad range of microbes relevant for the production of biofuels and bioproducts from biomass.

b) Plant systems design for bioenergy: To develop novel technologies for genome-scale engineering to re-design bioenergy crops that can grow in marginal environments while producing high yield of biomass that can be easily converted to biofuels and bioproducts. Applications should include strategies to address biocontainment, minimizing risks of potential release of engineered organisms into the environment or other unintended outcomes.

Preapplication due Dec. 19.

Data Infrastructure Building Blocks (DIBBs)

The NSF vision for a Cyberinfrastructure Framework for 21st Century Science and Engineering (CIF21) considers an integrated, scalable, and sustainable cyberinfrastructure to be crucial for innovation in science and engineering (see www.nsf.gov/cif21). The Data Infrastructure Building Blocks (DIBBs) program is an integral part of CIF21. The DIBBs program encourages development of robust and shared data-centric cyberinfrastructure capabilities, to accelerate interdisciplinary and collaborative research in areas of inquiry stimulated by data.

DIBBs investments enable new data-focused services, capabilities, and resources to advance scientific discoveries, collaborations, and innovations. The investments are expected to build upon, integrate with, and contribute to existing community cyberinfrastructure, serving as evaluative resources while developments in national-scale access, policy, interoperability and sustainability continue to evolve.

Effective solutions will bring together cyberinfrastructure expertise and domain researchers, to ensure that the resulting cyberinfrastructure address researchers' data needs. The activities should address the data challenges arising in a disciplinary or cross-disciplinary context. (Throughout this solicitation, 'community' refers to a group of researchers interested in solving one or more linked scientific questions, while 'domains' and 'disciplines' refer to areas of expertise or application.) The projects should stimulate data-driven scientific discoveries and innovations, and address broad community needs, nationally and internationally. **Due January 3.**

Transdisciplinary Research in Principles of Data Science Phase I (TRIPODS) - TRIPODS Phase I

Transdisciplinary Research In Principles Of Data Science (TRIPODS) aims to bring together the statistics, mathematics, and theoretical computer science communities to develop the theoretical foundations of data science through integrated research and training activities. Phase I, described in this solicitation, will support the development of small collaborative Institutes. Phase II (to be described in an anticipated future solicitation, subject to availability of funds) will support a smaller number of larger Institutes, selected from the Phase I Institutes via a second competitive proposal process. All TRIPODS Institutes must involve significant and integral participation by all three of the aforementioned communities. **LOI January 04, 2017 - January 19, 2017; full March 01, 2017 - March 15, 2017.**

Spectrum Efficiency, Energy Efficiency, and Security (SpecEES): Enabling Spectrum for All

The National Science Foundation's Directorates for Engineering (ENG) and Computer and Information Science and Engineering (CISE) are coordinating efforts to identify bold new concepts to significantly improve the efficiency of radio spectrum utilization while addressing new challenges in energy efficiency and security, thus enabling spectrum access for all users and devices, and allowing traditionally underserved Americans to benefit from wireless-enabled goods and services. The SpecEES program solicitation (pronounced "SpecEase") seeks to fund innovative collaborative research that transcends the traditional boundaries of existing programs. **Due January 19.**

DHS-16-DN-130-NFRA-001 Nuclear Forensics Research Award Department of Homeland Security

The Department of Homeland Security (DHS) Domestic Nuclear Detection Office (DNDO) National Technical Nuclear Forensics Center (NTNFC) is inviting U.S. colleges and universities to apply for the Nuclear Forensics Research Award (NFRA). The NFRA supports the establishment of a team of faculty, students, and technical staff at the national or defense laboratories to conduct research in the field of nuclear forensics. NTNFC was tasked with two core missions: to provide national-level integration, centralized planning, and stewardship for the National Technical Nuclear Forensics (NTNF) community; and to lead the U.S. Government (USG) in

establishing a robust and enduring pre-detonation radiological/nuclear materials forensics capability. A top priority of DNDO/NTNFC's stewardship mission is to lead USG efforts in addressing the enduring challenge of sustaining a preeminent Nuclear Forensics (NF) workforce of recognized technical experts and leaders through fostering scholastic and research collaboration between and among academia, the national and defense laboratories, and the NTNF Interagency. **Due January 30.**

Critical Resilient Interdependent Infrastructure Systems and Processes FY17 (CRISP)
The goals of the Critical Resilient Interdependent Infrastructure Systems and Processes (CRISP) solicitation are to: (1) foster an interdisciplinary research community of engineers, computer and computational scientists and social and behavioral scientists, that creates new approaches and engineering solutions for the design and operation of infrastructures as processes and services; (2) enhance the understanding and design of interdependent critical infrastructure systems (ICIs) and processes that provide essential goods and services despite disruptions and failures from any cause, natural, technological, or malicious; (3) create the knowledge for innovation in ICIs so that they safely, securely, and effectively expand the range of goods and services they enable; and (4) improve the effectiveness and efficiency with which they deliver existing goods and services. **Due February 8.**

URL Links to New & Open Funding Solicitations

- **HHS Grants Forecast**
- **American Cancer Society Index of Grants**
- **SAMHSA FY 2014 Grant Announcements and Awards**
- **DARPA Microsystems Technology Office Solicitations**
- **Open Solicitations from IARPA (Intelligence Advanced Research Projects Activity)**
- **Bureau of Educational and Cultural Affairs, Open Solicitations, DOS**
- **ARPA-E Funding Opportunity Exchange**
- **DOE Funding Opportunity Exchange**
- **NIAID Funding Opportunities List**
- **NPS Broad Agency Announcements (BAAs)**
- **NIJ Current Funding Opportunities**
- **NIJ Forthcoming Funding Opportunities**
- **Engineering Information Foundation Grant Program**
- **Comprehensive List of Collaborative Funding Mechanisms, NORDP**
- **ARL Funding Opportunities — Open Broad Agency Announcements (BAA)**
- **HHS Grants Forecast**
- **American Psychological Association, Scholarships, Grants and Awards**
- **EPA 2014 Science To Achieve Results (STAR) Research Grants**
- **NASA Open Solicitations**
- **Defense Sciences Office Solicitations**
- **The Mathematics Education Trust**

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

Solicitations Remaining Open from Prior Issues of the Newsletter

The Educational Component of the National Cooperative Geologic Mapping Program
The primary objective of the EDMAP component of the NCGMP is to train the next generation of geologic mappers. To do this NCGMP provides funds for graduate and selected undergraduate students in academic research projects that involve geologic mapping as a major component. Through these cooperative agreements NCGMP hopes to expand the research and educational capacity of academic programs that teach earth science students the techniques of geologic mapping and field data analysis. Another important goal is to increase the level of communication between the Nations geologic surveys (both State Geological Surveys and the USGS) and geologic mappers in the academic community. We hope that this improved communication will have two results: 1) that the academic mapping community will learn more about the societal needs that drive geologic mapping projects at the USGS and State Geologic Surveys, and 2) more geologic maps produced in academia will eventually be made available to the public**. Due November 9.**

2017 Ford Foundation Fellowship Programs
Competition is *NOW OPEN* and accepting applications
2017 Predoctoral application deadline:
November 17, 2016
(5:00 PM EST)

2017 Dissertation and Postdoctoral application deadlines:
November 10, 2016
(5:00 PM EST)
Supplementary Materials receipt deadline (all levels):
January 10, 2017
(5:00 PM EST)
Through its Fellowship Programs, the Ford Foundation seeks to increase the diversity of the nation's college and university faculties by increasing their ethnic and racial diversity, to maximize the educational benefits of diversity, and to increase the number of professors who can and will use diversity as a resource for enriching the education of all students.
Predoctoral, Dissertation, and Postdoctoral fellowships will be awarded in a national competition administered by the National Academies of Sciences, Engineering, and Medicine on behalf of the Ford Foundation. Eligibility to apply for a Ford fellowship is limited to:

- All citizens, nationals, and permanent residents (holders of a Permanent Resident Card) of the United States, as well as individuals granted deferred action status under the Deferred Action for Childhood Arrivals Program, regardless of race, national origin, religion, gender, age, disability, or sexual orientation,
- Individuals with evidence of superior academic achievement (such as grade point average, class rank, honors or other designations), and
- Individuals committed to a career in teaching and research at the college or university level.

Receipt of the fellowship award is conditioned upon each awardee providing satisfactory documentation that he or she meets the eligibility requirements. Awards will be made for study in research-based Ph.D. or Sc.D. programs; practice oriented degree programs are not eligible for support (see eligible fields). Prospective applicants should read carefully the eligibility requirements, the terms of the fellowship awards, application instructions and other information pertaining to the individual fellowship (Predoctoral, Dissertation, or Postdoctoral) for which they are applying. In addition to the fellowship award, Ford Fellows are eligible to attend the Conference of Ford Fellows, a unique national conference of a select group of high-achieving scholars committed to diversifying the professoriate and using diversity as a resource for enriching the education of all students.

Simons Early Career Investigator in Marine Microbial Ecology and Evolution - LOI
The Simons Foundation is now accepting applications for its Simons Early Career Investigator in Marine Microbial Ecology and Evolution Awards. The deadline for receipt of letters of intent (LOI) is November 7, 2016, 5:00 PM Eastern Standard Time. Overview: Microbes inhabit and sustain all habitats on Earth. In the oceans, microbes capture solar energy, catalyze biogeochemical transformations of important elements, produce and consume greenhouse gases, and provide the base of the food web. The purpose of these awards is to help launch the careers of outstanding investigators who use quantitative approaches to advance our understanding of marine microbial ecology and evolution. Investigators with backgrounds in different fields or with an interest in modeling or theory are encouraged to apply. Applicants must hold a Ph.D. or equivalent degree. She/he must have carried out research in an independent position (tenure-track or equivalent) for at least one year and no more than eight

years (start date between November 2008 and November 2015) and must currently hold a tenure-track or tenured position, or equivalent, in a U.S. or Canadian institution. She/he must be the principal investigator (PI) or co-PI currently or within the past year on a grant from a federal agency or major foundation.

About the Awards. Grants will be for **$180,000 USD per year**, including indirect costs (limited to 20 percent of modified total direct costs), for a period of three years, subject to annual reviews and continuation of research in areas relevant to the purpose of this program. Appropriate expenses include salary support for the investigator and postdoctoral and graduate research assistants, travel, equipment, supplies and other research expenses. Awards will begin April 1, 2017. Awards will be governed by the Simons Foundation Life Sciences policies, which can be found at http://www.simonsfoundation.org/funding/policies-and-forms/.

Submission of Letter of Intent. Prospective applicants must submit a letter of intent (LOI) by November 7, 2016, 5:00 PM Eastern Standard Time. LOIs must be completed electronically and submitted using forms provided at https://proposalcentral.altum.com/. Please log in as an applicant, go to the grant opportunities tab, scroll to simons foundation and click apply now for the "Simons Early Career Investigator in Marine Microbial Ecology and Evolution Awards" program. For assistance, please call 800-875-2562 or email pcsupport@altum.com. **LOI Due November 11.**

Graduate Research Fellowship Program in the Social and Behavioral Sciences

The Graduate Research Fellowship in the Social and Behavioral Sciences track is open to doctoral students in all social and behavioral science disciplines. The fellowship awards provide support for 12 to 18 months to accredited universities for research on crime, violence and other criminal justice-related topics. Awards made under the Social and Behavioral Sciences Fellowship Program are up to $32,000 for the period of performance. NIJ encourages doctoral students in the final stages of graduate study who are conducting research that has direct implications for criminal justice policy and practice in the U.S. to apply to this exciting program. **Webinar on October 4, 2016**, at 1pm ET, to learn more about the fellowship program and ask questions. Register!

Get ready for next year. While the fiscal year 2015 GRF solicitation has closed, we encourage you to:

- Sign up to receive an email when NIJ releases any new solicitation.
- Review the FAQs below to be ready to submit next time.
- Review a list of past and present fellows and learn about their research.

Frequently Asked Questions

These questions and answers will help you prepare your application for grant funds:

- Before Applying
- Application Submission
- About the Program Narrative
- About the Budget
- Required Documents
- Review and Awarding

Due November 21.

IMLS National Leadership Grants for Museums: Learning Experiences; Community Anchors; Collections Stewardship

National Leadership Grants for Museums support projects that address critical needs of the museum field and that have the potential to advance practice in the profession so that museums can improve services for the American public. National Leadership Grants for Museums has three project categories:

Learning Experiences. IMLS supports the unique ability of museums to open the door to meaningful knowledge and enhanced inquiry skills for people of all ages and backgrounds through multi-sensory learning, discovery, critical thinking, and problem solving. IMLS welcomes applications for projects that position museums as teaching and inquiry-focused institutions within today's formal and informal learning ecosystem. Successful projects will help the museum field provide high-quality, inclusive educational opportunities that address particular audience needs. We encourage projects that are based upon current research in cognitive and behavioral science as well as best practices developed in museums and other informal learning environments.

Community Anchors. IMLS promotes the role of museums as essential partners in addressing the needs of their communities by leveraging their expertise, knowledge, physical space, technology, and other resources to identify and implement solutions. By strengthening museums' capacities for civic engagement, these projects contribute to the creation of livable, sustainable communities. Museums have a role to play providing civic and cultural engagement, facilitating lifelong learning, promoting digital inclusion, and supporting economic vitality through programming and services. We envision museums to be highly collaborative, adopt co-creating strategies, and engage with a wide variety of cross-sector stakeholders to accomplish a sustained collective impact goal.

Collections Stewardship. IMLS supports the exemplary management, care, and conservation of, as well as broad access to and use of, museum collections. Investments designed to contribute to the long-term preservation of materials and specimens are complemented by skill-building and capacity-expanding programs for museum staff, volunteers, and interns. IMLS welcomes applications for projects that help the museum field address state-of-the-art collections care and collections-information management, curation, preventive conservation, conservation treatments, database creation and enhancement, digitization, and the use of digital tools to facilitate discovery and deepen engagement with museum collections. We welcome projects that demonstrate cross-sector and cross-disciplinary collaboration with libraries, archives, and other collecting institutions. Due **December 1.**

Science of Learning

The Science of Learning program supports potentially transformative basic research to advance the science of learning. The goals of the SL Program are to develop basic theoretical insights and fundamental knowledge about learning principles, processes and constraints. Projects that are integrative and/or interdisciplinary may be especially valuable in moving basic understanding of learning forward but research with a single discipline or methodology is also appropriate if it addresses basic scientific questions in learning. The possibility of developing connections between proposed research and specific scientific, technological, educational, and workforce challenges will be considered as valuable broader impacts, but are not necessarily

central to the intellectual merit of proposed research. The program will support research addressing learning in a wide range of domains at one or more levels of analysis including: molecular/cellular mechanisms; brain systems; cognitive affective, and behavioral processes; and social/cultural influences. The program supports a variety of methods including: experiments, field studies, surveys, secondary-data analyses, and modeling. **Due January 18**.

DOD University Small Grants BAA for Energy-related Basic, Applied, Advanced Research Projects of interest to Dept. of Defense **Due by April 1, 2017**

DARPA Information Innovation Office BAA

I2O sponsors basic and applied research in three thrust areas:

Cyber. As human activity has moved into cyberspace, cyber threats against our information systems have grown in sophistication and number, and protecting and assuring information is a matter of national security. Progress in the cyber security of best-of-breed systems has been significant over the last few years, giving us hope that we are no longer facing an impossible task. Looking to the future, I2O challenges itself with the goal: Win at Cyber. The I2O defensive cyber research and development (R&D) portfolio is focused on high-end cyber threats, including advanced persistent threats (cyber espionage and cyber sabotage) and other sophisticated threats to embedded computing systems, cyber-physical systems, enterprise information systems, and national critical infrastructure. I2O develops technologies that create software that is provably secure, applications that enhance cyberspace situational awareness, and systems for planning military operations in the cyber domain. Exploration of offensive methods is undertaken to inform the defensive cyber R&D and to establish viability of developed techniques with transition partners.

Analytics. Exponential increases in computation, storage, and connectivity have combined over the past five years to fundamentally alter science, engineering, commerce, and national security. Going under names such as “big data,” “machine learning,” and “analytics,” empirical modeling and data-driven approaches are providing powerful insight and competitive advantage for astute practitioners from biology to sports to finance. Through new analytics, algorithms, and software ecosystems, the modern data-centric paradigm exploits the increasingly dense, detailed measurements produced by networked sensors to optimize products, services, operations, and strategy. I2O is working to keep the Department of Defense (DoD) at the forefront of data-driven design and decision-making with the goal: Understand the World. I2O explores fundamental mathematical and computational issues such as complexity and scalability and develops applications in high-impact areas such as intelligence, software engineering, and command and control. I2O coordinates its R&D with the national security community to ensure timely transition of tools and techniques.

Symbiosis. The world is moving faster than humans can assimilate, understand, and act. At present we design machines to handle well-defined, high-volume or high-speed tasks, freeing humans to focus on complexity. I2O envisions a future in which machines are more than just tools that execute pre-programmed instructions. Rather, machines will function more as colleagues. Towards this end, I2O sets a goal: Partner with Machines. The symbiosis portfolio develops technologies to enable machines to understand speech and extract information contained in diverse media, to learn, to reason and apply knowledge gained through

experience, and to respond intelligently to new and unforeseen events. Application areas in which machines will prove invaluable as partners include: cyberspace operations, where highly-scripted, distributed cyber attacks have a speed, complexity, and scale that overwhelms human cyber defenders; intelligence analysis, to which machines can bring super-human objectivity; and command and control, where workloads, timelines and stress can exhaust human operators. **Due August 25.**

N00014-16-R-FO05 Multidisciplinary Research Program of the University Research Initiative Department of Defense Office of Naval Research

The MURI program supports basic research in science and engineering at U.S. institutions of higher education (hereafter referred to as "universities") that is of potential interest to DoD. The program is focused on multidisciplinary research efforts where more than one traditional discipline interacts to provide rapid advances in scientific areas of interest to the DoD. As defined in the DoD Financial Management Regulation: Basic research is systematic study directed toward greater knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications towards processes or products in mind. It includes all scientific study and experimentation directed toward increasing fundamental knowledge and understanding in those fields of the physical, engineering, environmental, and life sciences related to long-term national security needs. It is farsighted high payoff research that provides the basis for technological progress (DoD 7000.14-R, vol. 2B, chap. 5, para. 050201.B). DoD's basic research program invests broadly in many specific fields to ensure that it has early cognizance of new scientific knowledge. The FY 2017 MURI competition is for the topics listed below. Detailed descriptions of the topics and the Topic Chief for each can be found in Section VIII, entitled, "Specific MURI Topics," of this FOA. The detailed descriptions are intended to provide the offeror a frame of reference and are not meant to be restrictive to the possible approaches to achieving the goals of the topic and the program. **Due November 15.**

USDA-NIFA-AFRI-005942 Agriculture and Food Research Initiative - Agriculture and Natural Resources Science for Climate Variability and Change Challenge Area

This AFRI Challenge Area focuses on the priority to mitigate and adapt to climate variability and change. It supports activities that reduce greenhouse gas emissions, increase carbon sequestration in agricultural and forest production systems, and prepare the nation's agriculture and forests to adapt to variable climates. The long-term outcome for this program is to reduce the use of energy, nitrogen fertilizer, and water by ten percent and increase carbon sequestration by fifteen percent through resilient agriculture and forest production systems. In order to achieve this outcome, this program will support multi-function Integrated Research, Education, and/or Extension Projects and Food and Agricultural Science Enhancement (FASE) Grants. **Due November 17.**

Research Interests of the Air Force Office of Scientific Research BAA-AFRL-AFOSR-2016-0007

The Air Force Office of Scientific Research "we, us, our, or AFOSR" manages the basic research investment for the U.S. Air Force. As a part of the Air Force Research Laboratory (AFRL), our technical experts discover, shape, and champion research within the Air Force Research

Laboratory, universities, and industry laboratories to ensure the transition of research results to support U.S. Air Force needs. Using a carefully balanced research portfolio, our research managers seek to foster revolutionary scientific breakthroughs enabling the Air Force and U.S. industry to produce world-class, militarily significant, and commercially valuable products. Our focus is on research areas that offer significant and comprehensive benefits to our national warfighting and peacekeeping capabilities. These areas are organized and managed in two scientific Branches: Engineering and Information Sciences (RTA) Physical and Biological Sciences (RTB). **Open until superseded**.

Open Solicitations and BAAs

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

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

The U.S. Army Engineer Research and Development Center (ERDC) has issued a Broad Agency Announcement (BAA) for various research and development topic areas. The ERDC consists of the Coastal and Hydraulics Lab (CHL), the Geotechnical and Structures Lab (GSL), the Environmental Lab (EL), and the Information Technology Lab (ITL) in Vicksburg, Mississippi; the Cold Regions Research and Engineering Lab (CRREL) in Hanover, New Hampshire; the Construction Engineering Research Lab (CERL) in Champaign, Illinois; and the Topographic Engineering Center (TEC) in Alexandria, Virginia. The ERDC is responsible for conducting research in the broad fields of hydraulics, dredging, coastal engineering, instrumentation, oceanography, remote sensing, geotechnical engineering, earthquake engineering, soil effects, vehicle mobility, self-contained munitions, military engineering, geophysics, pavements, protective structures, aquatic plants, water quality, dredged material, treatment of hazardous waste, wetlands, physical/mechanical/chemical properties of snow and other frozen precipitation, infrastructure and environmental issues, computer science, telecommunications management, energy, facilities maintenance, materials and structures, engineering processes, environmental processes, land and heritage conservation, and ecological processes. The BAA is available at http://erdc.usace.army.mil and is open until superseded. Proposals may be accepted at any time. For questions regarding proposals to CHL, EL, GSL, TEC & ITL, contact Mike Lee at 601-634-3903 or via email at Michael.G.Lee@usace.army.mil . For questions regarding proposals to CERL, contact Wanda Huber at 217-373-6730 or via email at Wanda.L.Huber@usace.army.mil or Andrea Krouse at 217-373-6746 or via email at Andrea.J.Krouse@usace.army.mil . For questions regarding proposals at CRREL, contact Ashley Jenkins at 217-373-7297 or via email at Ashley.M.Jenkins@usace.army.mil . Contact the technical personnel listed at the end of each topic area for questions concerning the topic areas themselves. **Open until January 31, 2017**.

US Special Operations Command Broad Agency Announcement

This BAA is intended to solicit extramural research and development ideas, and is issued under the provisions of the Competition in Contracting Act of 1984 (Public Law 98-369), as implemented in Federal Acquisition Regulation 6.102(d) (2) and 35.016. This announcement provides a general description of USSOCOM's research areas of interest, general information, evaluation and selection criteria, and proposal/application preparation instructions. In accordance with FAR 6.102, projects funded under this announcement must be for basic and applied research and that part of development not related to the development of a specific system or hardware procurement. Projects must be for scientific study and experimentation directed toward advancing the state-of-the-art or increasing knowledge or understanding. Projects that are for the development of a specific system or hardware procurement will not be considered. The selection process is highly competitive and the quantity of meaningful proposal/applications (both pre-proposal/pre-applications and full proposal/full applications) typically received exceed the number of awards that available funding can support. This BAA provides a general description of USSOCOM's research and development programs, including research areas of interest, evaluation and selection criteria, pre-proposal/pre-application and full proposal/application preparation instructions, and general administrative information. Specific submission information and additional administrative requirements can be found in the document titled "General Submission Instructions" available in Grants.gov along with this BAA. **Open to May 14, 2017.**

W911NF-12-R-0012 Army Research Office Broad Agency Announcement for Basic and Applied Scientific Research

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

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**.

DARPA-BAA-16-46 Defense Sciences Office Office-wide

The mission of the Defense Advanced Research Projects Agency (DARPA) Defense Sciences Office (DSO) is to identify and pursue high-risk, high-payoff research initiatives across a broad spectrum of science and engineering disciplines and to transform these initiatives into game-changing technologies for U.S. national security. In support of this

mission, the DSO Office-wide BAA invites proposers to submit innovative basic or applied research concepts in one or more of the following technical areas: Mathematics, Modeling and Design; Physical Systems; Human-Machine Systems; and Social Systems. Each of these areas is described below and includes a list of example research topics that highlight several (but not all) potential areas of interest. Proposals must investigate innovative approaches that enable revolutionary advances. DSO is explicitly not interested in approaches or technologies that primarily result in evolutionary improvements to the existing state of practice. **Open until June 22, 2017.**

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

University Small Grants Broad Agency Announcement

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

HM0210-14-BAA-0001 National Geospatial-Intelligence Agency Academic Research Program

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

reason. (National Security Decision Directive (NSDD) 189, National Policy on the Transfer of Scientific, Technical, and Engineering Information). NGA seeks proposals from eligible U.S. institutions for path-breaking GEOINT research in areas of potential interest to NGA, the DoD, and the Intelligence Community (IC). **Open to September 30, 2017.**

NOAA-NFA-NFAPO-2016-2004791 FY2016 to FY2017 NOAA Broad Agency Announcement
This notice is not a mechanism to fund existing NOAA awards. The purpose of this notice is to request applications for special projects and programs ***associated with NOAA's strategic plan and mission goals***, as well as to provide the general public with information and guidelines on how NOAA will select proposals and administer discretionary Federal assistance under this Broad Agency Announcement (BAA). **This BAA is a mechanism to encourage research, education and outreach, innovative projects, or sponsorships that are not addressed through our competitive discretionary programs**. Funding for activities described in this notice is contingent upon the availability of Fiscal Year 2016 and Fiscal Year 2017 appropriations. Applicants are hereby given notice that funds have not yet been appropriated for any activities described in this notice. Publication of this announcement does not oblige NOAA to review an application beyond an initial administrative review, or to award any specific project, or to obligate any available funds. **Open to September 30, 2017.**

NOAA-OAR-SG-2016-2004772 National Sea Grant College Program 2016-17 Special Projects
The purpose of this notice is to request proposals for special projects associated with the National Sea Grant College Program's (Sea Grant) strategic focus areas, and to provide the general public with information and guidelines on how Sea Grant will select proposals and administer Federal assistance under this announcement. This announcement is a mechanism to encourage research or other projects that are not normally funded through Sea Grant national competitions. This opportunity is open only to Sea Grant Programs. Section III of this announcement describes eligibility requirements in more detail. Funding has not yet been made available to support applications submitted to this Federal Funding Opportunity (FFO), but such funding may become available during the year. Section II.A. below describes individual competition announcements that will be used to announce when funding is available; any restrictions or requirements on such funding, such as matching funds; and other funding details. Awards will be made under this FFO only if funds have been announced as provided in this FFO. **Open to September 30, 2017.**

BAA-16-100-SOL-00002 Broad Agency Announcement (BAA) for the Advanced Development of Medical Countermeasures for Pandemic Influenza- BARDA
BARDA (full announcement) encourages the advanced research, development and acquisition of medical countermeasures such as vaccines, therapeutics, and diagnostics, as well as innovative approaches to meet the threat of Pandemic Influenza in support of the preparedness mission and priorities of the HHS Public Health Emergency Medical Countermeasures Enterprise (PHEMCE) articulated in the 2014 PHEMCE Implementation Plan. The Implementation Plan is located on the ASPR website: http://www.phe.gov/Preparedness/mcm/phemce/Documents/2014-phemce-sip.pdf The Pandemic and All Hazard Preparedness Act Pub. L. No. 109-417, 42 U.S.C. § 241 et seq. (PAHPA;

http://www.gpo.gov/fdsys/pkg/PLAW-109publ417/pdf/PLAW-109publ417.pdf) and The Pandemic and All Hazard Preparedness Reauthorization Act Pub. L. No. 113-5, (PAHPRA: http://www.gpo.gov/fdsys/pkg/PLAW-113publ5/pdf/PLAW-113publ5.pdf) authorizes BARDA to (i) conduct ongoing searches for, and support calls for, potential qualified countermeasures and qualified pandemic or epidemic products; (ii) direct and coordinate the countermeasure and product advanced research and development activities of the Department of Health and Human Services; (iii) establish strategic initiatives to accelerate countermeasure and product advanced research and development (which may include advanced research and development for purposes of fulfilling requirements under the Federal Food, Drug, and Cosmetic Act or section 351 of this Act) and innovation in such areas as the Secretary may identify as priority unmet need areas; and (iv) award contracts, grants, cooperative agreements, and enter into other transactions, for countermeasure and product advanced research and development. Development Area of Interest: The purpose of this BAA is to solicit proposals that focus on one or more of the following area of interest as listed below: Development Area of Interest; Personal Protective Equipment (Mask and Respirators) for Influenza Infection for All- Hazards; Full-Featured Continuous Ventilators for Influenza and All-Hazards; Influenza Test Systems and Diagnostic Tools; Influenza Therapeutics; Influenza Vaccines BARDA anticipates that research and development activities awarded from this Broad Agency Announcement (BAA) will serve to advance the knowledge and scientific understanding of candidates' to protect the civilian population of the United States against pandemic influenza and serve to advance candidate medical countermeasures towards licensure or approval by the Food and Drug Administration (FDA). **Open to Oct. 24, 2017.**

AFRL Research Collaboration Program

The objective of the AFRL Research Collaboration program is to enable collaborative research partnerships between AFRL and Academia and Industry in areas including but not limited to Materials and Manufacturing and Aerospace Sensors that engage a diverse pool of domestic businesses that employ scientists and engineers in technical areas required to develop critical war-fighting technologies for the nation's air, space and cyberspace forces through specific AFRL Core Technical Competencies (CTCs). **Open until December 20, 2017.**

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

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

development issues. Programs funded under this BAA include basic research, applied research, and advanced technology development that can improve human performance and Army readiness. The funding opportunity is divided into two sections- (1) Basic Research and (2) Applied Research and Advanced Technology Development. The four major topic areas of research interest include the following: (1) Training; (2) Leader Development; (3) Team and Inter-Organizational Performance in Complex Environments; and (4) Solider/Personnel Issues. Funding of research and development (R&D) within ARI areas of interest will be determined by funding constraints and priorities set during each budget cycle. **Open to February 5, 2018.**

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

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

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

The AFRL/RIEA branch performs Research and Development (R&D) across a broad area of Air Force Command, Control, Communications, Computers/Cyber, and Intelligence (C4I). All applicable "INTs" are investigated with emphasis on Ground Moving Target Indication (GMTI), Electronic Intelligence (ELINT), Signals Intelligence (SIGINT), Image Intelligence (IMINT), Non Traditional Intelligence, Surveillance and Reconnaissance (NTISR), and Measurement and Signature Intelligence (MASINT). The APEX Center is used to perform analysis for seedling efforts, provide baseline tool development for major programs, and to provide realistic operational systems/networks/databases for integration efforts. The APEX Center resources will be used by the Government to perform the necessary research, development, experimentation, demonstration, and conduct objective evaluations in support of emerging capabilities within the Processing and Exploitation (PEX) area. Software tools, data sets, metrics (Measures of Performance/Measures of Effectiveness), and analysis are needed for the Government to perform the vetting, maturing, and analysis of efforts related to PEX, e.g. Automatic Tracking, Activity Based Intelligence, Entity, Event & Relationship (EER) Extraction,

Association & Resolution (A&R), Analysis & Visualization (A&V), Social Network Analysis, Network Analytics, Pattern Discovery, Scalable Algorithms, and Novelty Detection. The AFRL APEX Center is the AFRL/RI gateway into the cross-directorate PCPAD-X (Planning & Direction, Collection, Processing & Exploitation, Analysis & Production, and Dissemination eXperimentation) initiative. **Open to FY 2018**.

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

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

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

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

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

** Fundamental Research BAA posted on 20 March 2015.** Potential applicants are strongly encouraged to review the BAA in its entirety. **Please note that ALL general correspondence for this BAA must be sent to HDTRA1-FRCWMD-A@dtra.mil. Thrust Area-specific correspondence must be sent to the applicable Thrust Area e-mail address listed in Section 7: Agency Contacts.** **Open to Sept. 30, 2019.**

BAA-RQKH-2015-0001 Methods and Technologies for Personalized Learning, Modeling and Assessment Air Force -- Research Lab

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

BAA-AFRL-RQKMA-2016-0007 Air Force Research Laboratory, Materials & Manufacturing Directorate, Functional Materials and Applications (AFRL/RXA) Two-Step Open BAA

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

Academic Research Funding Strategies, LLC (Page 1)

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

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- Facilities and Instrumentation - Assistance in identifying and competing for grants to fund facilities and instrumentation
- Training for Staff - Professional Development for research office and sponsored projects staff

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