Research Development & Grant Writing News

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!! Pilot Error!!

The July issue of the newsletter had an error in the internal hotlinks from the Table of Contents. Clicking on "*Topics of Interest URLs*" jumped to "*Topics In Brief.*" It is now fixed for this issue. Best regards, Mike Cronan, co-Publisher.

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Katherine E. Kelly, PhD: Editing in the Humanities

About the co-publishers

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

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webinar.sciencemag.org

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Mapping Proposals to Agricultural Research Priorities

By Mike Cronan, co-publisher
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Hockey great Wayne Gretzky's iconic insight "*A good hockey player plays where the puck is. A great hockey player plays where the puck is going to be*" offers an excellent reason for faculty and research offices in agricultural sciences and engineering, as well as related scientific disciplines, to review the new 159-page report Science Breakthroughs to Advance Food and Agricultural Research by 2030 (free pdf download) by the National Academies of Sciences, Engineering, and Medicine (NASEM, 2018). The report, supported by USDA/NIFA, NSF, and the Department of Energy, looks at the new directions of agricultural research over the next decade. In short, it gives an insight into where the "***agricultural research puck***" is going to be by 2030, and the path it likely will take to get there.

Moreover, don't be deterred by the length of this report (159 pages). It is very readable using a "*skim and drill down*" approach: first skim for information relevant to your particular needs, and then drill down when needed for more details. The nine major sections of the report address: ***crops, animal agriculture, food science and technology, soils, water-use efficiency and production, data, a systems approach, and a strategy for 2030***. Within each section, each topic is addressed as follows: ***Introduction, Challenges, Scientific Opportunities, Barriers to Success, Recommendations, and References***. This makes it ideal for the "skim and drill" approach to obtaining the information you need and skipping the information you don't.

Overall, this report is chock-a-block with important information needed to become more competitive for funding in the agricultural sciences in the coming decade. As NASEM notes, the report (emphasis added) "identifies the most promising scientific breakthroughs that are possible to achieve in the next decade to increase the U.S. food and agriculture system's ***sustainability, competitiveness, and resilience***. The urgent progress needed today, given challenges such as water scarcity, increased weather variability, floods, and droughts, requires a ***convergent research*** *approach that harnesses advances in data science, materials science, information technology, behavioral sciences, economics, and many other fields*."

As an aside, it is noteworthy that the report also adopts the language of "**convergence research**" as an underlying strategic research direction, much like NSF now does in many of the agency's new solicitations, for example: Dear Colleague Letter: Growing Convergence Research. In this DCL, NSF identifies Convergence Research as having two primary characteristics:

- **"Research driven by a specific and compelling problem.** Research requiring a convergence paradigm is generally inspired by the need to address a specific challenge or opportunity, whether it arises from deep scientific questions or pressing societal needs.

- **"Deep integration across disciplines.** As experts from different disciplines pursue common research challenges, their knowledge, theories, methods, data, research communities and languages become increasingly intermingled or integrated. New frameworks, paradigms or disciplines can form from sustained interactions across multiple communities."

The take away here, especially for research offices, is that a ***deeper and more nuanced understanding of the characteristics of convergence research will be important in assisting faculty to write grants to federal research agencies that increasingly describe their research goals and objectives in the context of convergence research***. This resembles NSF's introduction of the concept of "broader impacts" into the solicitation process along with the review criteria to be addressed successfully to receive funding. Then, as now with convergence research, a robust understanding of the term and how it fits into a well-crafted and successful project narrative is one of many factors that will play a key role in successful attempts at funding. As another example of a USDA and NSF convergence related research area, see **Dear Colleague Letter: Planning for New Signals in the Soils (SitS)-Themed NSF Industry/University Cooperative Research Centers (IUCRCs)**.

Moreover, for faculty and research offices ***engaged in strategic research planning***, the five breakthrough opportunities identified in the report ***that take advantage of a convergent approach to research challenges*** and dramatically increase the capabilities of food and agricultural science are quoted below. The report contains recommendations for a range of federal agencies, as well as federal and private funders and researchers. Importantly, each of the nine major sections of the report contains a discussion of research opportunities in that particular agricultural domain, e.g., crops, animal agriculture, food science and technology, soils, water-use efficiency and production, data, systems, etc. The cited breakthrough areas are (emphasis added throughout):

1. **"A systems approach to understand the nature of interactions among the different elements of the food and agricultural system can be leveraged to increase overall system efficiency, resilience, and sustainability.** Progress is only able to occur when the scientific community begins to more methodically integrate science, technology, human behavior, economics, policy, and regulations into biophysical and empirical models. *Transdisciplinary science and systems approaches* should be prioritized to solve agriculture's most vexing problems. . . . Enticing and enabling researchers from disparate disciplines to work effectively together on food and agricultural issues will require incentives in support of the collaboration.

2. **"The development and validation of highly sensitive, field-deployable sensors and biosensors will enable rapid detection and monitoring capabilities across various food and agricultural disciplines.** Sensing technology has been used widely in food and agriculture to provide point measurements for a characteristic of interest, such as temperature, but the ability to continuously monitor several characteristics at once is the key to understanding both what is happening in the target system and how it is occurring. *An initiative should be created to more effectively develop and employ sensing technologies across all areas of food and agriculture*. For example, soil and crop sensors could provide a continuous data feed and alert a farmer when moisture content falls below a critical level to initiate site-specific irrigation to a group of plants, eliminating the need to irrigate an entire field.

3. **"The application and integration of data sciences, software tools, and systems models will enable advanced analytics for managing the food and agricultural system.** The

food and agricultural system collects an enormous amount of data, but has not had the right tools to use it effectively, as data generated in research laboratories and in the field have been maintained in an unconnected manner. . . . ***The ability to more quickly collect, analyze, store, share, and integrate heterogeneous datasets*** will vastly improve understanding of the complex problems, and ultimately, lead to the widespread use of near-real-time, data-driven management approaches.

4. **"The ability to carry out routine gene editing of agriculturally important organisms will allow for precise and rapid improvement of traits important for productivity and quality.** Gene editing is poised to accelerate breeding to generate traits in plants, microbes, and animals that improve efficiency, resilience, and sustainability. . . . ***This capability opens the door to domesticating new crops and soil microbes, developing disease-resistant plants and livestock, controlling organisms' response to stress, and mining biodiversity for useful genes***. Furthermore, crops could be effectively modified for enhanced taste and nutritional value.

5. **"Understanding the relevance of the microbiome to agriculture and harnessing this knowledge will improve crop production, transform feed efficiency, and increase resilience to stress and disease.** Research on the human microbiome demonstrates the effect of resident microbes on the body's health; however, a detailed understanding of the microbiomes in agriculture is markedly more rudimentary. ***A transdisciplinary research effort focused on the various agriculturally relevant microbiomes and the complex interactions between them would help modify and improve numerous aspects of the food and agricultural continuum***. For example, understanding the microbiome in animals could help to more precisely tailor nutrient rations and increase feed efficiency."

In conclusion, key elements in this report will contribute significantly to enhancing the long-term strategic planning of faculty and research offices for funding success in the agricultural and related sciences. Moreover, success in transdisciplinary/ convergence research opportunities often requires support from research offices on everything from identifying possible convergence team members to reviewing and editing a proposal for how well it maps to the funding solicitation, including expectations by the funding agency that convergence research plays a major role in research activities.

Funding for Advanced Building Technologies Research: NSF and DOE

By Lucy Deckard, co-publisher

There's a lot of interest in conducting research on various aspects of designing and constructing novel buildings and building systems. Innovations include new kinds of energy saving strategies, smart buildings, and buildings that are more resilient to disasters. Pursuing funding to support this kind of research can be tricky for several reasons. First, advanced building technologies encompass a wide range of disciplines, but many funding programs are organized by discipline, so it can be challenging to figure out where your project fits within an agency like the National Science Foundation (NSF). Second, this kind of research ranges from fundamental to extremely applied. Different funders target different points on the fundamental vs. applied spectrum, so it's critical to understand where on that spectrum your project fits and to find the right match with funding agency and program. (This fundamental vs. applied research challenge also applies to a lot of other engineering research topics.) Below, we'll discuss several programs that fund advanced building technologies research at NSF and the Department of Energy (DOE), with a focus on where they fit within this fundamental vs. applied spectrum.

NSF CMMI Funding

NSF has two programs within the Division of Civil, Mechanical and Manufacturing Innovation (CMMI) that explicitly focus on advanced building systems, among other things. These are the **Engineering for Civil Infrastructure** (ECI) program, and the **Civil Infrastructure Systems** (CIS) program. While the names of these programs are very similar, it's important to remember that, just as nature abhors a vacuum, funding programs abhor an overlap. This means that programs that on their face might seem to support the same kinds of projects actually have staked out separate territories of topics they wish to fund. As a PI, it's important that you understand the distinctions between these programs so that you can determine where your research project will best fit. We'll describe each program below.

NSF Engineering for Civil Infrastructure (ECI)

ECI is a result of a recent reorganization, in which CMMI combined the *Engineering for Natural Hazard (ENH)*, *Geotechnical Engineering and Materials*, and *Structural and Architectural Engineering and Materials (SAEM)* programs into the *Engineering for Civil Infrastructure (ECI)* Program. (See the Dear Colleague Letter.) For this program, which is part of the *Resilient and Sustainable Infrastructures* cluster within CMMI, NSF is encouraging proposals for "research driven by radical rethinking of traditional civil infrastructure in response to emerging technological innovations, changing population demographics, and evolving societal needs is encouraged." By "civil infrastructure," the ECI program means physical infrastructure, including the soil-foundation-structure-envelope-nonstructural building system; geostructures; and underground facilities. An underlying theme of this program is a focus on **resilience** to hazards and sustainability. Below are excerpts from their program description (you can find the full description on their program page, and you can find a list of funded projects here), bold ours:

The Engineering for Civil Infrastructure (ECI) program supports fundamental research that will shape the future of our nation's constructed civil infrastructure, subjected to and interacting with the natural environment, to meet the needs of humans. ...The ECI program focuses on the It seeks proposals that advance knowledge and methodologies within geotechnical, structural, architectural, materials, coastal, and construction engineering, especially that include collaboration with researchers from other fields, including, for example, biomimetics, bioinspired design, advanced computation, data science, materials science, additive manufacturing, robotics, and control theory. Research may explore holistic building systems that view construction, geotechnical, structural, and architectural design as an integrated system; adaptive building envelope systems; nonconventional building materials; breakthroughs in remediated geological materials; and transformational construction processes. **Principal investigators are encouraged to consider civil infrastructure subjected to and interacting with the natural environment under "normal" operating conditions; intermediate stress conditions (such as deterioration, and severe locational and climate conditions); and extreme single or multi natural hazard events (including earthquakes, windstorms, tsunamis, storm surges, sinkholes, subsidence, and landslides).** Principal investigators are expected to bear in mind broader impacts associated with, for example, economic, environmental, habitant comfort, and societal benefits, which may include implications for resource and energy efficiency, life cycle, adaptability and resilience, and reduced dependence on municipal services and utilities.

One way that many programs seek to clarify the boundaries of their topic "territory" is to describe in their program description not just what topics they are interested in funding, but what they will **not** fund. As a PI, it's important to take note of these descriptions. In the ECI program description, they state:

The ECI Program **does not support research on mission agency responsibilities**, such as nuclear power plants and energy-related infrastructure, transportation infrastructure (e.g., bridges and pavements), and natural resource exploration or recovery. The **ECI Program also does not support research on: hazard characterization for and hazard mitigation of the impact of explosions, fire, blast loading, flooding, and solar wind and storms on civil infrastructure; sensor and measurement technologies; field instrumentation and monitoring; induced seismicity; and construction safety.**

Interestingly, NSF recently issued a Dear Colleague Letter stating that ECI invites EAGER proposals "to investigate wholly new materials and radical changes in the design of conventional materials, through the adaptation and integration of advanced technologies, to enable *high performance buildings (structural systems, foundation systems, and building envelopes)*." This Dear Colleague Letter, entitled "**Discoveries to Revolutionize Engineering and Architectural Materials for Buildings (DREAM-B)**," goes on to say that engineers should envision materials that will allow buildings to adapt to extreme loadings and environmental stresses. Often, Dear Colleague Letters of this type are a harbinger of a solicitation that will eventually be issued once money has been budgeted to support it, so teams that use an EAGER grant to generate preliminary data will be well positioned for such an opportunity, should it materialize (no pun intended). Remember that you must get the OK from the Program Officer before submitting an EAGER.

NSF Civil Infrastructure Systems (CIS)

CIS, which is in the *Operations and Design* cluster "supports fundamental and innovative research in the design, operation and management of civil infrastructure that contributes to creating smart, sustainable and resilient communities at local, national and international scales." At first reading, this sounds very similar to ECI, but upon further reading of the program description and looking at the projects awarded, the underlying theme of a **system-level focus** becomes clear. Below are excerpts from the program description (bold ours):

> This program focuses on civil infrastructure **as a system** in which interactions between spatially- and functionally- distributed components and intersystem connections exist. All critical civil infrastructure systems are of interest, including transportation, power, water, pipelines and others. The CIS program encourages potentially disruptive ideas that will open new frontiers and significantly broaden and transform relevant research communities. The program particularly welcomes research that addresses novel **system** and service design, **system** integration, big data analytics, and **socio-technological-infrastructure connections**. The program values diverse theoretical, scientific, mathematical, or computational contributions from a broad set of disciplines.

As with ECI, the CIS program description also attempts to make territorial boundaries clear by describing what they will **not** fund:

> While component-level, subject-matter knowledge may be crucial in many research efforts, the program **does not support research with a primary contribution pertaining to individual infrastructure components** such as materials, sensor technology, extreme event analysis, human factors, climate modeling, structural, geotechnical, hydrologic or environmental engineering.

To get a more nuanced understanding of the types of projects that CIS funds, check out the funding database for CIS (the link is also at the bottom of the program page). Note that for both of these programs, buildings are just one type of infrastructure that they're interested in.

Other NSF Programs

There are, of course many other NSF programs that focus on other topics, but where advanced building technology could play a role or could be impacted. These could range from programs that focus on the fundamentals of heat transfer to programs focused on interactions between humans, disasters and the built environment. However, if you decide to submit to one of these programs, be sure you frame your project goals and research questions or hypotheses so that they fit squarely into the interests of those programs.

As you work to figure out where your project might fit within NSF, read the program descriptions and look at the projects awarded out of each program, but ultimately, be sure to talk the the program officer(s) of the program(s) you're considering. In the end, they will be the ones who decide whether your project fits their program.

DOE EERE Building Technologies Office

DOE has an entire office devoted to advanced building technologies in the Office of Energy Efficiency and Renewable Energy (EERE), appropriately named the *Building Technologies Office (BTO)*. Remember, however, that since DOE is a mission agency focused specifically on energy, all of its building technologies programs are focused on aspects of *energy efficiency*. In support

of its goal to "reduce the energy use intensity of U.S. buildings by 30% by 2030," BTO has 6 subprograms: 1) HVAC, Water Heating, and Appliances; 2) Windows and Building Envelope; 3) Solid-State Lighting; 4) Building Energy Modeling; 5) Sensors and Controls R&D; and 6) Buildings-to-Grid Integration. In April, the office announced competitions for two grant programs: Building Energy Efficiency Frontiers and Innovation (BENEFIT, which had 6 topic areas) and Solid-State Lighting Technology R&D. To find active BTO funding opportunities, go to the EERE Funding Opportunity Exchange website, and select "Buildings" in the "Program" column.

If you're considering pursuing funding from BTO, it's important to keep in mind that DOE's culture is very different from NSF's culture, and as a result, the approach you need to take is very different. We've written extensively in previous articles about the differences between mission agencies and basic research agencies, so we won't repeat that discussion here, but we will discuss the implications in the context of NSF and DOE below.

DOE ARPA-E

Another part of DOE—the Advance Research Projects Agency – Energy (ARPA-E)—also funds advanced building technologies research related to energy, among other energy-related topics. However, ARPA-E's culture is very different from EERE's culture. Modeled after the Defense Advanced Research Projects Agency (DARPA), ARPA-E focuses on potentially transformative projects. ARPA-E programs that focus on building efficiency include Delivering Efficient Local Thermal Amenities (DELTA) and Innovative Development in Energy-Related Applied Science (IDEAS).

DOE vs. NSF

The Basic vs. Applied Spectrum

As we mentioned briefly above, different funders are interested in supporting projects at different points on the basic vs. applied spectrum, and that's a key point when comparing DOE EERE and NSF. NSF supports fundamental research, **not development**. This means that even for the NSF programs discussed above, there must be fundamental scientific questions, challenges, or hypotheses that the PI proposes to explore. If the project simply entails applying existing tools and methods to develop a new application or system, even if that includes evaluating how well the system performs, such a project will likely be seen as development and, therefore, not appropriate for NSF.

In contrast, EERE programs are typically much closer to the applied part of the spectrum. An essential part of their mission is not only to develop energy-related innovations, but to make sure that they are **commercialized**. If a project uncovers interesting new science that is published in a top journal but goes no further, that would be a failure in EERE's eyes because it did not directly contribute to EERE's mission. As a result, EERE funds industry as well as university researchers and intramural (National Lab) researchers. Depending on the specific need or challenge, a specific program or solicitation may support fundamental research (e.g., the solid-state lighting R&D program mentioned above), but there must be a clear path to an application that can be commercialized and that aligns with EERE's energy-focused mission.

ARPA-E's focus is also tightly tied to DOE's mission, but it may fund fundamental research if such research has the potential to make transformative breakthroughs. On balance,

however, ARPA-E's language and proposal frameworks focus on clear outcomes that have the potential to lead to commercializable applications.

Approaching EERE and ARPA-E

For any funder, it's a good idea to discuss your project idea with a program officer, if possible, but for EERE and ARPA-E, it's especially important. Remember that, in contrast to NSF, DOE programs are looking for research that will solve specific problems or address specific needs that relate to DOE's mission. For that reason, they're looking for researchers who understand their problems and needs, and they often view funded researchers as collaborators, not just awardees. This is typical of many mission agencies.

One way for PIs to get their foot in the door is to attend EERE- or ARPA-E-sponsored workshops on topics related to your research. These workshops provide an opportunity for you to discuss your research with program officers, and perhaps as important, for you to hear about what the program officers are looking for. If your science is of interest to a program officer, they may very well end up pursuing you, encouraging you to submit a proposal.

Another path to funding is to connect with intramural researchers (in this case, researchers at the DOE National Labs) who are doing research related to yours. You may see these researchers at conferences, and you may see their publications in the same journals in which you publish. Talk to them about what you do and how it might be relevant to the problems they're tackling. While they typically don't have a lot of extramural funding to give out, they can invite you to visit the National Lab, perhaps conduct research over the summer, and host your students for internships. As your collaboration develops, you can then work together to apply for funding from EERE, ARPA-E or other parts of DOE. The institutional and mission knowledge these National Lab researcher team members can contribute will make it much more likely that your proposal will clearly address the priorities of the specific DOE program using language that shows you're part of the DOE community and understand them.

Approaching NSF

In contrast to DOE, NSF has no intramural research. The best way to approach a program officer is to develop the outline of your proposed project (including the goal and fundamental research questions, challenges, or hypotheses, and an overview of your approach and expected outcomes), write it up in a few paragraphs, and include that description in the body of an email in which you ask if you can talk on the phone or in person with the program officer at a convenient time. When you talk to the program officer, they are likely to focus on whether the topic fits their program and how your project will advance the field. They may also ask you about the specifics of your approach. In contrast to EERE and ARPA-E, they are unlikely to focus on specific applications or on questions related to eventual commercialization. In fact, if your research focuses on one specific application, that is likely to be considered a problem since that's a sign your project is too applied for NSF. A helpful rule of thumb, provided by an NSF program officer is to ask yourself, "Does my research have applications, or am I researching an application?" For NSF, your answer should be the former, not the latter.

In conclusion, when pursuing funding for a complex topic that's funded by multiple agencies and programs, be sure to do your homework to understand the differences among these funders so that you can be sure to find the right fit for your project.

Federal 2020 Budget Priorities for R&D

By Mike Cronan, co-publisher

The July 31 memorandum *FY 2020 Administration Research and Development Budget Priorities* is the start of the long and laborious process of determining the research and development funding landscape in FY 2020 and beyond. For faculty and research offices, it is the beginning of information, albeit very tentative and preliminary, to use in strategic research planning and positioning for funding success two years out. As noted in the memorandum, "Federal R&D dollars focused primarily on basic and early-stage applied research, paired with targeted deregulation, and investment in science, technology, engineering, and mathematics (STEM) education and workforce development, will strengthen the Nation's innovation base and position the United States for unparalleled job growth, continued prosperity, and national security."

The memorandum highlights the Administration's R&D priorities and provides guidance to agencies as they formulate their Fiscal Year 2020 budget submissions. Two areas in the memorandum of particular interest to research offices will be the description of FY 2020 **R&D Priority Areas and R&D Priority Practices**, the latter particularly important to strategizing on research partnership configurations for funding success in FY 2020 and beyond.

Research priority areas include (emphasis added) "investments in AI, autonomous systems, hypersonics, a modernized nuclear deterrent, and advanced microelectronics, computing, and cyber capabilities… Advanced cyber capabilities at scale require investment in new computing and technology paradigms, including adaptive and automated defensive measures… Agencies should also invest in R&D to improve the *security and resilience of the Nation and its critical infrastructure from natural hazards, physical threats, cyber-attacks, and emerging threats from autonomous systems and biological agents*."

R&D in support of American Manufacturing should invest in "smart and digital manufacturing, and advanced industrial robotics, especially *systems enabled by the industrial internet of things* (IoT), machine learning, and AI Agencies should also invest in the development of *advanced materials* and the associated processing technologies, including high performance materials, critical materials, and additive manufacturing… Agencies should invest in R&D of methods for low-cost distributed manufacturing and continuous manufacturing, including investments in *bio-based manufacturing* to ensure domestic access to needed medicines."

Moreover, in the domain of American Agriculture, the memorandum directs federal agencies to "prioritize R&D that enables *advanced and precision agriculture and aquaculture technologies*, including the use of embedded sensors, data analytics, and machine learning techniques to minimize agricultural inputs and maximize the quantity and quality of agricultural products… Agencies should prioritize investments in pre-competitive research regarding the safety of microorganisms, plants, and animals developed using gene editing, in order to greater leverage biotechnology products for agriculture."

University research offices will want to take special note of the recommendations in the memorandum related to R&D Priority Practices. They represent cross-cutting areas and

configurations important to successful proposals across disciplinary domains. In addition, while the term is not used in this memorandum, it pays attention to the newly emerging emphasis on convergence research at federal funding agencies.

For example, the memorandum addresses **Educating and Training a Workforce for the 21st Century Economy.** This topic is commonly addressed in research proposals to federal agencies, particularly NSF or those agencies such as NOAA, NASA, USDA, etc. that often make workforce training in their STEM mission areas a component of their proposals. As noted in the memorandum (emphasis added), "An American workforce capable of succeeding in the 21st century economy will require *adaptability to the increasingly technical nature of work across all employment sectors and ongoing technical training*... Experiential learning, such as apprenticeships, internships, job shadows, and other employer-educator partnerships will help ensure the alignment of curriculum with workplace demands [e.g., NSF ATE]... Agencies should prioritize initiatives that reskill Americans for the jobs of today *and the future*... Education in science, technology, engineering, and mathematics (STEM), including computer science, will be foundational to preparing America's future workforce, and should be integrated into instruction through application to real world challenges... Agencies should work to ensure the STEM workforce includes all Americans, including those from urban and rural areas as well as underrepresented groups."

In the domain of **Transferring Technology from Laboratory to Marketplace, the** memorandum directs agencies to (emphasis added) *focus on the basic and early-stage applied research that provides the fundamental building blocks of new technological advances*, and expand efforts that empower the private sector to accelerate the *transfer of research discoveries from the laboratory to the marketplace*... Agency budget proposals should prioritize and highlight lab-to-market initiatives, such as efforts to identify more efficient regulatory and administrative approaches to technology transfer, enhancements to small business innovation programs, entrepreneurial workforce development initiatives, and *other programs that improve the transition of federally funded technologies from discovery to practical use*."

Finally, the memorandum addresses **Partnering with Industry and Academia** (e.g., Dear Colleague Letter: Planning for New Signals in the Soils [SitS]-Themed NSF Industry/University Cooperative Research Centers [IUCRCs]]). It is recommended that federal research agencies engage in public-private collaborations to help (emphasis added) "*align basic research with future private sector needs, establish testbeds and datasets reflective of real-world conditions, transfer techniques and technologies across sectors, and more quickly diffuse basic research results to the private sector*."

As is the case in every federal R&D budget cycle, the information often comes out in dribs and drabs from multiple sources, and over time, hopefully, a consensus is reached that is sufficient for a budget to be realized. Faculty and research offices are then able to put in place a strategic plan for funding. This memorandum is the start of that process for the FY 2020 budget and can be helpful in beginning to frame what the funding landscape will look like two years hence.

Research Development & Grant Writing News

Topics in Brief

By Mike Cronan, co-publisher

Writing Graduate Fellowship Proposals

The new 175- page report **Graduate STEM Education for the 21st Century** (free pdf download) by the National Academies of Sciences, Engineering, and Medicine (2018) is very timely given the recent release of two major graduate fellowship programs: DoED's Graduate Assistance in Areas of National Need (GAANN Applications for New Awards; Graduate Assistance in Areas of National Need; Federal Register Notice) and NSF's Graduate Research Fellowship Program (GRFP).

Typical of DoED, GAANN has a short fuse due date of August 29. The GAANN Program provides grants to academic departments and programs at institutions of higher education (IHEs) to support graduate fellowships for students with excellent academic records who demonstrate financial need and plan to pursue the highest degree available in their course of study. **Seventy-four awards will be made** in the range of $149,250–$398,000.

The GRFP program has due dates clustered in late October depending on program area. NSF expects to **award 1,500 Graduate Research Fellowships** per fiscal year under this program solicitation pending availability of funds. Each Fellowship consists of three years of support during a five-year fellowship period. Currently, NSF provides a stipend of $34,000 to the Fellow and a cost-of-education allowance of $12,000 to the graduate degree-granting institution for each Fellow who uses the fellowship support in a fellowship year.

This report can serve as an important reference document for anyone writing or assisting in the writing of proposals that seek funding for graduate student fellowships, either from DoED (GAANN) or NSF (GRFP), or many other programs at NSF and other federal research agencies where a proposal has a graduate fellowship component. *The value of this report is to help you better understand (1) the operational characteristics of successful graduate fellowship programs, (2) best practices and evidence-based recommendations that can be used to strengthen the arguments made in the proposal narrative, and (3) critical references and useful demographic and data trends of national graduate education that will help you set your proposal narrative in the context of effective and successful fellowship programs across the nation*.

As noted by NASEM, "A critical element is the report's articulation of the core competencies that all students who have been through U.S. graduate STEM education should acquire, at both the master's and the Ph.D. levels. While the report recommends that students be offered some supplemental coursework and training experiences, the committee feels strongly that instilling those core competencies should remain the American graduate STEM education system's primary task. After laying out the reasons for the committee's work in Chapter 1, the report, covering both master's and doctoral STEM education, presents its analysis of the current education system in Chapter 2. Chapters 3, 4, and 5 offer findings, conclusions, and recommendations to ensure that the system remains dynamic by addressing current needs and anticipating future contexts in graduate education. Chapter 6 presents a summary of what an ideal graduate education system would be like if all the recommendations

in this report were to be implemented. It also provides a listing of the committee's recommendations organized by stakeholder, to make clear what each must do to actualize the revised graduate STEM education system the committee envisions."

Also, reference recommendations in the NSF archived document: [Dear Colleague Letter: Improving and Supporting the Transition to Graduate School in the Mathematical Sciences](#).

Why Scalability, Sustainability, and Dissemination Are Important at NSF

With the above in mind, i.e., the linkage of a national report to the writing of two major national graduate fellowship programs that have been funded for decades by both agencies, although with some modifications, the other important point to keep in mind, particularly for educational fellowship programs or on larger research grants with required educational or broader impacts components, is the criterion of **project scalability** for both institutional long-term **sustainability**, where appropriate, and **dissemination** of your model to other institutions.

Briefly, **scalability** means that the proposed project *does not depend on a unique set of institutional characteristics,* such as student demographics, PI's, program support staff, etc., for success, but rather serves as a model that can be adopted and adapted by others, e.g., programs, departments, colleges, PUIs, MSIs, R-1's, etc., with an expectation of similar results. This is a key point at NSF, since the agency tends to *favor funding new models that help advance best practices and evidence-based activities that meet specific agency objectives across multiple institutional types*.

NSF is not interested in funding "one-off" programs that depend entirely on *a singular set of unique institutional factors*. They do not have the budget for that. Moreover, in terms of an agency's budget, scalability offers the opportunity to significantly leverage an investment in one institution when a successful program can be adopted and adapted to another institution through dissemination practices. Basically, scalability is achieved by institutionally-fungible program components and objectives.

Moreover, the meaning of the second criterion, **sustainability**, should not be confused with meanings associated with topics such as *environmental sustainability, agricultural sustainability, sustainable energy,* etc. In this context, it has a fiscal meaning related to **continuing the program after the grant funding has expired**. For example, if NSF grant money is used to develop a program model for the recruitment of more women and minorities to graduate programs in STEM, e.g., such as an NSF AGEP, over a specific funding term, the agency expects that an institutional plan for sustainability will keep the program operational in years thereafter. *The funding agency is not interested in a program that dies when the grant money stops coming*.

Therefore*, success at NSF in a wide range of programs requires that what you propose must be* <u>*systemic,*</u> *have* <u>*impact at scale,*</u> *be* <u>*sustainable,*</u> *and easily* <u>*disseminated*</u>. Moreover, this must be validated in the proposal, e.g., in a broader impacts section, with an <u>evidence-based</u> approach that drives management decision making, mid-course corrections, improvements, and enhancements for *yields greater than incremental progress*. The key to many successful proposals at NSF is project ***scalability linked to sustainability and dissemination***.

As NSF often notes, the agency funds education program models with the *potential for* <u>*replication across multiple scales*</u> *rather than project-specific activities uniquely linked to a*

particular institution or academic ecosystem.   To compete in these cases, your proposal will need a <u>plan for scalability</u> that is validated by the specifics, details, and metrics to convince reviewers that you meet this key attribute of a funded proposal.

Moreover, it may be appropriate in the planning, development, and writing of a proposal that requires a sustainability statement (not all do) to develop a strategic plan for local sustainability. This plan would identify the program goals and objectives that need to be sustained, e.g., as in the referenced AGEP.   These goals and objectives then need to be mapped to institutional resources that will be ***available after the grant period*** to ensure continuation of key program activities. There are often a broad range of institutional resources and program linkages of potential use in continuing key program activities after the grant period, including:

- incorporating some project activities into a base budget,
- committing staff time,
- continuing space commitments made during the grant period, or new space commitments,
- providing access to equipment and instrumentation,
- providing institutional support in seeking other funding opportunities from federal agencies and foundations, industry, or university donors,
- adopting project goals into strategic plans and mission statements,
- institutionalizing project goals, e.g., changes to community, culture, and climate developed under a diversity project, or adopting new courses developed as part of a research program,
- developing institutional partnerships and collaborations that allow the integration of key project components into existing institutional infrastructures,
- identifying institutional "administrative champions" that support the project's goals and objectives and will work to sustain them.

In conclusion, when writing your proposal narrative, keep the ideas of scalability, sustainability, and dissemination in mind as intertwined rather than siloed program goals. This will significantly enhance your chances at funding success

ARPA-E's Grid Optimization Competition

By Mike Cronan, co-publisher

The GO Competition Challenge 1 begins in fall 2018. You can learn more about the competition here. Full applications are due by 9:30 AM ET on Friday, September 7, 2018. Additional information is available on ARPA-E's online application portal, ARPA-E eXCHANGE.

More specifically, ARPA-E's Grid Optimization (GO) Competition comprises, as noted in above documents (emphasis added), "a series of prize challenges to accelerate the development and comprehensive evaluation of new software solutions for **tomorrow's electric grid**. Key areas for development include but are not limited to *optimal utilization of conventional and emerging technologies, management of dynamic grid operations (including extreme event response and restoration), and management of millions of emerging distributed energy resources* (**DER**). Challenge 1, the first challenge of the GO Competition, is an algorithm competition to develop solutions to the electric power sector's security-constrained optimal power flow (SCOPF) problem."

Whether or not you will be submitting an application to this specific program, the discussion about the topic within the application package itself (Support Grants for Participation in ARPA-E GO Competition Challenge 1 FOA Document) places it *in the national context of new research areas and the funding agency solicitations that fund those new areas under the large umbrella of grid modernization*. It is said that "*all roads lead to Rome*," but it can also be said that all grid modernization research, both basic and applied, as well as education and training in those grid domains, leads to convergence research. *This is important because the umbrella of grid modernization includes research in the wheel house of faculty across several colleges and numerous departments supported by university research offices*.

For example, this includes faculty specifically from colleges of engineering, colleges of science, colleges of geosciences (e.g., wind and solar forecasting for efficient integration of renewals into the grid, thermal, tidal, etc.), among others, and departments of electrical engineering, computer engineering, mechanical engineering, materials engineering, computer science, mathematics, statistics, and atmospheric sciences, among others.

Two principal funders of convergence research in grid modernization are the Department of Energy, which includes ARPA-E, and NSF. In the former case, examples include the FOA: FY 2018 Solar Energy Technologies Office that was due July 5, and the current GO competition noted herein; in the latter case, significant funding for the electric power grid comes from several divisions and programs across directorates, including topics related to Big Data and the new Advanced Technology Education Program. **Important to grid modernization at NSF**, note that **effective August 15, 2018,** unsolicited proposals to all core programs in the NSF Division of Electrical, Communications and Cyber Systems (ECCS) can be submitted at any time. The Directorate for Engineering (ENG) announced this change in a Dear Colleague Letter (NSF 18-082) and provided answers to Frequently Asked Questions (NSF 18-083).

Moreover, to be better positioned for grid modernization funding in the coming years, it is important to have a strategic planning matrix in place that identifies these opportunities,

particularly at NSF and DOE/ARPA-E, and maps them to faculty across colleges and departments that could contribute to a "convergent team" structure likely to succeed in winning funding in this domain. Clearly, there are many funding opportunities related to grid modernization open at any given time, and it is possible to sift through NSF and DOE, as well as other agencies such as DARPA, and weave together a tapestry of funding opportunities over the coming year that can make this a more coordinated and successful effort.

Finally, specific to this ARPA-E GO competition, the below quote from the application nicely summarizes and can contribute to developing a funding strategy in this area over the coming year or more. Emphasis is added below to show more clearly the role of convergence research principles as applied to this research area.

"Existing grid software was designed for a power grid *based on conventional generation and transmission technologies which are dominated by large, centralized power plants*. The rapid development in recent years of new resources, including DERs, intermittent resources (*wind and solar*), and *storage* has created a new set of challenges for **grid management**. Currently, grid management software *does not allow for new forms of generation and storage to be used at full potential*. Existing grid software makes several simplifying assumptions that produce suboptimal power flow solutions and result in increased electricity costs; *the effects of these assumptions grow as the number of DERs grows*. Furthermore, *increasing emphasis on grid resilience demands innovative management of more diverse and decentralized resources, which existing grid software is not equipped to handle*. *Innovation is needed regarding the underlying modeling, optimization, and control methods to increase grid flexibility, reliability, and resilience while substantially reducing system costs and barriers to fully integrated emerging technologies*."

Basic Grant Writing Training Presentation

Reprinted from July 2016
By **Mike Cronan**, co-publisher

While the principal focus of university research offices is to support faculty in the planning, development, and writing of research grants to federal agencies, in many instances, nonfaculty professional staff in various nonresearch offices are also called upon to write proposals. These proposal often serve university offices that depend to various degrees on "soft money" for both staff and programmatic support, e.g., for extension services, educational outreach partnerships, on-campus summer enrichment programs, and a host of others.

Furthermore, students, particularly graduate students and new postdocs, can often benefit from basic grant writing training since it prepares them to write the narrative section of applications for graduate fellowships and to take a support role on faculty research grants, not to mention to assume positions in academia and industry where grant writing will be an important element in career advancement.

Moreover, it is not unusual for various community organizations and centers, municipal agencies, school districts, science museums, city and county food banks, nongovernmental support services, etc. to write proposals to secure funding for their community mission activities. In this case, it is not uncommon for someone in a university research office to volunteer to provide "pro bono" grant writing advice and assistance to these organizations, or do so as part of a university commitment to community service partnerships and relations.

In these cases, you have a somewhat different audience for introductory grant writing training than the training typically provided to new faculty each fall. For this nonfaculty audience, either within or outside the university, writing grants will be an occasional part of their job duties on an intermittent basis as the need and opportunities arise. The "CAREER-like" strategic planning approach to grant writing presentations for new and tenure-track faculty is not appropriate for this audience. They need a "nuts and bolts" presentation on grant writing basics that emphasizes generic best practices and identifies pitfalls.

Moreover, while faculty grant training may take the form of a one- to three-day research retreat, or form part of a half-day or all-day grant training presentation on a specific agency, almost always including NSF and NIH, or a specific program, almost always including an NSF CAREER workshop, this audience needs something like a one-hour PowerPoint presentation, perhaps followed by a half hour, moderated FAQ discussion, on basic grant writing for nonresearch, nonfaculty professionals. The goal here is to offer a primarily nonresearch audience an abbreviated, jump start into the grant writing process.

Many staff members in a research office could give such a presentation on a moment's notice, somewhat like the old circuit riders who traveled around on horseback serving rural areas in the mid to late 1800s. In today's vernacular, it might be called the "*Basic Grant Writing Elevator Speech,*" targeting professional practitioners of all sorts.

The question for this nonfaculty, nonresearch audience becomes "*what key informational topics on grant writing need to be addressed and done so within a one-hour*

presentation?" While these topics will differ somewhat by institution and audience, in most cases they will include some key "nuts and bolts" perspectives on writing a successful grant.

An example set of topics might include:

- Finding funding
- Understanding the funding solicitation
- Funding agency mission
- Proposal review process
- Writing well

With these five "nuts and bolts" topics in mind, the issue then becomes how to best address each topic in an average of 12 minutes. The below observations by topic offer a starting point to that process, but they are in no way exhaustive. Keep in mind that your presentation can serve as a training tool, so make sure to embed sufficient hotlinks in the presentation to make it useful afterwards as a guided tour to deeper exploration.

Finding Funding

This is fairly straightforward information to convey to anyone submitting a proposal to a federal agency. **One word**: Grants.gov. All new federal agency funding opportunities are posted on a daily basis to this site. In most cases, the funding notice will also be posted to the agency website, and in some cases, duplicate postings will be found at FedConnect, FedBizOps, and the Federal Register. Most agencies are set up to send out funding alerts by email or RSS subscriptions.

However, many in this type of audience will be looking for funding from foundations at a national, regional, or local level. This may take some digging to find the right funding source(s). The Foundation Center and places like GrantsWatch are starting points for this process. However, a simple Google search often turns up good starting places for finding foundation funding, e.g., do a Google search on "foundations that fund [*enter your topic*]." Once possible foundations are identified, search the foundation website to see whether you are a fit for their funding mission and review instructions on how to submit a proposal to that foundation.

Bottom line: when it comes to finding funding outside of the domain of federal agencies and foundations, ***Google becomes your best friend***. Crafting Google funding queries is a good skill to develop to find lesser-known funders. After all, the most valuable time frame in grant writing begins on the date a solicitation is published and ends at the proposal due date. Tracking funding in real time is key to success.

Understanding the funding solicitation (aka RFP, FOA, etc.)

The important point to make here is that a careless or uninformed reading of the funding solicitation is the most common mistake made that leads to a declined proposal. Great care must be taken to ensure the proposal narrative responds fully to the funder's goals, objectives, and review criteria . A solicitation tells you all you need to know about submitting a proposal in response to a specific funding opportunity at an agency. Solicitations describe or reference such key information as the goals and objectives of the funding opportunity, proposal organization, topics and questions the applicant must address in the proposal, review criteria, and procedural questions related to eligibility, budgets, due dates, contact information for

program offices, and related information. Several key points need to be emphasized when it comes to the funding solicitation, specifically what it is and what it is not:

- It is a **non-negotiable** listing of performance expectations reflecting the mission, goals, and research objectives of the funding agency.
- It is not a research smorgasbord offering a choice to address some topics but not others, depending on the applicant's interest; nor can only some review criteria be addressed and others ignored.
- **Agencies do not fund good ideas**.
- **Agencies fund good ideas that advance <u>their</u> mission and investment priorities.**

Think of the funding solicitation as a treasure map. It is a step by step set of instructions that lead to funding success. Read it and read it again. Know it well and you will be successful.

The funding agency mission

All funding agencies have a mission, or a reason for funding specific activities of interest to the agency. Understanding the mission of the funding agency is key to success because all successful proposals have one common characteristic: **the proposal makes a strong and compelling case that the proposed activities will bring value-added benefits to the agency's mission**. That case cannot be made in a convincing way unless the person(s) who writes the proposal understands the agency's mission and investment priorities.

The proposal review process

Always write to your audience. Your audience for a proposal will be the program officers and reviewers. In some cases, they may be experts in your field; in other cases, they may be technically literate reviewers but not experts. Funding solicitations give information on the review process as well as describe the review criteria that will be used to judge the merits of the proposal. If this information is not given in the funding solicitation, it will be referenced in the solicitation with a URL to the agency website where it will appear in a more detailed way. It is important to locate and understand this information before you start writing the proposal. Understanding the review criteria and review process will influence how you write the proposal narrative, since the enumerated criteria will have to be clearly addressed in the proposal. Most federal funding agencies and many foundations provide very detailed information on their website about the review process.

Moreover, an important part of understanding the review process is understanding how the funding decision will be made, particularly the role of the program officer in the process. In some cases, reviewed proposals receive a numerical score that ranks them against all other proposals submitted to the competition and the program officer(s) fund by rank order. In others cases, the reviews are advisory only and the program officer(s) make the final determination on which proposals are funded in any given competition. In this latter case, other factors that influence a funding decision may be the geographic distribution of the awards, how well the proposed activities map to the funding agency mission priorities, or whether the proposed activities have been sufficiently funded in the past to preclude a continued agency investment in the particular topic area.

If in doubt about how your proposal will be reviewed, call the program officer and ask. In successful grant writing, timidity is never rewarded and ambiguity is always punished. If there is any ambiguity in how you understand the review process, or for that matter, how you understand the objectives of the funding opportunity, call and ask a program officer.

Writing Well

Reviewers often comment on how well a proposal is written, and more commonly comment on how poorly a proposal is written with such comments as *"it is not clear what the proposer intends to do,"* or *"the goals and objectives are vague and general and lack specifics,"* or *"this proposal is confusing,"* etc.. A poorly written and poorly organized proposal makes it difficult for program officers and reviewers to determine the merit of the proposal. It leaves them guessing at what you intend to do. Funding agencies are not in the business of buying the equivalent of a lotto ticket and funding a proposal on the off chance that it might accomplish something of significance and importance to the agency. One thing is certain, if a proposal is challenging to read, it will not be read in anything more than a quick and perfunctory way. ***More to the point--it will not be funded***. Reviewers will assume that sloppy errors in language, grammar, and spelling will translate into sloppy research, something they will not fund.

Moreover, it is important to understand that ***proposal organization is an important part of writing well***. Whenever possible, organize you proposal narrative to reflect the funding solicitation in terms of order and in terms of the questions you address as given in the funding solicitation. A good strategy is to use the funding solicitation as a narrative template to make sure you fully respond to all questions asked by the funder and that you do so in the order asked, which will be the order the reviewers will be looking for then reading your proposal. Format your proposal to make it easy to read, e.g., through the use of white space, bullets, readable font sizes, manageable paragraphs, etc. Finally, reviewers respond best to details and specifics, and not so well to vague generalities. Get to the point quickly. Tell reviewers in an introductory paragraph what you propose to do, why you propose to do it, how you will do it, your rationale for doing it, why you have the expertise to do it, your anticipated outcomes, and the value-added benefits of your proposed activities to the agency's mission priorities.

If nonfaculty grant seekers at your university or in your university community need a starting point for learning how to write a successful grant to a federal or state agency, foundation, corporate sponsor, of any other funder, the above information can be the starting point of a one-hour presentation that will help them jump start that process.

Research Grant Writing Web Resources
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NSF Spring 2018 Grants Conference Presentations

NSF Grant Writing Resources

Big Data to Knowledge Program Resources

Request for Information on Broadening the Scope of Energy R&D and Associated Facility Needs at the National Renewable Energy Laboratory's National Wind Technology Center
The National Wind Technology Center (NWTC) is a 305-acre site in Colorado that comprises field test sites, test laboratories, industrial high-bay work areas, machine shops, electronics and instrumentation laboratories, and office areas. While NWTC's initial focus was on wind energy, it has been used to demonstrate and test other energy technologies, and is looking to further expand these large-scale field testing capabilities. Given recent interest in utilization of the site for testing other technologies, DOE's Office of Energy Efficiency and Renewable Energy is requesting public input on specific facility and infrastructure investments that would enable expanded energy research and development at the site. Specific areas of interest include hydrogen fuel cells, advanced manufacturing, solar, grid integration and storage, marine hydrokinetic, hydropower, geothermal, and hybrid energy technologies. Responses to this RFI must be submitted electronically to NWTC_EERE_RFI@ee.doe.gov no later than 5:00 p.m. Eastern Time (ET) on August 27, 2018.

Webinar August 22: Development of Real-Time Characterization Tools and Associated Efforts to Assist Membrane Electrode Assembly Manufacturing Scale-Up
On August 22, 2018, at 12 p.m. ET, FCTO will hold a public webinar titled "Development of Real-Time Characterization Tools and Associated Efforts to Assist Membrane Electrode Assembly Manufacturing Scale-Up." In this webinar, the National Renewable Energy Laboratory (NREL) will present an overview of early-stage R&D related to manufacturing of fuel cell membrane electrode assembly (MEA) materials. Topics will include (1) an overview of the manufacturing context and challenges for MEA materials, (2) a detailed presentation of work to develop real-time in-line characterization techniques, (3) an overview of specialized in situ diagnostics developed to understand how defects in MEA materials affect cell performance and lifetime, and (4) an overview of efforts to understand the foundational relationships between electrode materials (inks and coated layers), processing methods, and performance. The webinar will be recorded and made available online, and includes a 15 minute Q&A portion. Register for the webinar.

Educational Grant Writing Web Resources

Research on Education Practice and Its Improvement - Lyle Spencer Awards for Large Scale Projects - LOI

The Lyle Spencer Research Awards Program is intended to support intellectually ambitious research oriented to improving the practice of education, independent of any particular reform agendas or methodological strictures. It supports projects with budgets up to $1 million. In this program, we envision a large-minded conception of educational practice that encompasses formal and informal learning as well as the institutional, policy, and normative frameworks that influence and are influenced by learning and developmental processes. Moreover, we recognize learning occurs across settings—from the classroom to the workplace and even onto the playing field—any of which may, in the right circumstance, provide the basis for rewarding study.

Spencer Small Grants in Education Research

The Small Research Grants program aims to support smaller scale or pilot research projects that have budgets of $50,000 or less. Proposals are encouraged from scholars across a variety of disciplines in an effort to fund field-initiated education research. Read more... Deadlines: Small Research Grant proposals are accepted 4 times per year. The next deadline is at 4:00pm CDT, August 1, 2018. The following deadlines will fall on November 1, 2018, February 1, 2019, and May 1, 2019.

K–12 Teachers Get Up Close to Hydrogen and Fuel Cell Technology

The U.S. Department of Energy's (DOE's) Fuel Cell Technologies Office (FCTO) joined forces with the Smithsonian Science Education Center to increase understanding of hydrogen and fuel cell technologies among a group of 30 K–12 science teachers attending the Center's week-long, science-focused course in Washington, D.C. FCTO's participation included an opportunity for teachers to ride in one the world's first commercial fuel cell cars as well as a presentation highlighting how hydrogen and fuel cell technologies work, how they are being used today, and how they fit into the national energy economy. Most of the teachers were not aware there are now more than 5,000 hydrogen fuel cell cars on U.S. roads, and they were excited to bring new hydrogen- and fuel cell-related topics to their classrooms for the upcoming school year. By teaching the teacher, events like this one make a powerful impact on public understanding of America's energy opportunities and help foster STEM (science, technology, engineering, and mathematics) learning in the classroom. To learn more about how fuel cells work and get involved, download the Increase your H2IQ training resource to give a hydrogen and fuel cells presentation in your classroom or community and visit the FCTO website.

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.

If you have questions about the FET Core Program, please contact:
- Mitra Basu, Program Director, CISE/CCF; and/or
- Dmitry Maslov, Program Director, CISE/CCF.

The FET core program joins the existing three core programs within CCF: Algorithmic Foundations (AF), Communications and Information Foundations (CIF), and Software Hardware Foundations (SHF). Research in quantum computing and computational biology, formerly considered across these three core programs, is now addressed by the FET program. More information about the FET and other CCF core programs, along with proposal submission guidelines, can be found in the CCF Core Programs solicitation NSF 18-568.

Dear Colleague Letter: Planning for New Signals in the Soils (SitS)-Themed NSF Industry/University Cooperative Research Centers (IUCRCs)

The National Science Foundation's (NSF) Directorate for Engineering (ENG), in collaboration with its Computer and Information Science and Engineering (CISE) and Geosciences (GEO) Directorates, aims to encourage convergent research that transforms existing capabilities in understanding dynamic near-surface processes through advances in sensor systems and dynamic models. Specifically, the goal of this Dear Colleague Letter (DCL) is to encourage planning of one or more Industry-University Cooperative Research Centers (IUCRC).

The Industry-University Cooperative Research Centers (NSF IUCRC program (https://www.nsf.gov/eng/iip/iucrc/home.jsp) seeks to achieve these goals by:
- Leveraging NSF funds with industry to support graduate students performing industrially-relevant pre-competitive research;
- Expanding the innovation capacity of our nation's competitive workforce through partnerships between industries and universities; and

- Encouraging the nation's research enterprise to remain competitive through active engagement with academic and industrial leaders throughout the world.

Preliminary proposals for IUCRC planning grants addressing SitS-themed precompetitive research areas are welcome and will be fully considered.

Faculty are encouraged to collaborate within their institutions as well as with other institutions to bring together a multi-institution partnership towards planning a prospective center per the requirements of the IUCRC program. If the institutions planning the IUCRC can obtain letters of strong support from industry, each university may submit a planning grant proposal to NSF following the guidance in the IUCRC program solicitation (https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf17516). Preliminary Proposals are required as a pre-requisite to a full Planning Grant Proposal submission. Please refer to the IUCRC solicitation for details and applicable submission dates. SitS topic questions about this DCL should be directed to: SitSquestions@nsf.gov.

Soils are the foundation of terrestrial ecosystems that support economic prosperity and provide services that are essential for humanity. Soils are complex living ecosystems containing billions of organisms that mediate a myriad of biological, chemical, and physical processes, interacting to cycle carbon and nutrients essential for plant growth, food, and fiber production, and to remove contaminants from water.

Dear Colleague Letter (DCL): Removal of Deadlines for the Secure and Trustworthy Cyberspace (SaTC) Program

The Directorates for Computer and Information Science and Engineering (CISE), Education and Human Resources (EHR), Engineering (ENG), Mathematical and Physical Sciences (MPS), and Social, Behavioral, and Economic Sciences (SBE) wish to provide notice about an important upcoming change to submission windows for all proposals to the National Science Foundation's (NSF) Secure and Trustworthy Cyberspace (SaTC) program.

In order to allow principal investigators (PIs) more flexibility and to better facilitate interdisciplinary research across all disciplines, SaTC is removing deadlines for submission of solicited proposals across all its designations [CORE, Transition to Practice (TTP), and Education (EDU)] and size categories (Small, Medium), effective October 1, 2018. (The Frontier category will not be offered in FY 2019, but we anticipate resuming this size category in FY 2020.) Another associated change is that individuals may participate as a PI, co-PI or senior personnel in at most three SaTC proposals in a given fiscal year (i.e., October 1 through September 30), including in at most one proposal designated as CORE; at most one proposal designated as TTP; and at most one proposal designated as EDU. These limits are unrelated to any limits imposed in other NSF program solicitations.

For those unfamiliar with the no-deadline submission process, frequently-asked questions and other relevant information will be provided on the SaTC program webpage. By accepting proposals at any time, PIs will have the opportunity to think more creatively, build strong collaborations, converse with Program Directors and carefully prepare proposals with the potential to make significant research and education contributions. We anticipate that the elimination of deadlines will reduce the burden on institutions and the community by extending the submission period throughout the year rather than to annual deadlines.

With this change, the SaTC program will implement a guideline in which a declined proposal (or substantively similar proposal/topic by the same PI team) in a given fiscal year (e.g., FY 2019) is ineligible for resubmission to that designation until the next fiscal year (FY 2020 in this example). This moratorium will allow PIs the time required to digest the results of the merit review and revise/restructure the declined proposal accordingly. Any proposal considered too similar to a previous proposal that is under the moratorium period will be returned without review. Similarly, any proposal submitted to SaTC that the program decides has not been substantially revised will be returned without **review, as outlined in the NSF** *Proposal and Award Policies and Procedures Guide (PAPPG)*.

Dear Colleague Letter: NSF/NSFC Joint Research on Environmental Sustainability Challenges

The NSF Engineering and Geosciences Directorates (ENG and GEO) and the National Natural Science Foundation of China (NSFC) Department of Engineering and Material Sciences (DEMS) and Department of Geosciences are partnering to encourage joint research by U.S. - China teams collaborating on fundamental research that addresses critical environmental sustainability challenges.

Among nations, the U.S. and China have the two largest economies on Earth and also have important engineering, technology, business and trade relationships with each other. Both nations face significant environmental sustainability challenges, for example in the food-energy-water (FEW) nexus, urban sustainability, global change, and manufacturing. Fundamental research is needed to provide the foundational knowledge for addressing these challenges.

This call is for research proposals from joint U.S. - China teams in the environmental sustainability themes of:

"Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS: U.S.-China)"
1. **quantitative and computational modeling of a FEW system**
2. **innovative human and technological solutions to critical FEW systems problems.**

Every proposal must include the participation of researchers from at least one U.S. institution and at least one institution in China. Proposals that do not comply with this requirement will be returned without review. The proposal submitted to NSF must conform to NSF proposal requirements as specified in NSF's posted Proposal and Award Policies and Procedures Guide (NSF 18-1), and the matching proposal submitted to NSFC must conform to requirements posted by NSFC. NSF will fund the U.S. researchers of winning teams (up to a total of $500K for 4 years for each winning proposal), while NSFC will fund the China researchers of winning teams (up to a total of 3 million yuan for 4 years for each winning proposal). In total, no more than 8 joint NSF-NSFC project grants are expected to be funded. Each proposal must include a management plan that clearly specifies the role of team researchers from both the U.S. and China, and the mechanisms through which close collaboration will be assured. The management plan is not to exceed 3 pages and is to be included in the supplementary document file of the electronic submission.

Dear Colleague Letter: Research on Integrated Photonics Utilizing AIM Photonics Capabilities

With this Dear Colleague letter (DCL), the Division of Electrical, Communications and Cyber Systems (ECCS) and the Division of Industrial Innovation and Partnerships (IIP) within the

Engineering Directorate of the National Science Foundation continue to encourage innovative exploratory and translational research by academic researchers and small businesses in all aspects of integrated photonics that utilize the current silicon photonics capabilities resident in AIM Photonics.

Please see below a brief introduction of **AIM Photonics** and examples of the research project opportunities that it can enable. Then follow the step-by-step instructions in the section on **Project Preparation** for use of AIM Photonics capabilities, and at the end of this document the **Proposal Submission to NSF** procedures.

AIM PHOTONICS - The American Institute of Manufacturing of Integrated Photonics (AIM) (http://www.aimphotonics.com) was established in July 2015 by the U.S. government under Department of Defense (DoD) leadership as a manufacturing innovation institute to advance integrated photonics. AIM Photonics is an industry-led public-private-partnership that focuses the nation's premiere capabilities and expertise to capture and mature critical manufacturing domestic capability for integrated photonics. The Institute's goal is to emulate the dramatic successes experienced by the semiconductor industry over the past 40 years and transition key lessons, processes, and approaches to the photonic integrated circuit (PIC) industry. AIM Photonics supports providing practical access and technology on-ramps for academic communities, as well as for industry and government. AIM Photonics is creating a National PIC manufacturing infrastructure, widely accessible and inherently flexible to meet the challenges of the future marketplace with practical, innovative PIC manufacturing-oriented solutions.

Dear Colleague Letter: Revision of CISE Research Infrastructure (CRI) Program

Through this Dear Colleague Letter (DCL), the National Science Foundation's (NSF) Directorate for Computer and Information Science and Engineering (CISE) wishes to alert the CISE community about forthcoming changes to the CISE Research Infrastructure (CRI) program. CISE is in the process of revising the CRI program to focus exclusively on infrastructure that engages emerging communities of CISE researchers in order to move CISE research frontiers forward. In the future, the program will aim to support testbeds, platforms, datasets, etc., coupled with a supporting suite of tools, resources, and user services to enable innovative research by diverse communities of CISE researchers.

As part of this change, CISE will be discontinuing support for the Institutional Infrastructure class of awards. Funding for institutional infrastructure will continue to be available through other NSF programs that support infrastructure, including the Major Research Instrumentation (MRI) program. CISE researchers may also wish to consider embedding modest equipment requests within their CISE research proposals.

Further information about the program will be available once the revised solicitation is released. A series of webinars will provide information about the new program and program officers to contact with questions. Please see the CISE website (https://www.nsf.gov/dir/index.jsp?org=CISE) for information about upcoming webinars on the new program.

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

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 (free pdf download) 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.

Opportunities from the Integration of Simulation Science and Data Science
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.

Sexual Harassment of Women: Climate, Culture, and Consequences in Academic Sciences, Engineering, and Medicine
Over the last few decades, research, activity, and funding has been devoted to improving the recruitment, retention, and advancement of women in the fields of science, engineering, and medicine. In recent years the diversity of those participating in these fields, particularly the participation of women, has improved and there are significantly more women entering careers and studying science, engineering, and medicine than ever before. However, as women increasingly enter these fields they face biases and barriers and it is not surprising that sexual harassment is one of these barriers.

 Over thirty years the incidence of sexual harassment in different industries has held steady, yet now more women are in the workforce and in academia, and in the fields of science, engineering, and medicine (as students and faculty) and so more women are experiencing

sexual harassment as they work and learn. Over the last several years, revelations of the sexual harassment experienced by women in the workplace and in academic settings have raised urgent questions about the specific impact of this discriminatory behavior on women and the extent to which it is limiting their careers.

Sexual Harassment of Women explores the influence of sexual harassment in academia on the career advancement of women in the scientific, technical, and medical workforce. This report reviews the research on the extent to which women in the fields of science, engineering, and medicine are victimized by sexual harassment and examines the existing information on the extent to which sexual harassment in academia negatively impacts the recruitment, retention, and advancement of women pursuing scientific, engineering, technical, and medical careers. It also identifies and analyzes the policies, strategies and practices that have been the most successful in preventing and addressing sexual harassment in these settings.

[Understanding Measures of Faculty Impact and the Role of Engineering Societies](#)
On January 26, 2017, the National Academy of Engineering (NAE), with support from the National Science Foundation (NSF), held a workshop in Washington, DC, on the engagement of engineering societies in undergraduate engineering education. Since then, the NAE has held a series of follow-up regional workshops to investigate specific issues identified in the January 2017 workshop as deserving of further discussion and evaluation.

The second in this series of supplemental workshops was held on February 12, 2018. It brought together about 45 representatives of professional societies, academic institutions, and businesses to explore the role of engineering societies in enhancing understanding of faculty impact on the engineering profession as part of the reappointment, promotion, and tenure (RPT) process. This publication summarizes the presentations and discussions from the workshop.

New Funding Opportunities

Content Order
New Funding Posted Since July 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 July 15 Newsletter

G18AS00114 National Land Remote Sensing Education Outreach and Research Activity
The National Land Imaging (NLI) Program of the U.S. Geological Survey (USGS) Land Resources (LR) mission area is soliciting applications from qualified Educational Institutions, State and Local Governments, and Non-profit Organizations (NPOs) to develop a U.S. national consortium to expand the science of remote sensing through education, outreach and research / applications development for environmental monitoring to include the effects of land use and land cover change on water quality, quantity and utility; societal adaptation and phenology; public health-related issues to include identification of potential indicators relating to vector-borne diseases and harmful algal blooms; natural resource management, agricultural applications, disaster risk reduction, and other land surface and surface water monitoring applications. **Due September 4**.

International Research Experiences for Students (IRES)
The International Research Experiences for Students (IRES) program supports international research and research-related activities for U.S. science and engineering students. The IRES program contributes to development of a diverse, globally-engaged workforce with world-class skills. IRES focuses on active research participation by undergraduate or graduate students in high quality international research, education and professional development experiences in NSF-funded research areas. The overarching, long-term goal of the IRES program is to enhance U.S. leadership in research and education and to strengthen economic competitiveness through training the next generation of research leaders. This solicitation features three mechanisms; proposers are required to select one of the following tracks to submit their proposal. Track I focuses on the development of world-class research skills in international cohort experiences. Track II is dedicated to targeted, intensive learning and training opportunities that leverage international knowledge at the frontiers of research. Track III calls for U.S. institutional partnerships and coalitions to develop and evaluate innovative models for high-impact, large-

scale international research and professional development experiences for graduate students, as individuals or groups. **Due September 11.**

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.**

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.

URL Links to New & Open Funding Solicitations

Links verified June 8, 2018

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

Solicitations Remaining Open from Prior Issues of the Newsletter

NSF/FDA Scholar-in-Residence at FDA

The National Science Foundation (NSF), through the Directorate for Engineering, the Directorate of Computer and Information Science and Engineering Division of Computer and Network Systems, and the Directorate for Mathematical and Physical Sciences Division of Materials Research, along with the U.S. Food and Drug Administration (FDA), through its Center for Devices and Radiological Health (CDRH), have established the NSF/FDA Scholar-in-Residence Program at FDA. This program comprises an interagency partnership for the investigation of scientific and engineering issues concerning emerging trends in medical device technology. This partnership is designed to enable investigators in science, engineering, and computer science to develop research collaborations within the intramural research environment at the FDA. This solicitation features three flexible mechanisms for support of research at the FDA: 1) Principal Investigators at FDA; 2) Postdoctoral Researchers at FDA; and 3) Graduate Students at FDA. **Proposals accepted anytime.**

Bridges to the Baccalaureate Program (R25)

The NIH Research Education Program (R25) supports research education activities in the mission areas of the NIH. The over-arching goal of this National Institute of General Medical Sciences (NIGMS) R25 program is to support educational activities that enhance the diversity of

the biomedical research workforce. To accomplish the stated over-arching goal, this FOA will support creative educational activities with a primary focus on Courses for Skills Development, Research Experiences, and Curriculum or Methods Development. A program application must include each activity, and describe how they will be synergized to make a comprehensive program. The Bridges to Baccalaureate Program is intended to provide these activities to community college students to increase transition to and completion of Bachelor's degree in biomedical sciences. This program requires partnerships between community colleges or other two-year post-secondary educational institutions granting the associate degree with colleges or universities that offer the baccalaureate degree. Additionally, recruitment and retention plans are required as part of the application. **Due September 25**.

NIH: Bridges to the Doctorate (R25)

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

Innovations at the Nexus of Food, Energy and Water Systems (INFEWS)

The INFEWS program seeks to support research that conceptualizes FEW systems broadly and inclusively, incorporating social and behavioral processes (such as decision making and governance), physical processes (such as built infrastructure and new technologies for more efficient resource utilization), natural processes (such as biogeochemical and hydrologic cycles), biological processes (such as agroecosystem structure and productivity), and cyber-components (such as sensing, networking, computation and visualization for decision-making and assessment). Investigations of these complex systems may produce discoveries that cannot emerge from research on food or energy or water systems alone. It is the synergy among these components in the context of sustainability that will open innovative science and engineering pathways to produce new knowledge, novel technologies, and innovative predictive capabilities.

The overarching goal of the INFEWS program is to catalyze well-integrated, convergent research to transform understanding of the FEW Nexus as integrated social, engineering, physical, and natural systems in order to improve system function and management, address

system stress, increase resilience, and ensure sustainability. The NSF INFEWS activity is designed specifically to attain the following goals:

1. Significantly advance our understanding of the food-energy-water system of systems through quantitative, predictive and computational modeling, including support for relevant cyberinfrastructure;
2. Develop real-time, cyber-enabled interfaces that improve understanding of the behavior of FEW systems and increase decision support capability;
3. Enable research that will lead to innovative and integrated social, engineering, physical, and natural systems solutions to critical FEW systems problems;
4. Grow the scientific workforce capable of studying and managing the FEW system of systems, through education and other professional development opportunities.

This initiative enables interagency cooperation on one of the most pressing problems of the millennium - understanding interactions across the FEW nexus - how dynamics of the FEW Nexus are likely to affect our world, and how we can proactively plan for consequences. This solicitation allows the partner agencies - National Science Foundation (NSF) and the United States Department of Agriculture National Institute of Food and Agriculture (USDA/NIFA) - to combine resources to identify and fund the most meritorious and highest-impact projects that support their respective missions, while eliminating duplication of effort and fostering collaboration between agencies and the investigators they support. **Due September 26**.

Division of Materials Research: Topical Materials Research Programs (DMR-TMRP)
This solicitation applies to six DMR Topical Materials Research Programs (Biomaterials, Condensed Matter Physics, Electronic and Photonic Materials, Metals and Metallic Nanostructures, Polymers, and Solid-State and Materials Chemistry) and replaces their previous funding opportunities (respectively PD 06-7623, PD 03-1710, PD 03-1775, PD 09-1771, PD 03-1773, and PD 10-1762). It does not apply to the following Topical Materials Research Programs in DMR, which are governed by their own separate solicitations: Ceramics (NSF 16-597), and Condensed Matter and Materials Theory (NSF 16-596). All proposals submitted to these six DMR Topical Materials Research Programs (other than the following exceptions) must be submitted through this solicitation, otherwise they will be returned without review. **Due Oct. 1-Nov. 1.**

Joint DMS/NIGMS Initiative to Support Research at the Interface of the Biological and Mathematical Sciences (DMS/NIGMS)
The Division of Mathematical Sciences (DMS) in the Directorate for Mathematical and Physical Sciences (MPS) at the National Science Foundation (NSF) and the National Institute of General Medical Sciences (NIGMS) at the National Institutes of Health (NIH) plan to support fundamental research in mathematics and statistics necessary to answer questions in the biological and biomedical sciences. Both agencies recognize the need to promote research at the interface between mathematical and life sciences. This program is designed to encourage new collaborations, as well as to support innovative activities by existing teams. **Due October 1-18.**

Spencer Foundation Invites LOIs for Large-Scale Education Projects

Research Development & Grant Writing News

The Spencer Foundation is accepting Letters of Intent from investigators for its Lyle Spencer Research Awards program. Grants of up to $1 million will be awarded in support of intellectually ambitious, large-scale education research projects. In an effort to create much-needed space for creative and ambitious research projects that promise to advance our understanding of educational practice and its improvement, the program encourages proposals from scholars across a variety of disciplines and fields. To be eligible, principal investigators and co-PIs must have an earned doctorate in an academic discipline or professional field, or appropriate experience in an education research-related profession. In addition, the PI must be affiliated with a college, university, school district, nonprofit research facility, or nonprofit cultural institution that is willing to serve as the administering organization if the grant is awarded. The foundation does not award grants directly to individuals. LOIs must be received no later than October 2, 2018. Upon review selected applicants will be invited to submit a brief essay explaining the aims, context, and rationale for the proposed project. See the Spencer Foundation website for complete program guidelines, an FAQ, information about previous grant recipients, and application procedures. Link to Complete RFP . **LOI due Oct. 2.**

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**.

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**.

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**.

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.]

National Geospatial-Intelligence Agency Academic Research Program (NARP)
NGA welcomes all innovative ideas for path-breaking research that may advance the GEOINT mission. The NGA mission is to provide timely, relevant, and accurate geospatial intelligence (GEOINT) in support of national security objectives. GEOINT is the exploitation and analysis of

imagery and geospatial information to describe, assess, and visually depict physical features and geographically referenced activities on the Earth. GEOINT consists of imagery, imagery intelligence, and geospatial information. NGA offers a variety of critical GEOINT products in support of U.S. national security objectives and Federal disaster relief, including aeronautical, geodesy, hydrographic, imagery, geospatial and topographical information. The NGA Academic Research Program (NARP) is focused on innovative, far-reaching basic and applied research in science, technology, engineering and mathematics having the potential to advance the GEOINT mission. The objective of the NARP is to support innovative, high-payoff research that provides the basis for revolutionary progress in areas of science and technology affecting the needs and mission of NGA. This research also supports the National System for Geospatial Intelligence (NSG), which is the combination of technology, systems and organizations that gather, produce, distribute and consume geospatial data and information. This research is aimed at advancing GEOINT capabilities by improving analytical methods, enhancing and expanding systems capabilities, and leveraging resources for common NSG goals. The NARP also seeks to improve education in scientific, mathematics, and engineering skills necessary to advance GEOINT capabilities. It is NGA's intent to solicit fundamental research under this BAA. Fundamental research means basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from Industrial development, design, production, and product utilization, the results of which ordinarily are restricted for proprietary or national security reason. (National Security Decision Directive (NSDD) 189, National Policy on the Transfer of Scientific, Technical, and Engineering Information).NGA seeks proposals from eligible U.S. institutions for path-breaking GEOINT research in areas of potential interest to NGA, the DoD, and the Intelligence Community (IC). **Open to Dec. 31, 2018**.

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

[BAA-RQKD-2014-0001 Open Innovation and Collaboration Department of Defense Air Force -- Research Lab](#)
Open innovation is a methodology to capitalize on diverse, often non-traditional talents and insights, wherever they reside, to solve problems. Commercial industry has proven open innovation to be an effective and efficient mechanism to overcome seemingly impossible technology and/or new product barriers. AFRL has actively and successfully participated in collaborative open innovation efforts. While these experiences have demonstrated the power of open innovation in the research world, existing mechanisms do not allow AFRL to rapidly

enter into contractual relationships to further refine or develop solutions that were identified. This BAA will capitalize on commercial industry experience in open innovation and the benefits already achieved by AFRL using this approach. This BAA will provide AFRL an acquisition tool with the flexibility to rapidly solicit proposals through Calls for Proposals and make awards to deliver innovative technical solutions to meet present and future compelling Air Force needs as ever-changing operational issues become known. The requirements, terms and specific deliverables of each Call for Proposals will vary depending on the nature of the challenge being addressed. It is anticipated that Call(s) for Proposals will address challenges in (or the intersection between) such as the following technology areas: Materials: - Exploiting material properties to meet unique needs - Material analysis, concept / prototype development, and scale up Manufacturing Processes that enable affordable design, production and sustainment operations Aerospace systems: - Vehicle design, control, and coordinated autonomous and/or manned operations - Power and propulsion to enable next generation systems Human Effectiveness: - Methods and techniques to enhance human performance and resiliency in challenging environments - Man – Machine teaming and coordinated activities Sensors and Sensing Systems: - Sensor and sensing system concept development, design, integration and prototyping - Data integration and exploitation. **Open to July 12, 2019.**

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

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

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

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

Army Research Office Broad Agency Announcement for Basic and Applied Scientific Research

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

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

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

Broad Agency Announcement for the Army Rapid Capabilities Office

This Broad Agency Announcement (BAA), W56JSR-18-S-0001, is sponsored by the Army Rapid Capabilities Office (RCO). The RCO serves to expedite critical capabilities to the field to meet Combatant Commanders' needs. The Office enables the Army to experiment, evolve, and deliver technologies in real time to address both urgent and emerging threats while supporting acquisition reform efforts. The RCO executes rapid prototyping and initial equipping of capabilities, particularly in the areas of cyber, electronic warfare, survivability and positioning, navigation and timing (PNT), as well as other priority projects that will enable Soldiers to operate and win in contested environments decisively. This BAA is an expression of interest only and does not commit the Government to make an award or pay proposal preparation costs generated in response to this announcement.

Questions concerning the receipt of your submission should be directed:
http://rapidcapabilitiesoffice.army.mil/eto/

Technical questions will be sent to the appropriate Technical Points of Contact (TPOC), topic authors, and/or Subject Matter Experts (SMEs) to request clarification of their areas of interest. No discussions are to be held with offerors by the technical staff after proposal submission without permission of the Army Contracting Command-Aberdeen Proving Ground (ACC-APG) Contracting Officer. **Open to March 23, 2023.**

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

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

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

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

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

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

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

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

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

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

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

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

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

Research Development & Grant Writing News

Academic Research Funding Strategies, LLC (Page 1)
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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)