Research Development & Grant Writing News

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Topics of Interest URLs

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BLUF: Write as if Your Reviewers were Generals

By Lucy Deckard, co-publisher

PIs working on grant proposals would do well to follow the guidance given to US Department of Defense (DoD) workers writing reports for their superiors: use BLUF—"Bottom Line Up Front"—style. At first glance, it would seem that military officers and proposal reviewers are very different audiences, but they have several things in common:

1. They have a lot of other things to read (other reports or other proposals), so they can't afford to spend a lot of time on one document.

2. They need to make a decision based on the information provided, and they'll grow impatient with text that doesn't seem strictly relevant to that decision.

3. They are often not experts in the specific topic of the document.

So how can a writer best deal with a reluctant, impatient, and often grumpy reader? Get to your point quickly. This is the philosophy behind BLUF. While this may seem obvious, if you take a look at most proposals, you'll find that PIs don't usually write in BLUF style. Instead, trained by years of writing for scholarly journals, PIs tend to take the build-from-the-bottom-up approach, first providing background, motivation, or evidence, and finally coming to the conclusion (i.e., the "bottom line"). As a result, readers must often wade through a lot of text before they come to the information they need in order to understand why the text is relevant. In many cases, the conclusion may be so buried, it's difficult for a non-expert reader to even identify.

The BLUF approach does several things. It makes it easy for the reader to identify the main point. It provides context for a number of different pieces of information or arguments that are made in support of the main point. And it grabs the attention of the reader since the bottom line is usually the key information the reader needs. Take, for example, the following paragraph, written in traditional journal article "build-from-the-bottom-up" style:

In 1990, Dr. Higgenbottom and colleagues found that when ewes give birth facing to the north, their lambs are more likely to have crossed eyes at birth (Higgenbottom et al., 1990). Similar findings were found in goats, pigs, and camels (Bloomfield et al., 2001; Cabris et al., 2003; Hoeford et al., 2003), with the exception that the findings were reversed in the southern hemisphere (Dunkin et al., 2015). In our work, we found that placing the ewes in a magnetic field each day in the 6 weeks before giving birth nullified this effect (Birtwistle, 2016). Separately, Popplewell and Crotchet found that when antelopes who were born in the northern hemisphere with crossed eyes spent over 6 months living in the southern hemisphere before reaching maturity, their symptoms decreased markedly (Popplewell et al., 2017). These observations provide strong evidence that in ungulates, the muscles that control eye movement are strongly affected by the the direction of the earth's magnetic field, particularly before maturity.

As a reader, by the time you got a few sentences into this paragraph, you were probably thinking, "Where the heck are they going with this?" Moreover, when you finally got to the conclusion, it was likely that you couldn't remember most of the evidence that was presented in support of this conclusion because you had no context for it. If you're a conscientious reviewer, it's not 2 am, and you don't have a stack of other proposals to read, you might go back and re-read this paragraph now that you know the point that these various bits of information are meant to support. However, it's not a good idea for a PI to depend on that lucky confluence of situations. Now look at the same paragraph, written in BLUF style:

> A number of observations provide strong evidence that in ungulates, the muscles that control the eye are strongly affected by the the direction of the earth's magnetic field, particularly before maturity. In 1990, Dr. Higgenbottom and colleagues found that when ewes give birth facing to the north, their lambs are more likely to have crossed eyes at birth (Higgenbottom et al., 1990). Similar findings were found in goats, pigs, and camels (Bloomfield et al., 2001; Cabris et al., 2003; Hoeford et al., 2003), with the exception that the findings were reversed in the southern hemisphere (Dunkin et al., 2015). In our work, we found that placing the ewes in magnetic field each day in the 6 weeks before giving birth nullified this effect (Birtwistle, 2016). Separately, Popplewell and Crotchet found that when antelopes who were born in the northern hemisphere with crossed eyes spent over 6 months living in the southern hemisphere before reaching maturity, their symptoms decreased markedly (Popplewell et al., 2017).

This paragraph could now be further improved by discussing the various pieces of supporting information in the context of your conclusion (which you can now do since you've communicated the bottom line at the top of the sentence). For example:

> A number of observations provide strong evidence that in ungulates, the muscles that control the eye are strongly affected by the direction of the earth's magnetic field, particularly before maturity. In 1990, Dr. Higgenbottom and colleagues found that when ewes give birth facing to the north, their lambs are more likely to have crossed eyes at birth (Higgenbottom et al., 1990). It is likely that when the ewes faced north, lambs in utero experienced a transverse magnetic field across their lateral rectus extraocular muscles, which caused them to contract, resulting in crossed eyes. Similar findings…

The BLUF approach applies not just to how you should structure your **paragraphs**, but also to how you should structure **each section** of your proposal, and how you should structure your **entire proposal**. Be sure to put the most important information about your proposed project, and your strongest arguments, in the first few paragraphs of your proposal narrative. Then the reviewer will be able to read the rest of the narrative in the context of these main points. Similarly, in each proposal section, put the most important points at the beginning (for example, the main conclusions from your preliminary results and their significance), and then follow with the details.

A critical step toward getting funded is making it easy for your reviewers understand your proposal. By using the BLUF approach, you'll make it easier for your (potentially tired and grumpy) reviewers to identify your main points and follow your arguments, even if they aren't experts in your topic.

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Preparing to Write Your Proposal

By Mike Cronan, co-publisher

This month many new faculty arriving on campus will confront for the first time the prospect of planning, developing, and writing a research proposal to a federal agency. They are hoping to secure early funding to support the research that will lay the foundation for successfully navigating the tenure and promotion process over the coming six years. This can be a daunting task to the uninitiated, and one that benefits greatly from the advice, insight, and guidance offered by more senior faculty who have successfully obtained research funding and by the guidance of research offices that support faculty in this critical endeavor.

Left alone to navigate the world of research grant funding, new faculty risk losing precious time before finally submitting a research grant and, more importantly, can make avoidable mistakes in writing the grant that results in a declined proposal. This, in turn, causes more time lost, often a full year or more, before a revised proposal can be resubmitted, or, if the reviews are harsh, the initial research idea dropped entirely or substantively revised and another put forward in an entirely new proposal.

However, the path to funding success can be significantly enhanced for new faculty if, at the beginning of their academic appointment, they receive some fundamental guidance on grant writing, particularly from research offices that can **outline the basic building blocks of any successfully proposal**. This guidance will help them (1) prepare to write the proposal, (2) write the proposal, (3) edit/rewrite the proposal, and (4) understand the proposal review process. These basic building blocks of a successful proposal are all well know and well understood by research offices, and the **task is then to communicate them to the new faculty** in the most effective way, perhaps by individual consultations or a workshop of a few hours that addresses these building blocks in an integrated way.

Of course, the core of any successful proposal is a compelling idea of interest to the funding agency. **That idea must be provided by the faculty member, and if it is absent, no amount of support from research offices or senior faculty will result in a funded grant**. However, if the core idea is a compelling one, then the **support of research offices and senior faculty can be a decisive factor in funding success**.

Once a compelling idea is "**proposal ready**," the process of developing a successful proposal can begin by **preparing to write the proposal**. You might think of this process as a staging phase where all the key information needed to submit a proposal is gathered and analyzed, **starting with the funding solicitation and any referenced documents**. The funding solicitation is always the backbone of any successful proposal effort. **Any proposal that does not respond fully to the solicitation will not be funded**. Moreover, as the applicant prepares to write, the funding solicitation will determine the organizational structure of the research narrative, present the goals and objectives of the funding agency to which he or she must respond, explain the review criteria the agency will use to make a funding determination, and provide other guidelines needed to submit a successful funding application/proposal.

However, while the funding solicitation is a detailed, specific, and **explicit document** guiding the preparation for writing a proposal, there are also **implicit requirements** for

preparing to write a successful proposal that will not be stated in the solicitation, or anywhere else by the agency for that matter, but yet are fundamental to funding success. These implicit requirements to funding success might be thought of as the overarching knowledge base that must guide how to read and analyze the funding solicitation, how to organize the proposal beyond what is required in the solicitation, how to integrate the agency goals and objectives with the research idea, and how to best address the program officers and reviewers that will determine your funding status.

It is here that the interplay of three key but nuanced factors critical to funding success come into play, specifically *the interplay of agency culture, mission, and research context*. For faculty new to grant writing, these factors are worthy of sufficient discussion with research offices to ensure that the role they play in a successful proposal is well understood and planned for before proposal writing begins. While the funding solicitation provides a checklist of key factors that must be considered prior to writing the proposal, for example, specific questions that must be answered in the research narrative, *no such checklist will appear in the solicitation related to addressing the interplay among agency culture, mission, and research context*.

Depending on the program, specific agency questions enumerated in the solicitation can be extensive and detailed or brief and general. But in most cases, questions will be stated clearly and ordered in the way the agency expects them to be addressed in the research narrative. Moreover, in all cases, a subset of key questions will be *common or generic across most agencies and programs*, requiring the applicant's thoughtful planning **before writing the proposal.** This planning should focus on how the project description will address the following with sufficient clarity to convince reviewers to recommend funding: **what** *do you propose to do;* **why** *do you propose to do it;* **how** *do you propose to do it; what is your* **rationale***; what is the* **significance** *of doing it; what is your* **capacity** *to do it based on prior results or preliminary data; what are your anticipated* **outcomes***, etc*.

However, for the foregoing to be addressed convincingly in the research narrative requires that the proposal author(s) and project principal investigators discuss and understand among themselves *prior to writing the proposal* (1) the arguments that will be made in the proposal's project description for the relationship of specific questions, such as those above, and (2) how the answers to those specific questions will be framed by an understanding of the agency's culture, mission, and research context.

For example, a *successful proposal must implicitly demonstrate an understanding of the agency's culture* when addressing questions such as those above or when responding to the agency's goals and objectives detailed in the solicitation. However, an agency's culture is not discussed directly in the funding solicitation, i.e., no section in the solicitation entitled "Agency Culture" characterizes the agency in that way; rather, it emerges as *an understanding that the author of the research narrative* brings to the solicitation *rather than gleaning it from within the solicitation*.

It is this knowledge of the agency culture that *senior faculty and research offices can impart to new faculty* seeking research funding in a way that can make them more competitive for funding success. For example, one of the most important agency cultures to understand for new and junior faculty is NSF. But what does agency culture actually mean? In one instance, it refers to overarching themes characterizing the agency that transcend directorates, divisions,

offices, programs, and solicitations and whose presence in the research narrative significantly enhances proposal success and whose absence likely results in a declined proposal.

In the instance of NSF, *agency culture can include agency-wide adherence to such guiding concepts as broader impacts, integration of research and education, convergence research, diversity in the scientific workforce, research at the frontiers of science, educational best practices, evidence-based outcomes, etc*. It is important that all investigators, and new investigators in particular, should understand these key terms of NSF culture in a nuanced and substantive way. It would be a grave mistake to dismiss them as agency slogans deserving only lip service, but otherwise irrelevant to the success or failure of a proposal.

Similarly, this will be the case—to varying degrees—when it comes to understanding the culture of other federal agencies from NIH to NASA to DOE to DARPA to USDA, etc. Moreover, *research offices are well positioned to point out to new faculty, or faculty new to a particular agency, that research agencies often have both an overarching culture and unique subcultures specific to office or program area*. For example, DOE spans 11 technical offices and the national labs. NIH spans some 21 institutes and six centers. Applicants need to keep in mind that understanding the overarching agency culture as well as the culture of a particular office or program within an agency *are both important to crafting a more competitive proposal*.

This is something the thousands of junior faculty who submitted CAREER proposals to NSF in July will have come to realize in terms of addressing the overarching, agency-wide NSF *cultural criteria* of Broader Impacts in one section of the proposal and addressing their research and career plan specific to an NSF directorate/division level in another section of the proposal. Those who best integrated the overarching cultural criteria of Broader Impacts with the research expectations at the division level in their CAREER proposals will be those most likely to receive funding notifications later this year or early next.

The *next building block of a successful proposal for new and junior faculty to understand is the specific agency mission*, as well as how that mission is both informed by and informs the agency culture. *The bottom line here is that all federal research agencies have a specific mission* that characterizes *the research they will fund* and, equally important, *the research they will not fund*. Those agencies that are part of the executive branch of government are referred to as "federal mission agencies," since they are under the purview of a cabinet secretary such as agriculture, defense, energy, education, etc. NSF and NIH, by contrast, are independent agencies.

The most important point for faculty to understand about mission agencies is that they *fund only research that advances the agency's mission-specific objectives*. No matter how great the research idea put forward, if it does not *bring value-added benefits to the agency mission, it will not be funded*. Mission agencies do not make awards in the same way the MacArthur Foundation awards "genius grants." The bottom line here is that if you are not sufficiently informed about the agency mission and the mission areas within an agency, *you will not be able to make the critical case in your research narrative that the research you propose will advance and impact the mission-critical objectives of the funding agency*.

Moreover, another important point for faculty to understand about the mission of federal research agencies is that some agencies fund primarily basic research, most notably NSF and NIH, and other agencies fund primarily applied research, and yet other agencies fund a mix

of basic and applied research, e.g., DOE, USDA, NOAA, NASA, etc. Additionally, depending on the culture of the particular agency or office within an agency, federal agencies may also incorporate workforce training and education at the undergraduate level as part of their mission in funded grants. For example, NOAA may fund educational components to research grants that help prepare students to enter the NOAA workforce in disciplines of importance to the NOAA mission.

Research offices can impart information such as the forgoing to new and junior faculty in both workshops and consultations. This information can help them jump start their understanding of a funding agency's culture and mission, including how they are intertwined, and thereby make the first proposals they write more competitive for funding.

Finally, specific to the *interplay of agency culture, mission and research context,* an understanding of your **research context** is critical to funding success. The bottom line here is that *proposals are recommended for funding or declined for funding largely on how well an applicant makes the argument in the research narrative that the research being proposed lies at the cutting edge of research being done in the field today*. If the proposed research is not at the cutting edge, then it will not meet the fundamental criterion of all research agencies that they allocate precious research funding to proposals that advance the state of the field, or as such agencies from NSF to DARPA often state, they fund "transformative research not incremental research."

However, stating clearly where the proposed research falls in terms of the current state of the field is *not a trivial undertaking.* It requires close attention to *make sure that the claimed significance of the proposed research and the capacity of that research to advance the state of the field in some important way is both convincing and supportable to program officers and reviewers*.

Moreover, this argument falls to the PI to make in the proposal. *Research offices can give new faculty a heads up as to the importance of research context addressed early in the project description, but it falls to the principal investigators when preparing to write a proposal to come to an understanding of how they will present their research in the context of the current state of the field*. After all, it is certain that many of the competitors for the research funding available for an agency-specific program will be peer researchers who are also making a case for the significance of their own research in the current context of the state of the field.

In conclusion, research offices can't solve all issues of culture, mission, and research context for new and junior faculty, but they can do them a major service by making them aware of the challenges they face in writing a successful proposal and of all research agencies' expectations that an understanding of their culture, mission, and research context must be woven into the fabric of the research narrative.

Writing Your Proposal

By Mike Cronan, co-publisher

The important first step in writing the proposal is to **decide who will write it**. In many cases, the PI is the principal author and coPIs or other senior research personnel may serve as contributing authors for various sections or subsections of the proposal. In other cases, particularly on larger team proposals that involve *transdisciplinarity, interdisciplinarity, and multidisciplinarity* to solve, as NSF notes, "vexing research problems, in particular, complex problems focusing on societal needs in a way that entails integrating knowledge, methods, and expertise from different disciplines and forming novel frameworks to catalyze scientific discovery and innovation," *several principal authors may be writing sections of the proposal addressing their particular contribution to the project*. Of course on small, single-PI proposals, authorship is a foregone conclusion.

One of the more challenging decisions to make on team grants is to determine who among the principal investigators/authors has **both** the technical and scientific knowledge and the integrative writing skills to revise and rewrite contributions from multiple authors. The writing must ensure that the overall proposal reads as the product of one author rather than a siloed collection of disassociated sections written by multiple authors. Moreover, as NSF and other federal agencies increasingly favor convergence research, writing a successful project description is becoming much more challenging, particularly in requiring planning and coordination among multiple authors to ensure a seamlessly integrated research narrative that clearly demonstrates the benefits of research synergy.

A next major step in writing the proposal is to decide **how to organize it**. Some federal *agencies strictly prescribe the organization of the proposal narrative*, while others do not. For example, the narrative structure of US DoED proposals is highly prescribed while many NSF proposals may simply reference the very general proposal sections suggested in the GPG (Grant Proposal Guide). Regardless, a common strategy for organizing the proposal is to use the funding solicitation as an organizational template or proposal outline. Section headings prescribed in the solicitation are listed in order to provide a first-draft template of the research narrative. , along with any specific questions related to those sections and to the goals and objectives of the project, as well as the review criteria that need to be addressed in the appropriate sections. This narrative outline will guide the writing of the project description in a way that makes it *fully responsive to the agency's guidelines and funding priorities*.

Another major consideration in proposal writing relates to writing the **proposal introduction** and its role in enhancing the competitiveness of the proposal. Understanding the function of the introduction is one of the most important lessons on writing successful proposals that can be imparted to new and junior faculty. A well crafted proposal introduction is key to a funded proposal. In many ways, it represents a condensed version of the entire proposal, particularly the essential information about the proposed research that program officers and reviewers must understand as they reach a funding decision.

It is in the **proposal introduction** that the applicant addresses in an abbreviated way the core questions that any proposal must address, as noted in the prior article, *Preparing to Write*

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Your Proposal: **what** *do you propose to do*; **why** *do you propose to do it*; **how** *do you propose to do it; what is your* **rationale***; what is the* **significance** *of doing it; what is your* **capacity** *to do it based on prior results or preliminary data; what are your anticipated* **outcomes***; etc*. Most likely, a reviewer's engagement with   a proposal will be determined after reading the proposal introduction. In fact, experienced reviewers consistently note that if the proposal does not capture the reviewer's interest and excitement in the project introduction, then the rest of the proposal may very well go unread.

Moreover, in writing a proposal's research narrative, junior faculty will want to learn many "***do's and don'ts***" that can make the difference between funding success and failure. First, of course, is the ***fact that a funded proposal must be written clearly and effectively***. Poor writing and poor organization frustrate reviewers and make it challenging for them to understand what is being proposed and why it is important. ***Most reviewers will not finish reading a poorly written and poorly organized proposal, and why should they***? Also, poor writing also includes errors in usage, mechanics, grammar, spelling, subject/verb agreement, etc.

Bottom line: reviewers will assume that a poorly written proposal with grammatical errors indicates sloppy research and a refusal to fund. Fortunately, many PIs benefit greatly from the services of a good editor who assists in drafting the proposal. Research office personnel often include an editor with experience editing in the specific disciplinary domain and with the agency to which the proposal is being submitted. An effective proposal editor will point out some of the common mistakes made in the writing of declined proposals as well as the characteristics of funded proposals.

For example, the most common error made in writing the research narrative, and the one ***most often cited by reviewers when declining to fund a proposal***, is the overabundance of generalized research statements and promises with a corresponding ***lack of research specifics and details***. This error amounts to an ***overemphasis on*** **what** ***will be done and little detail about*** **how** ***it will be done, along with*** a failure to explain the ***significance and impact*** of the proposed research in the **context** of the funding agency's mission priorities and the scientific field.

What is the takeaway here for research offices? There are many ways new and junior faculty can be assisted in preparing their proposals to significantly enhance their funding success by helping them avoid some of the more common pitfalls that, in aggregate, become the Achilles heel of declined proposals. Success in writing funded research proposals is a learned skill based on experience writing proposals and having a compelling idea. However, funding success can be significantly enhanced by training support from research offices and senior faculty mentors designed to show new and junior faculty what a competitive funded proposal should look like.

Editing, Revising, and Rewriting Your Proposal

By Mike Cronan, co-publisher

Funded proposals converge on perfection; unfunded proposals never converge. In grant writing, how well a proposal converges on perfection is often a function of how many drafts or iterations of the proposal have been edited, revised, and rewritten prior to the due date. (Here, think **numerous iterations**, not few!) Scheduling proposal drafts needs to be planned prior to writing the proposal to ensure that there is an orderly, stepwise process informing both the contributing authors who will revise and rewrite major drafts as well as those who will review, edit and comment at each of the many draft stages of the project description. Always keep in mind that being close to perfection is not good enough to ensure a funded proposal. As the old saying goes, "Close only counts in horseshoes and hand grenades."

The most common way to do this is to develop two tools at once: a *Schedule and Task Assignment Table* for the narrative draft, and a narrative organizational template of proposal sections and subsections based on the funding solicitation. Using these two tools, the proposal development team (1) agrees on the number of draft iterations the proposal likely will require, (2) assigns due dates to those drafts, (3) assigns authorship responsibly to those drafts, and (4) identifies reviewers that will edit and comment on each draft, which then becomes the next draft, a process that may often include at least several major drafts and more numerous fine-tuning drafts before a proposal is ready for submission.

This process of converging on perfection is important to proposals at any scale, from grants with one or a few principal investigators to grants at the large-team scale. But make no mistake about it—proposals are won or lost in the reviewing, editing, and revision trenches. The hard work of crafting a winning proposal takes place here. Moreover, it is here that research offices can play an important role in assisting faculty, particularly new and junior faculty, to put in place process of multiple reviews and edits of proposal drafts prior to submittals. Truth be told, faculty new to grant writing often are not aware of the strategic planning and proposal development processes employed by those successful at grant writing. Fortunately, research offices have participated in this process numerous times with faculty from numerous disciplines submitting proposals to numerous agencies. For this reason, they have very valuable insights to pass on to those new to grant writing.

It is critically important *that the first substantive reviews of a proposal be done not by program officers and reviewers at the funding agency but by research offices and others who can bring key perspectives to the review process and thereby enhance the competitiveness of the proposal prior to submission.* Many of the key perspectives on grant writing represent skill sets common to research offices developed over time through experience, creating essentially a research office corporate memory of grant writing best practices. For example, research offices can (1) transmit an understanding of the mission and culture of the funding agency, (2) offer experience working with other faculty on similar proposals submitted to the specific agency, (3) benefit faculty with their experience analyzing funding solicitations and review criteria and mapping them to the research narrative to ensure the proposal is fully responsive to the guidelines, (4) read, edit, and comment on proposal drafts, (5) transmit their experience

reading and responding to reviews of declined proposals as part of the resubmission process, etc.

Helping faculty plan a series of draft reviews of their proposals is an invaluable service research offices can extend to proposal authors. A key point to keep in mind here is that an in-depth technical review of the proposed research narrative by the co-PIs or disciplinary peers expert in the field is only one element of a successful review, edit, and comment on the proposal. The fundamental requirement of a well written and successful proposal is that reviewers and program officers find it accessible.

Agency reviewers and program officers can find a technically correct narrative unclear or otherwise inaccessible, or it may leave them with key questions unanswered, especially if it includes too much technical minutiae. Some proposals fail by virtue of reporting what will be done without describing how the research will be done, its rationale, and its significance and impact in the context of the agency mission and the current state of the disciplinary field. In fact, the most helpful reviews, edits, and comments on a research narrative come from scientifically literate or generally intelligent readers, without expertise in the disciplinary field. Fortunately, the bull pen for finding such reviewers from among faculty and research offices is a large one and offers many possibilities for various review configurations to best meet the needs of the specific proposal.

One of the most common errors faculty make in identifying reviewers for draft stages of their proposals prior to submittal is to provide a draft of the proposal for review minus the funding solicitation that explains the agency's goals, objectives, deliverables, review criteria, and other information that motivated the funding opportunity to begin with. A review and edit of a proposal untethered to the funding solicitation and guidelines is of minimal use at best. After all, reviewers commonly deny proposals for funding when they fail fully to respond to the funding solicitation. Faculty are wise to rely on peers and research offices to tell them how well a draft research narrative responds to the funding solicitation.

Finally, draft reviews benefit from an experienced editor able to correct errors in usage and grammar and revise poorly structured sentences. If a good editor finds your draft proposal difficult to understand, it may be that sections of the proposal are poorly written rather than that the editor is incapable of understanding the technical discussion. After all, none other than Einstein made the comment on science writing that "if you can't explain something simply then you probably don't understand it well enough." Words to keep in mind as you write the research narrative of your proposal.

Understand the Review Process
& How to Write to Your Reviewers

A successful proposal narrative, i.e., a funded proposal, can be characterized in several ways, not the least of which is the authors' understanding of (1) the proposal review process specific to the funding agency, (2) a research narrative that fully addresses both agency-wide review criteria (e.g., intellectual merit and broader impacts specific to NSF) and program-specific review criteria, and (3) the author(s) understanding of their audience and how to write to them. How well and how convincingly authors write to their small audience of reviewers and program officers determines whether their research will be recommended or declined for funding.

The review process itself can vary significantly from one agency to the next and from one program to the next. It may be conducted in an ad hoc fashion or by panel, or by other means, depending on agency and program. Reviewers may be comprised of other researchers and academics (a "peer review"); or they may consist only of the program officer or a group of personnel from the funding agency (an "internal review"); or they may combine peer and internal reviewers. Furthermore, reviews may be written independently and mailed or electronically transferred to the agency, or reviews may be conducted by a panel of reviewers who convene at the funding agency (often called a "panel review").

Reviewers may be experts in the applicant's field; they may be experts in related fields; or they may have little or no knowledge of the applicant's field but are in the applicant's discipline, e.g., in electrical engineering but not expert in grid security, or in computer science but not expert in parallel computing. Or reviewers may be neither in the applicant's discipline or field, something increasingly common in transdisciplinary and convergence research.

The most comprehensive information about the agency review process will come from visiting the agency website and talking with agency program officers as well as with colleagues who have served as reviewers for the agency, served as rotating program officers at the agency, or who have been well funded by the agency. Most agencies, particularly NSF and NIH, two of the principal funders of university-based research, have extensive information on their websites describing how proposals are reviewed and who reviews them.

For example, NIH posts information not only on the review process but also for those who will review NIH proposals (NIH Reviewer Orientation). This is invaluable information to writing a successful proposal. Knowing how NIH instructs reviewers to review a proposal and how to write and score a written critique of an application, as this document explains, will give the applicant much greater insight into writing a research narrative that enhances the quality of a proposal's responsiveness to the overall impact score and individual scores for (at least) five scored criteria.

NSF's merit review process is described in detail in Part I of the NSF Proposal & Award Policies & Procedures Guide (PAPPG), which helps an applicant prepare and submit proposals to NSF. Of course, the best advice for new and junior faculty is not only to study the review

process at the agency to which they will submit a proposal but to volunteer to serve as a reviewer at the agency. As NSF notes on the benefits of reviewing for the agency, "In addition to providing a great service to NSF and the science and engineering community, reviewers benefit from reviewing and serving on panels. For example, reviewers gain first hand knowledge of the peer review process; learn about common problems with proposals; discover strategies to write strong proposals; and, through serving on a panel, meet colleagues and NSF program officers managing programs related to your interests." Most agencies post information describing how to review proposals for the agency at the agency's website, or you can contact a program officer in your disciplinary domain for guidance.

Keep in mind that research proposals addressing convergence research or transdisciplinary research, or large-team proposals, or research proposals with educational and training activities required as part of the solicitation will be judged by a more diverse group of reviewers. Many or most of these reviewers will not be expert in an applicant's field or even familiar with that field. To prepare for this, keep in mind what NSF has often described as the common characteristic of a research narrative: it should be *written to the scientifically literate or intelligent reviewer, but not necessarily to an expert in the field*. In other instances, NSF has suggested writing a research narrative as if it were directed at the reader of an article in *Scientific American*.

Regardless, the key point here is that *one of the most important, fundamental decisions you will make in proposal writing is to correctly judge who your audience will be and to write with them* in mind For example, your narrative contribution to a proposal may address technical strategies for guarding the electrical grid against hackers and other malicious attacks, but others on your large proposal team may be addressing issues related to societal and economic benefits of grid security, education and training of the future grid security workforce, etc. The bottom line is that it is most likely that the review group will represent various key disciplines and fields with varied educational and training backgrounds. *The applicant, along with each team member, must write her narrative contribution in a way that will convince all reviewers to fund the proposal, not just those reviewers in the applicant's technical specialty*.

In the final analysis, *success at grant writing requires* <u>*knowing who your audience is and writing to that audience*</u> to convince them that what you propose is worthy of a positive funding recommendation.

Research Development & Grant Writing News

Reviewing the Reviewers
(Resubmitting Declined Proposals)

Reprinted from June 2012
By **Mike Cronan**, co-publisher

Decoding reviews of proposals not funded is familiar territory for anyone who writes proposals, or supports those who do. In some cases, reviewing the reviews may seem as challenging as decoding the Rosetta Stone, an ancient Egyptian granodiorite inscribed with a decree appearing in three different scripts, including two in Ancient Egyptian hieroglyphs and one in Ancient Greek. Peering intently into the reviews of your declined proposal may not be as perplexing as it was for archeologists attempting to decipher the Rosetta Stone, but at times it may seem that your reviews were written in ancient scripts nonetheless. While this Rosetta-like experience may not be the norm in understanding reviews, the process of correctly interpreting reviews is often one sufficiently infused with uncertainty to make the task of deciding whether or not to rewrite and resubmit a proposal a difficult one. However, keep in mind that reviews are secular and not divine documents, and so the various principles of author inerrancy that apply in the latter case will not apply in the former, to-wit, **reviewers can be wrong**, but be very cautious and thoughtful in coming to this conclusion.

You might begin by assuming that the quality of reviews resembles a bell curve, not unlike the quality of submitted proposals being distributed among the five common ranking points of poor, fair, good, very good, and excellent. In this case, i.e., where some reviewers do a good job and others, well, not so good, the author of a declined proposal, or those assisting the author in interpreting the reviews, must learn the somewhat imperfect art of "reviewing reviewers" and characterizing or assigning a value weighting scheme to the reviewers' comments, perhaps the same five-point value assignment used in ranking proposals.

In this process of characterizing reviews, don't assume a reviewer's credibility just because the review favors your proposal, nor should you assume a reviewer's blame when the review criticizes your proposal. In the former case, for example, you might be suspicious if the lone excellent review on a declined proposal is represented by little more elaboration than a check mark on "excellent" and a few brief and very general favorable statements. In the latter case, by contrast, seriously consider taking to heart the comments by a reviewer who rates your proposal as "poor" or "fair", but accompanies that sobering judgment with extensive comments that are thorough, insightful, and instructive. A review of "poor" by an excellent reviewer can be a gift, whereas an "excellent" review with no substantive elaboration is of little value on a declined proposal.

Of course, rating reviewers is not really about characterizing their performance, so you can either praise or grouse about them, although the latter can be an alluring thought at times. The real purpose is to help you better understand the weight to give reviewers' comments, essentially determining the credibility of each reviewer's comments as input to your decision whether or not to prepare a resubmission, as well as to identify the revisions that should be made to ensure a competitive resubmission.

Minimalist reviews, regardless of ranking or score given, can be problematic as input to revising and resubmitting a declined proposal for the next grant cycle, assuming one exists. Because they are brief and generally non-specific, minimalist reviews are ambiguous in many ways, leaving you to ponder whether or not the reviewer actually gave your proposal a close and thoughtful read, or, for some unknown reason, was not able or willing to offer more substantive comments on the strengths and weaknesses of your research narrative. Any reviewer-assigned ranking of your declined proposal, e.g., whether "fair" or "excellent," not accompanied by sufficient comment to justify the ranking will likely prove of little value in determining your revision and resubmission strategy.

By comparison, the "ideal reviewer" takes a sufficient interest in your research narrative to offer a thorough and knowledgeable explication of your proposal's weaknesses and strengths. The ideal reviewer will accompany a ranking or score with clear and specific details that address both the weaknesses and the strengths of your declined proposal. Ideal reviewers can offer valid roadmaps to help you revise and resubmit a more competitive research narrative. Fortunately, odds are favorable that out of perhaps five reviewers, at least one and likely more will at least approximate the ideal reviewer. Specificity, details, and rationale in reviews is just as important as they are in a successful research narrative.

The key to finding value in reviews given a declined proposal is to judge reviewers not on how well or how poorly they ranked your proposal so much as whether the reviewer has supported that ranking by sufficiently insightful, knowledgeable, and thorough comments clearly illuminating both the weaknesses and strengths of your proposal. In one way, your task is to judge the significance and relevance of the reviews of your proposal relative to preparing a competitive resubmission just as the reviewers will judge the significance and relevance of your proposed research to the funding agency mission.

But keep in mind that reviewing proposals is not a perfect process, and that reviewing the reviewers is just one way among many to discover the reasons for a declined proposal that will allow you to make an informed decision on how best to correct identified weaknesses and amplify identified strengths for a resubmission.

Of course the other key question in a resubmission relates to how much or extensively the original research narrative in a declined proposal needs to be revised based on reviews, among other factors. The hopeful response by the harried PI of a declined proposal might be "as little as possible." However, it may often be the case that *the entire proposal should be re-written for a resubmission*.

Several factors support this response, not the least of which is that integrating revisions of an old narrative with a new research narrative text written in response to review comments will be hampered by the structural rigidity of the logic, sequencing, and transitions of the original narrative. Moreover, it is likely that a year has passed between the submission of a declined proposal and the due date for a resubmission. During that intervening year, it is reasonable to assume that the PI has significantly advanced the original research from what was proposed a year ago, or more. It would not be a good competitive indicator should the research remain static over that period of time. In fact, given a year's time to advance the research, the PIs of a resubmission of a declined proposal should be much better and more competitive than at the time of the original submission—in effect, they should have become more mature researchers.

Given this, a comprehensive rethinking of the proposal may be in order for a resubmission. If that is the case, it will require a rethinking of the narrative structure to accurately reflect the research and the arguments, logic, and specificity used to persuasively describe it. Rather than end up with a revised research narrative that reads like a patchwork quilt or a proposal mimic of a Rube Goldberg device, optimize the competitiveness of your resubmission by starting anew from Word 1 to Word N and **write an entirely new research narrative for the resubmission** to ensure a seamless integration of all the new factors that have developed over the intervening year since the original submission, including the reviewer comments and, particularly, ***to reflect your significant growth as a researcher during that period.***

Research Grant Writing Web Resources
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Guide for the Submission of Unsolicited Proposals to DOE
The National Energy Technology Laboratory (NETL), Pittsburgh Office has operational responsibility of the DOE Unsolicited Proposal (USP) Program. All unsolicited proposals should be forwarded by Email to John N. Augustine at DOEUSP@NETL.DOE.GOV who will serve as the single point of contact for all Department of Energy (DOE) unsolicited proposals. Please direct all unsolicited proposals, abstracts and correspondence to:

> **John N. Augustine**, Mail Stop 921-107 Unsolicited Proposal Manager
> U.S. Department of Energy National Energy Technology Laboratory 626 Cochrans Mill Road P.O. Box 10940 Pittsburgh, PA 15236-0940
> Email: DOEUSP@NETL.DOE.GOV

The unsolicited proposal is another method used by the DOE to fund research and development. An "Unsolicited Proposal" is an application for support of an idea, method, or approach which is submitted by individuals, businesses, and organizations solely on the proposer's initiative, and not in response to a "formal" Government solicitation or announcement. Funding of unsolicited proposals is considered a noncompetitive action and DOE is under no obligation to fund a meritorious unsolicited proposal due to funding limitations or other program priorities.

An unsolicited proposal may be accepted by DOE if it:

- Demonstrates a unique and innovative concept, or demonstrates a unique capability of the submitter;
- Offers a concept or services not otherwise available to the Government;
- Does not resemble the substance of a recent, current or pending competitive solicitation/announcement; and,
- Is independently originated by the proposer without Government supervision.
- Must be limited to 25 pages not including appendices.

ARPA-E University: Winning Technical Pitches
Funding applications often require something shorter than a research paper, but more substantive than a business pitch—you need a technical pitch. ARPA-E Program Directors Dane Boysen and Ilan Gur share their five best practices and five deadly sins for writing technical proposals in this edition of ARPA-E University.

How to Write a Winning ARPA-E OPEN FOA Proposal
Howard Branz, Senior Research Associate, University of Colorado, Renewable and Sustainable Energy Institute (RASEI).

ARPA-E Frequently Asked Questions

Educational Grant Writing Web Resources
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Message from IES Director: Changes Are Coming to Research Competitions

The 2018 "proposal season" just ended and IES received over 900 applications. As many of you know, we instituted several changes in this year's RFAs. These changes were important but were mostly on the margin, since there was not enough time after I arrived at IES to make broader changes. In the next few months, IES will more systematically examine the existing RFAs with the goal of more extensive updates for next year. Each new Director at IES brings their own experience and expertise to the process, but we all build on the good work of the past.

I want to share some of our thinking about next steps. I will begin with what may seem like a digression about the What Works Clearinghouse, one of IES' most important products. We are in the midst of designing a rating system for work included in the WWC. While we are not changing WWC evidence standards, we are working on an additional system modeled on the well-known "LEED" green building certification system. Following LEED, we intend to award research in the WWC different "certification" levels, such as platinum, gold, or silver. We are still working out the dimensions of the ratings, but they will include things such as registration, cost-effectiveness analysis, and the measurement of long term outcomes. To achieve the highest rating, studies will have to meet these dimensions.

Here's the connection to the RFAs: one purpose of the proposed WWC rating system is to recognize and incentivize more work using what IES views as the most valuable dimensions of education research to support evidence-based decision making.

Our RFAs should emphasize the same dimensions. Clearly, not all aspects of the proposed certification process will fit with all types of research we fund, but, in general, more explicitly aligning WWC standards and the RFAs should create a more coherent and coordinated IES research agenda.

We moved in this direction this year by requiring registration of research designs and cost-effectiveness analysis, as appropriate. Our goal is to increase the pipeline of research that will eventually find its way into the WWC with more dimensions of high quality research. We will continue working on this synchronization over the coming year.

Simplification of RFAs

We also plan to simplify our RFAs. Presently, they all too often read like an accretion of planks and phrases, many of which were added to deal with a problem that we encountered 5 or 10 years ago. As a result, the RFAs have become overly complex and difficult to read.

We are vigorously pursuing a "plain language" initiative across all of IES, including our RFAs. Malcolm Gladwell's Revisionist History podcast devoted an episode to a particularly unpleasant event in the politics of science. The hero of the story is Bernadine Healy, the first woman to run the National Institutes of Health. While Healy demonstrated many admirable characteristics, her commitment to clear writing is central to the podcast. Healy summarized her approach to writing in simple, powerful guidance: "Strong verbs. Short sentences."

Research Development & Grant Writing News

Agency Research News

Dear Colleague Letter: Announcing a Core Program within the Division of Computing and Communication Foundations

The Directorate for Computer and Information Science and Engineering (CISE) is notifying members of the research community about the addition of a core program, called Foundations of Emerging Technologies (FET), within its Division of Computing and Communication Foundations (CCF). FET aims to enable radical innovations across all areas traditionally supported by CCF, through research in emerging computing and communication paradigms at the intersection of computing and biological systems, nanoscale science and engineering, quantum information science, and other nascent, yet promising, areas. The FET program welcomes research in the theory, algorithms, software, hardware, and architecture of such emerging computing and communication systems. A unique aspect of the FET program is that interdisciplinary collaborations between computer and information scientists and engineers as well as those in various other fields such as biology, chemistry, engineering, mathematics, and physics are highly encouraged, with the fundamental aim of pursuing foundational breakthroughs in computer and information science and engineering.

Dear Colleague Letter: Seeking Community Input for Topic Ideas for Emerging Frontiers in Research and Innovation (EFRI) Program

The purpose of this Dear Colleague Letter (DCL) is to invite the research community to submit suggestions for Topic Ideas to be considered for the FY 2020 Emerging Frontiers in Research and Innovation (EFRI) Program Solicitation. Suggestions for EFRI Topic Ideas are currently solicited and vetted every two years. Selected Topic(s) become the focus of research supported by the EFRI Program. Solicitations are announced annually for research proposals that fall under the specified Topic area(s).

This DCL is not a request for submission of a single research proposal idea; rather, it is designed to solicit submission of emerging topic areas of potentially transformative research and innovation. Candidate topic ideas, including a 500-word description, may be submitted at: https://www.surveymonkey.com/r/efritopicideasFY2020.
The deadline for topic idea submission is: **October 31, 2018.**
BACKGROUND

The EFRI Program aims to focus the engineering community on important emerging areas in a timely manner. EFRI evaluates, recommends, and funds interdisciplinary initiatives at the emerging frontiers of engineering research and innovation. These transformative opportunities may lead to: new research directions; new industries or capabilities that result in a leadership position for the country; and/or significant progress on a recognized national or societal need, or grand challenge. The EFRI Program is the signature activity of the Office of Emerging Frontiers and Multidisciplinary Activities (EFMA) in the Directorate for Engineering. EFRI invests in high-risk multidisciplinary opportunities with high-potential payoff. Its role is to support research areas that would not fit within the scope of an existing program. These frontier ideas cannot be pursued by one researcher or within one field of expertise. They are

"frontier" because they not only push the limits of knowledge of one field, but are actually at the convergence of multiple fields. The EFRI funding process is designed to both inspire and enable a group of researchers with diverse technical expertise to work together on a single frontier idea.

The EFRI Program continuously gathers information for use in deciding future research topic areas to support. This rolling process ensures input and feedback from the engineering community on promising upcoming research opportunities. Input comes from diverse sources including workshops, advisory committees, proposals and awards, technical meetings, and professional societies, as well as from individual engineering researchers. From this comprehensive input, the EFRI team identifies, evaluates, and prioritizes those frontier topics that best match EFRI criteria.

Through this DCL, the NSF EFRI team is providing a direct opportunity for the research community to offer input on potential topic ideas for FY 2020, by inviting the community to submit emerging frontier Topic Idea suggestions for consideration. **Submit Your Ideas at:** https://www.surveymonkey.com/r/efritopicideasFY2020.

Topic Idea submitters will be asked to provide: Name, E-mail address, Organization, Title of Proposed Topic, up to three Key Words, and a Description (maximum 500 words) that encompasses how the suggested topic meets EFRI topic criteria: transformative, addressing a national need or grand challenge, and with a leadership role for Engineering.

NOTE: Ideas you submit should provide forward-looking views and identify opportunities in emerging frontiers of research and innovation; topic ideas should not simply represent your own ongoing or planned research activities. Suggested topics should identify challenges or opportunities rather than solutions. Topics or areas of opportunity should be those that would be unlikely to be supported through existing NSF programs. In order to facilitate broader discussion of the submitted ideas, topic suggestions will not be kept confidential. NSF staff will review submitted candidate topic ideas in consultation with external experts. NSF plans to invite up to ten submitters to NSF for further discussions of their proposed topic. Those submitters selected will be notified in December 2018 and will be invited to come to NSF in early 2019. Inquiries may be directed to: Dr. Louise R. Howe or Dr. Sohi Rastegar at efritopicideas2020@nsf.gov.

Dear Colleague Letter: Non-Academic Research Internships for Graduate Students (INTERN) Supplemental Funding Opportunity

Fostering the growth of a globally competitive and diverse research workforce and advancing the scientific and innovation skills of the Nation is a strategic objective of the National Science Foundation (NSF). The Nation's global competitiveness depends critically on the readiness of the Nation's Science, Technology, Engineering and Mathematics (STEM) workforce and NSF seeks to continue to invest in programs that directly advance this workforce. As part of this effort, a supplemental funding opportunity is available in fiscal years FY 2019 and FY 2020 to provide support for non-academic research internships for graduate students to support career opportunities in any sector of the U.S. economy. NSF currently invests in a number of graduate student preparedness activities and has historically encouraged principal investigators (PIs) to include such activities in research proposals to NSF. This Dear Colleague Letter (DCL) describes

new funding opportunities at NSF to ensure graduate students are well prepared for the 21st-century STEM workforce.

With rapidly accelerating changes in technology-driven global and national economies, today's graduate students will have a wide choice of career paths to pursue over their professional lives. Graduate students have the potential to make important contributions in careers outside academia, in organizations including: startup businesses, small and large corporations, government agencies, and non-profit organizations. NSF's 2018 Science and Engineering Indicators report reveals 79 percent of master's level STEM graduates and 57 percent of doctoral degree holders work in industry or government. It is therefore important that graduate students supported by NSF grants be provided opportunities to develop skills that prepare them to be successful for a broad range of academic and non-academic career paths.

The PI of an active NSF award may request supplemental funding for one or more graduate students to gain knowledge, skills and experiences that will augment their preparation for a successful long-term career through an internship in a non-academic setting, including the following:

- For-profit industry laboratories or industry research and development groups;
- Start-up businesses, such as (but not limited to) those funded through the NSF's Small Business Innovation Research (SBIR) program and Small Business Technology Transfer (STTR) program;
- Government agencies (all levels) and National Laboratories;
- Policy think-tanks; and
- Non-profit organizations.

PIs are encouraged to discuss with the cognizant NSF program director activities that are synergistic with the project scope.

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

Exoplanet Science Strategy

The past decade has delivered remarkable discoveries in the study of exoplanets. Hand-in-hand with these advances, a theoretical understanding of the myriad of processes that dictate the formation and evolution of planets has matured, spurred on by the avalanche of unexpected discoveries. Appreciation of the factors that make a planet hospitable to life has grown in sophistication, as has understanding of the context for biosignatures, the remotely detectable aspects of a planet's atmosphere or surface that reveal the presence of life. Exoplanet Science Strategy highlights strategic priorities for large, coordinated efforts that will support the scientific goals of the broad exoplanet science community. This report outlines a strategic plan that will answer lingering questions through a combination of large, ambitious community-supported efforts and support for diverse, creative, community-driven investigator research.

Future Directions for the U.S. Geological Survey's Energy Resources Program

Reliable, affordable, and technically recoverable energy is central to the nation's economic and social vitality. The United States is both a major consumer of geologically based energy resources from around the world and - increasingly of late - a developer of its own energy resources. Understanding the national and global availability of those resources as well as the environmental impacts of their development is essential for strategic decision making related to the nation's energy mix. The U.S. Geological Survey Energy Resources Program is charged with providing unbiased and publicly available national- and regional-scale assessments of the location, quantity, and quality of geologically based energy resources and with undertaking research related to their development. At the request of the Energy Resources Program (ERP), this publication considers the nation's geologically based energy resource challenges in the context of current national and international energy outlooks. Future Directions for the U.S. Geological Survey's Energy Resources Program examines how ERP activities and products address those challenges and align with the needs federal and nonfederal consumers of ERP products. This study contains recommendations to develop ERP products over the next 10-15 years that will most effectively inform both USGS energy research priorities and the energy needs and priorities of the U.S. government.

Returning Individual Research Results to Participants: Guidance for a New Research Paradigm

When is it appropriate to return individual research results to participants? The immense interest in this question has been fostered by the growing movement toward greater transparency and participant engagement in the research enterprise. Yet, the risks of returning individual research results—such as results with unknown validity—and the associated burdens on the research enterprise are competing considerations. Returning Individual Research Results to Participants reviews the current evidence on the benefits, harms, and costs of returning individual research results, while also considering the ethical, social, operational, and regulatory aspects of the practice. This report includes 12 recommendations directed to various

stakeholders—investigators, sponsors, research institutions, institutional review boards (IRBs), regulators, and participants—and are designed to help (1) support decision making regarding the return of results on a study-by-study basis, (2) promote high-quality individual research results, (3) foster participant understanding of individual research results, and (4) revise and harmonize current regulations.

The Gulf Research Program Annual Report 2017

Each year, the Gulf Research Program (GRP) produces an annual report to summarize how funds were used. These reports review accomplishments, highlight activities, and, over time, will assess metrics to determine how the program is progressing in accomplishing its goals. The 2017 annual report is the fourth report in this series. The GRP is an independent, science-based program founded in 2013. Through grants, fellowships, and other activities, it seeks to enhance oil system safety and the protection of human health and the environment in the Gulf of Mexico region and other areas along the U.S. outer continental shelf with offshore oil and gas operations. This report captures key developments and successes in 2017. The GRP continues to build on its past work and seeks to learn, think about, and plan for how and where it can have the greatest cumulative and lasting impacts.

Graduate STEM Education for the 21st Century

The U.S. system of graduate education in science, technology, engineering, and mathematics (STEM) has served the nation and its science and engineering enterprise extremely well. Over the course of their education, graduate students become involved in advancing the frontiers of discovery, as well as in making significant contributions to the growth of the U.S. economy, its national security, and the health and well-being of its people. However, continuous, dramatic innovations in research methods and technologies, changes in the nature and availability of work, shifts in demographics, and expansions in the scope of occupations needing STEM expertise raise questions about how well the current STEM graduate education system is meeting the full array of 21st century needs. Indeed, recent surveys of employers and graduates and studies of graduate education suggest that many graduate programs do not adequately prepare students to translate their knowledge into impact in multiple careers.

Graduate STEM Education for the 21st Century examines the current state of U.S. graduate STEM education. This report explores how the system might best respond to ongoing developments in the conduct of research on evidence-based teaching practices and in the needs and interests of its students and the broader society it seeks to serve. This will be an essential resource for the primary stakeholders in the U.S. STEM enterprise, including federal and state policymakers, public and private funders, institutions of higher education, their administrators and faculty, leaders in business and industry, and the students the system is intended to educate.

Opportunities from the Integration of Simulation Science and Data Science: Proceedings of a Workshop

Convergence has been a key topic of discussion about the future of cyberinfrastructure for science and engineering research. Convergence refers both to the combined use of simulation and data-centric techniques in science and engineering research and the possibilities for a

single type of cyberinfrastructure to support both techniques. The National Academies of Science, Engineering, and Medicine convened a Workshop on Converging Simulation and Data-Driven Science on May 10, 2018, in Washington, D.C. The workshop featured speakers from universities, national laboratories, technology companies, and federal agencies who addressed the potential benefits and limitations of convergence as they relate to scientific needs, technological capabilities, funding structures, and system design requirements. This publication summarizes the presentations and discussions from the workshop.

Open Science by Design: Realizing a Vision for 21st Century Research
Openness and sharing of information are fundamental to the progress of science and to the effective functioning of the research enterprise. The advent of scientific journals in the 17th century helped power the Scientific Revolution by allowing researchers to communicate across time and space, using the technologies of that era to generate reliable knowledge more quickly and efficiently. Harnessing today's stunning, ongoing advances in information technologies, the global research enterprise and its stakeholders are moving toward a new open science ecosystem. Open science aims to ensure the free availability and usability of scholarly publications, the data that result from scholarly research, and the methodologies, including code or algorithms, that were used to generate those data.

Open Science by Design is aimed at overcoming barriers and moving toward open science as the default approach across the research enterprise. This report explores specific examples of open science and discusses a range of challenges, focusing on stakeholder perspectives. It is meant to provide guidance to the research enterprise and its stakeholders as they build strategies for achieving open science and take the next steps.

Research Development & Grant Writing News

New Funding Opportunities

Content Order
New Funding Posted Since August 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 August 15 Newsletter

Infrastructure Innovation for Biological Research (IIBR)
The Infrastructure Innovation for Biological Research (IIBR) solicitation supports new and innovative research in biological informatics, instrumentation and associated methods, as well as multidisciplinary approaches to these broad themes that address needs in basic biological research. These awards support pioneering approaches that develop de novo infrastructure, significantly redesign existing infrastructure, or apply existing infrastructure in novel ways. Activities must demonstrate the potential to advance or transform research in biology as supported by the Directorate for Biological Sciences at the National Science Foundation (https://nsf.gov/bio). **Proposals Accepting Anytime**.

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

Plant Biotic Interactions
The Plant Biotic Interactions (PBI) program supports research on the processes that mediate beneficial and antagonistic interactions between plants and their viral, bacterial, oomycete, fungal, plant, and invertebrate symbionts, pathogens and pests. This joint NSF/NIFA program supports projects focused on current and emerging model and non-model systems, and agriculturally relevant plants. The program's scope extends from fundamental mechanisms to

translational efforts, with the latter seeking to put into agricultural practice insights gained from basic research on the mechanisms that govern plant biotic interactions. Projects must be strongly justified in terms of fundamental biological processes and/or relevance to agriculture and may be purely fundamental or applied or include aspects of both perspectives. All types of symbiosis are appropriate, including commensalism, mutualism, parasitism, and host-pathogen interactions. Research may focus on the biology of the plant host, its pathogens, pests or symbionts, interactions among these, or on the function of plant-associated microbiomes. **Proposals Accepting Anytime**.

Humanities Connections National Endowment for the Humanities

The Humanities Connections program seeks to expand the role of the humanities in undergraduate education at two- and four-year institutions. Awards will support innovative curricular approaches that foster productive partnerships among humanities faculty and their counterparts in the social and natural sciences and in pre-service or professional programs (such as business, engineering, health sciences, law, computer science, and other technology-driven fields), in order to encourage and develop new integrative learning opportunities for students. Competitive applications will demonstrate that the proposed curricular projects address significant and compelling topics or issues in undergraduate education at the applicant institution(s); that these projects develop the intellectual skills and habits of mind cultivated by the humanities; and that faculty and students will benefit from meaningful collaborations in teaching and learning across disciplines as a result of the project. **Due October 17.**

DARPA Safe Documents SafeDocs

DARPA is soliciting innovative research proposals in the area of secure processing of untrusted electronic data. Proposed research should investigate innovative approaches that radically improve software's ability to recognize and safely reject invalid and maliciously crafted input data, while preserving essential functionality of legacy electronic data formats. Proposed research should build on an existing base of knowledge of electronic document, message, and streaming formats and the nature of security vulnerabilities associated with these formats. **Due October 19**.

NSF Graduate Research Fellowship Program (GRFP)

The purpose of the NSF Graduate Research Fellowship Program (GRFP) is to help ensure the vitality and diversity of the scientific and engineering workforce of the United States. The program recognizes and supports outstanding graduate students who are pursuing full-time research-based master's and doctoral degrees in science, technology, engineering, and mathematics (STEM) or in STEM education. The GRFP provides three years of support for the graduate education of individuals who have demonstrated their potential for significant research achievements in STEM or STEM education. NSF especially encourages women, members of underrepresented minority groups, persons with disabilities, veterans, and undergraduate seniors to apply. **Multiple due dates in October**.

DE-FOA-0001914 Scientific Infrastructure Support for Consolidated

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

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

- Track I: Research proposals: Each proposal must have at least one Principal Investigator (PI) or co-PI with expertise in formal methods and at least one with expertise in one or more of these fields: computer networks, cyber-human systems, distributed/operating systems, hybrid/dynamical systems, and machine learning. Proposals are expected to address the fundamental contributions to both formal methods and the respective field(s) and should include a proof of concept in the field along with a detailed evaluation plan that discusses intended scope of applicability, trade-offs, and limitations. All proposals are expected to contain a detailed collaboration plan that clearly highlights and justifies the complementary expertise of the PIs/co-PIs in the designated areas and describes the mechanisms for continuous bi-directional interaction. Projects are limited to $750,000 in total budget, with durations of up to four years.

- Track II: Transition to Practice (TTP) proposals: The objective of this track is to support the ongoing development of extensible and robust formal methods research prototypes/tools to facilitate usability and accessibility to a larger and more diverse community of users. These proposals are expected to support the development, implementation, and deployment of later-stage successful formal methods research and tools into operational environments in order to bridge the gap between research and practice. A TTP proposal must include a project plan that addresses major tasks and system development milestones as well as an evaluation plan for the working system. Proposals are expected to identify a target user community or organization that will serve as an early adopter of the technology. Collaborations with industry are strongly encouraged. Projects are limited to $100,000 in total budget, with durations of up to 18 months.

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

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

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

- [**SAMHSA FY 2017 Grant Announcements and Awards**](#)
- [**Open Solicitations from IARPA (Intelligence Advanced Research Projects Activity)**](#)
- [**Bureau of Educational and Cultural Affairs, Open Solicitations, DOS**](#)
- [**ARPA-E Funding Opportunity Exchange**](#)
- [**DOE Funding Opportunity Exchange**](#)
- [**NPS Broad Agency Announcements (BAAs)**](#)
- [**NIJ Current Funding Opportunities**](#)
- [**NIJ Forthcoming Funding Opportunities**](#)
- [**Engineering Information Foundation Grant Program**](#)
- [**Comprehensive List of Collaborative Funding Mechanisms, NORDP**](#)
- [**ARL Funding Opportunities — Open Broad Agency Announcements (BAA)**](#)

Research Development & Grant Writing News

- **NASA Open Solicitations**
- **CDMRP FY 2018 Funding Announcements**
- **DOE/EERE Funding Opportunity Exchange**
- **New Funding Opportunities at NIEHS (NIH)**
- **National Human Genome Research Institute Funding Opportunities**
- **Office of Naval Research Currently Active BAAs**
- **HRSA Health Professions Open Opportunities**
- **Foundation Center RFP Weekly Funding Bulletin**

Solicitations Remaining Open from Prior Issues of the Newsletter

Agriculture and Food Research Initiative - Sustainable Agricultural Systems

Applications to the FY 2018 Agriculture and Food Research Initiative - Sustainable Agricultural Systems (SAS) Request for Applications (RFA) must focus on approaches that promote transformational changes in the U.S. food and agriculture system within the next 25 years. NIFA seeks creative and visionary applications that take a systems approach, and that will significantly improve the supply of abundant, affordable, safe, nutritious, and accessible food, while providing sustainable opportunities for expansion of the bioeconomy through novel animal, crop, and forest products and supporting technologies. These approaches must demonstrate current and future social, behavioral, economic, health, and environmental impacts. Additionally, the outcomes of the work being proposed must result in societal benefits, including promotion of rural prosperity and enhancement of quality of life for those involved in food and agricultural value chains from production to utilization and consumption. See AFRI SAS RFA for details. Webinar: AFRI Sustainable Agricultural Systems (May 23) **Due October 10**.

Fiscal Year (FY) 2019 Department of Defense Multidisciplinary Research Program of the University Research Initiative

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 fields to ensure that it has early cognizance of new scientific knowledge. The FY 2019 MURI competition is for the topics listed below. Detailed descriptions of the topics and the Topic Chief for each can be found in Section II. I, entitled, "SPECIFIC MURI TOPICS," The detailed descriptions are intended

to provide the applicant 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. Innovative ideas addressing these research topics are highly encouraged. Proposals from a team of university investigators are warranted when the necessary expertise in addressing the multiple facets of the topics may reside in different universities, or in different departments in the same university. By supporting multidisciplinary teams, the program is complementary to other DoD basic research programs that support university research through single-investigator awards. Proposals shall name one Principal Investigator (PI) as the responsible technical point of contact. Similarly, one institution shall be the primary awardee for the purpose of award execution. The PI shall come from the primary institution. The relationship among participating institutions and their respective roles, as well as the apportionment of funds including sub-awards, if any, shall be described in both the proposal text and the budget. **Due October 16**.

Advanced Technological Education (ATE)
With an emphasis on two-year Institutions of Higher Education (IHEs), the Advanced Technological Education (ATE) program focuses on the education of technicians for the high-technology fields that drive our nation's economy. The program involves partnerships between academic institutions (grades 7-12, IHEs) and industry to promote improvement in the education of science and engineering technicians at the undergraduate and secondary institution school levels. The ATE program supports curriculum development; professional development of college faculty and secondary school teachers; career pathways; and other activities. The program invites research proposals that advance the knowledge base related to technician education. It is expected that projects will be faculty driven and that courses and programs credit bearing, although materials developed may also be used for incumbent worker education. **Due October 18.**

NOAA-NOS-NCCOS-2019-2005608, NOAA RESTORE Science Program
The purpose of this document is to advise the public that NOAA/NOS/NCCOS is soliciting applications for the NOAA RESTORE Science Program for projects of five years in duration with the option for a five year, non-competitive renewal award for high performing projects. This funding opportunity invites applications that propose to identify, track, understand, and/or predict trends and variability in the Gulf of Mexico's living coastal and marine resources and the processes driving them. Funding is contingent upon the availability of funds in the Gulf Coast Restoration Trust Fund. It is anticipated that final recommendations for funding under this Announcement will be made in June 2019, and that projects funded under this Announcement will have a September 1, 2019 start date. Total funding for this competition will be approximately $15 million over five years and approximately six projects may be funded. The minimum individual award amount is approximately $500,000 over five years (an average of $100,000 per year) and the maximum individual award amount is approximately $7.5 million over five years (an average of $1.5 million per year). An additional $15 million may be available for five year, non-competitive renewals for high performing projects. Electronic Access: The NOAA RESTORE Science Program website (http://restoreactscienceprogram.noaa.gov/) furnishes supplementary information. Full applications should be submitted through Grants.gov (http://www.grants.gov). **Due October 29**.

Research Development & Grant Writing News

NOAA-NOS-NCCOS-2019-2005608, NOAA RESTORE Science Program
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DARPA-RA-18-02 Young Faculty Award
The Defense Advanced Research Projects Agency (DARPA) Young Faculty Award (YFA) program aims to identify and engage rising stars in junior faculty positions in academia and equivalent positions at non-profit research institutions and expose them to Department of Defense (DoD) and National Security challenges and needs. In particular, this YFA will provide high-impact funding to elite researchers early in their careers to develop innovative new research directions in the context of enabling transformative DoD capabilities. The long-term goal of the program is to develop the next generation of scientists and engineers in the research community who will focus a significant portion of their future careers on DoD and National Security issues. DARPA is particularly interested in identifying outstanding researchers who have previously not been performers on DARPA programs, but the program is open to all qualified applicants with innovative research ideas. **Due November 13**.

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

Opportunity Announcement, which can be accessed on the EERE Exchange website - https://eere-exchange.energy.gov **Due Nov. 30**.

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

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

Open Solicitations and BAAs

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

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

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National Geospatial-Intelligence Agency Academic Research Program (NARP)

NGA welcomes all innovative ideas for path-breaking research that may advance the GEOINT mission. The NGA mission is to provide timely, relevant, and accurate geospatial intelligence (GEOINT) in support of national security objectives. GEOINT is the exploitation and analysis of imagery and geospatial information to describe, assess, and visually depict physical features and geographically referenced activities on the Earth. GEOINT consists of imagery, imagery intelligence, and geospatial information. NGA offers a variety of critical GEOINT products in support of U.S. national security objectives and Federal disaster relief, including aeronautical, geodesy, hydrographic, imagery, geospatial and topographical information. The NGA Academic Research Program (NARP) is focused on innovative, far-reaching basic and applied research in science, technology, engineering and mathematics having the potential to advance the GEOINT mission. The objective of the NARP is to support innovative, high-payoff research that provides

the basis for revolutionary progress in areas of science and technology affecting the needs and mission of NGA. This research also supports the National System for Geospatial Intelligence (NSG), which is the combination of technology, systems and organizations that gather, produce, distribute and consume geospatial data and information. This research is aimed at advancing GEOINT capabilities by improving analytical methods, enhancing and expanding systems capabilities, and leveraging resources for common NSG goals. The NARP also seeks to improve education in scientific, mathematics, and engineering skills necessary to advance GEOINT capabilities. It is NGA's intent to solicit fundamental research under this BAA. Fundamental research means basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from Industrial development, design, production, and product utilization, the results of which ordinarily are restricted for proprietary or national security reason. (National Security Decision Directive (NSDD) 189, National Policy on the Transfer of Scientific, Technical, and Engineering Information).NGA seeks proposals from eligible U.S. institutions for path-breaking GEOINT research in areas of potential interest to NGA, the DoD, and the Intelligence Community (IC). **Open to Dec. 31, 2018**.

[PAR-16-242 Bioengineering Research Grants (BRG) (R01) Department of Health and Human Services National Institutes of Health](#)
The purpose of this funding opportunity announcement is to encourage collaborations between the life and physical sciences that: 1) apply a multidisciplinary bioengineering approach to the solution of a biomedical problem; and 2) integrate, optimize, validate, translate or otherwise accelerate the adoption of promising tools, methods and techniques for a specific research or clinical problem in basic, translational, or clinical science and practice. An application may propose design-directed, developmental, discovery-driven, or hypothesis-driven research and is appropriate for small teams applying an integrative approach to increase our understanding of and solve problems in biological, clinical or translational science. **Open to May 9, 2019.**

[BAA-RQKD-2014-0001 Open Innovation and Collaboration Department of Defense Air Force -- Research Lab](#)
Open innovation is a methodology to capitalize on diverse, often non-traditional talents and insights, wherever they reside, to solve problems. Commercial industry has proven open innovation to be an effective and efficient mechanism to overcome seemingly impossible technology and/or new product barriers. AFRL has actively and successfully participated in collaborative open innovation efforts. While these experiences have demonstrated the power of open innovation in the research world, existing mechanisms do not allow AFRL to rapidly enter into contractual relationships to further refine or develop solutions that were identified. This BAA will capitalize on commercial industry experience in open innovation and the benefits already achieved by AFRL using this approach. This BAA will provide AFRL an acquisition tool with the flexibility to rapidly solicit proposals through Calls for Proposals and make awards to deliver innovative technical solutions to meet present and future compelling Air Force needs as ever-changing operational issues become known. The requirements, terms and specific deliverables of each Call for Proposals will vary depending on the nature of the challenge being addressed. It is anticipated that Call(s) for Proposals will address challenges in (or the

intersection between) such as the following technology areas: Materials: - Exploiting material properties to meet unique needs - Material analysis, concept / prototype development, and scale up Manufacturing Processes that enable affordable design, production and sustainment operations Aerospace systems: - Vehicle design, control, and coordinated autonomous and/or manned operations - Power and propulsion to enable next generation systems Human Effectiveness: - Methods and techniques to enhance human performance and resiliency in challenging environments - Man – Machine teaming and coordinated activities Sensors and Sensing Systems: - Sensor and sensing system concept development, design, integration and prototyping - Data integration and exploitation. **Open to July 12, 2019.**

[HDTRA1-14-24-FRCWMD-BAA Fundamental Research to Counter Weapons of Mass Destruction](#)
** Fundamental Research BAA posted on 20 March 2015.** Potential applicants are strongly encouraged to review the BAA in its entirety. **Please note that ALL general correspondence for this BAA must be sent to HDTRA1-FRCWMD-A@dtra.mil. Thrust Area-specific correspondence must be sent to the applicable Thrust Area e-mail address listed in Section 7: Agency Contacts.** **Open to Sept. 30, 2019.**

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

[BAA-AFRL-RQKMA-2016-0007 Air Force Research Laboratory, Materials & Manufacturing Directorate, Functional Materials and Applications (AFRL/RXA) Two-Step Open BAA](#)
Air Force Research Laboratory, Materials & Manufacturing Directorate is soliciting White Papers and potentially technical and cost proposals under this two-step Broad Agency Announcement (BAA) that is open for a period of five (5) years. Functional Materials technologies that are of interest to the Air Force range from materials and scientific discovery through technology development and transition, and support the needs of the Functional Materials and Applications mission. Descriptors of Materials and Manufacturing Directorate technology

interests are presented in the context of functional materials core technical competencies and applications. Applicable NAICS codes are 541711 and 541712. **Open to April 20, 2021.**

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

FA9453-17-S-0005 Research Options for Space Enterprise Technologies (ROSET)
The Air Force Research Laboratory (AFRL) Space Vehicle Directorate (RV) is interested in receiving proposals from all offerors to advance state of the art technology and scientific knowledge supporting all aspects of space systems including payload adapters, on-orbit systems, communications links, ground systems, and user equipment. Efforts will include basic and advanced research, advanced component and technology development, prototyping, and system development and demonstration and will span the range from concept and laboratory experimentation to testing/demonstration in a relevant environment. Specific tasks include design, development, analysis, fabrication, integration, characterization, testing/experimentation, and demonstration of hardware and software products. **Open to September 22, 2022.**

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

[W911NF-18-S-0005 U.S. Army Research Institute for the Behavioral and Social Sciences Broad Agency Announcement for Basic, Applied, and Advanced Research (Fiscal Years 2018-2023)](#)

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

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

[FA8650-17-S-6001 Science and Technology for Autonomous Teammates (STAT)](#)

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

impact of integration of autonomous systems into the mission space will enable the Air Force to operate inside of the enemy's decision loop.

STAT will develop and apply autonomy technologies to enhance the full mission cycle, including mission planning, mission execution, and post-mission analysis. Particular areas of interest include multi-domain command and control, manned-unmanned teaming, and information analytics. The technology demonstrations that result from this BAA will substantially improve the Air Force's capability to conduct missions in a variety of environments while minimizing the risks to Airmen. The overall impact of integration of autonomous systems into the mission space will enable the Air Force to operate inside of the enemy's decision loop. This effort plans to demonstrate modular, transferable, open system architectures, and deliver autonomy technologies applicable to a spectrum of multi-domain applications. Development efforts will mature a set of technologies that enable airmen to plan, command, control, and execute missions with manageable workloads. The software algorithms and supporting architectures shall:• Ingest and understand mission taskings and commander's intent• Respond appropriately to human direction and orders• Respond intelligently to dynamic threats and unplanned eventsChosen technologies will be open, reusable, adaptable, platform agnostic, secure, credible, affordable, enduring, and able to be integrated into autonomous systems. The program will be comprised of various technologies developed by AFRL and Industry, integrated into technology demonstrations and deliverables with all the necessary software, hardware, and documentation to support AFRL-owned modeling and simulation environments for future capability developments. Thus, all technology development efforts must adhere to interface designs and standards. **Open to July 23, 2023**.

Changes at Academic Research Funding Strategies
By Lucy Deckard
(Back to Page 1)

Expanded Editing Services

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

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

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

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

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

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

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

Research Development & Grant Writing News

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What We Do--

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

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

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

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

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

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

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

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

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

Workshops by Academic Research Funding Strategies

We offer workshops on research development and grant writing for faculty and research professionals based on all published articles.

(View Index of Articles)