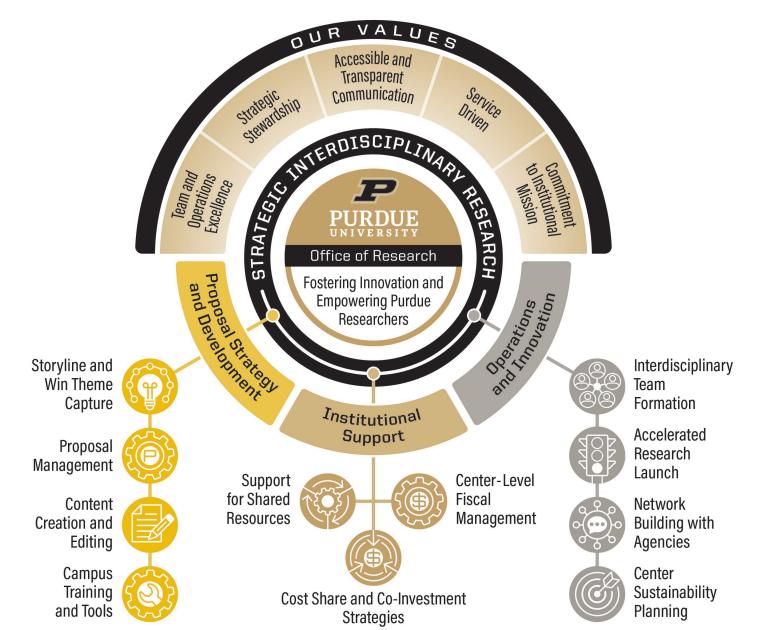
Successful Grant Mriting Strategies

Sally Bond
Director, Proposal Strategy and Development
Office of Research
September 2024



Strategic Interdisciplinary Research



Congratulations, at this time I am pleased to inform you that your application received in response to Industrial Efficiency and Decarbonization FOA has been selected for negotiation for award. Attached you will find a copy of the letter confirming your application's selection. The award number assigned to your project is DE-EE0010864

Congratulations on your successful application for the Request for Full Application (RFA)
72ASHA21RFA00001. Your application has been favorably viewed by the selection committee and approved for funding. We look forward to partnering with you in the coming years.

This email is being provided to update you on the evaluation of your proposal entitled, "Wolfpack – Enabling Teaming and Cooperative Engagement for Hypersonic Systems."

It is our pleasure to inform you that your proposal has been selected for negotiation and potential award of a project sub-agreement (PSA). Negotiations with TEES and WHS are expected to be forthcoming and we will be in touch to schedule a meeting to discuss the terms of the PSA if necessary.

The attached Notice of Award, D18HP32125-06-00 for Health Careers Opportunity Program to PURDUE UNIVERSITY, West Lafayette, Indiana is provided by the Health Resources and Services Administration (HRSA).

We are pleased to inform you that your application, "Quantum Photonic Integrated Design Center (QuPIDC)," submitted in response to DE-FOA-0003258, Energy Frontier Research Centers (EFRCs), has been recommended for an award.

Thank you for submitting the above application in response to the subject Funding Opportunity Announcement (FOA). Evaluation of your application received in response to the FOA has been completed in accordance with the merit review process contained in the announcement. After a careful review of your application, we are pleased to inform you that your project has been selected for award negotiations.

45 seconds each:

What is something that is lacking/missing/a barrier/challenge in your field and how do you want to address it?



Online Resources

Grant Writing Support

Welcome to the Research Development Services grant writing support site. Here you can access resources for your proposal development as well as request hands-on help from our team of grant writers. If you have any questions, contact sbond@purdue.edu.













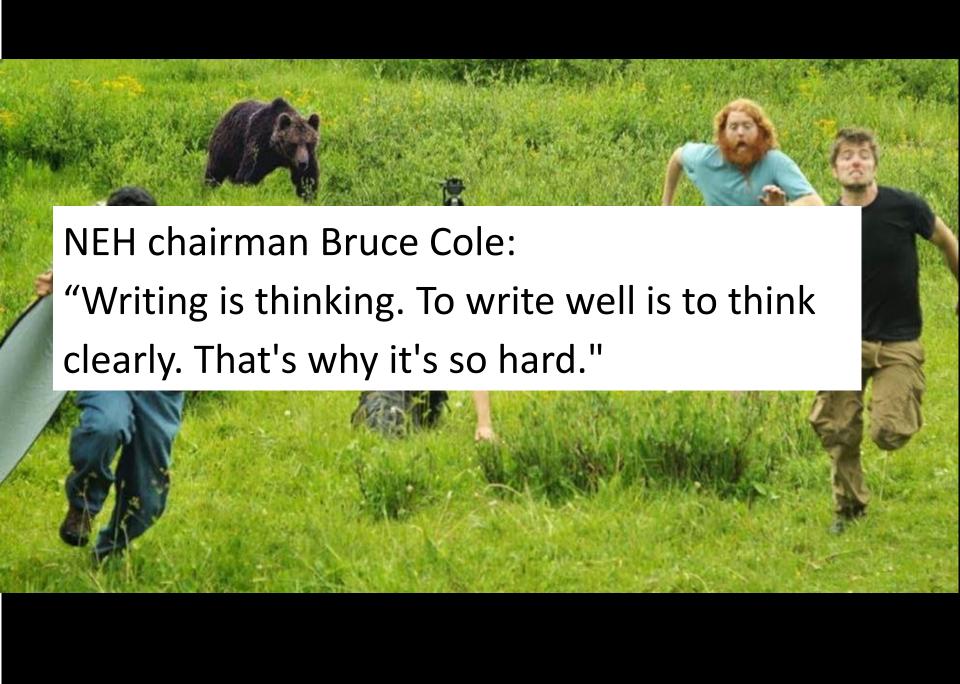




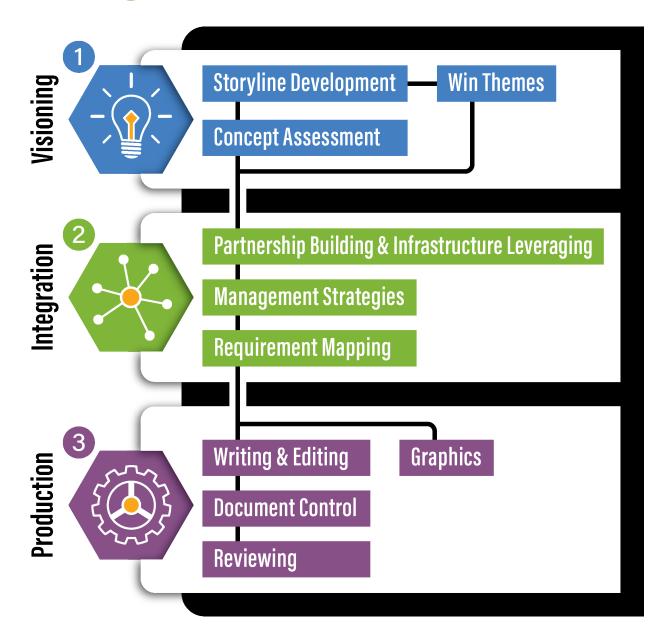








A Strategic Process



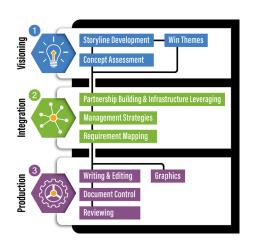
Milestone-Driven Schedule

CISE Expeditions Full Proposal Development Schedule

		Aug	Sep	Oct	Nov	Mon 12/2	Mon 12/16	Thur 12/19	Thu 12/19	Jan	Mon 2/10	Tue 2/11	Mon 2/17	Mon 2/24	Mon 3/3	Mon 3/10	Fri 3/14	Mon 3/17	Fri 3/21	Tue 3/25	Wed 3/26	5/2 3/2
	Team mtg on proposal development process/schedule																					
ı	Develop Storyline																					\vdash
	What is the problem?																					
	What has been done to address this problem?																					
	What is the gap that still remains?																					
	How do you propose to address this gap?																					
ŀ	Collaborate on prototyping projects																					\vdash
ŀ	Identify win theme and Red Panel Review team																					\vdash
	members																					
ŀ	Debrief on preproposal reviews				-																	\vdash
ŀ	Revise storyline, vision/goals, thrust/theme				 															_		⊢
	strategy, diagram				l																	
ŀ	Initial thrust strategizing/preplanning for template																					\vdash
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0	Finalize org chart/ basic management structure				Out																	⊢
5	Conduct review panel for competitive win theme				8th																	
Visioning	and storyline review with advisory board members																					⊢
	Debrief/revise after win theme review																					╙
ŀ	Finalize team organizations and personnel																					┞
	Draft initial task/milestone Gantt timeline and																					
ŀ	discuss for integration																					╙
	Identify additional graphics																					
8	Collect facilities, bios, COA, C&P, synergistic																					
Ē	activities																					
ntegration	Collect letters of collaboration																					
_	Review outline & assign leads				15th																	
L	Team writing																					
	Draft1 compile																					
	Editing iterations																					
	Draft2 compile																					
	Core team walk through of draft2																					
	Editing iterations																					
	Draft3 compile for red panel review									20th												
ı	Write summary									20th												
ı	Send draft to red panel reviewers									27th												
ı	Write data management plan																					Г
ı	Write mentoring plan																					
ı	Conduct Red Panel Review																					\vdash
ı	Debrief with core team																					\vdash
ı	Editing iterations																					\vdash
ı	Conduct final Gold Team Review																					\vdash
ŀ	Editing iterations for final narrative																					\vdash
ŀ	Submit non-tech docs to PreAward																					\vdash
1	Submit non-tech docs to PreAward																					\vdash
ŀ	Submit list of project personnel to cise-																			_		\vdash
	expeditions@nsf.gov																					
-	Develop summary ppt slide				 											\vdash				\vdash		\vdash
	Submit to NSF										-									-	\vdash	

Key Strategies

- Tell a compelling story
- Answer "Why you?"
- Be responsive to agency
- Know what reviewers need
- Plan for internal review





Tell a Compelling Story





Persuade the reviewers:

- Your idea is more important than competing ideas
- You have the right process
- You are the right people

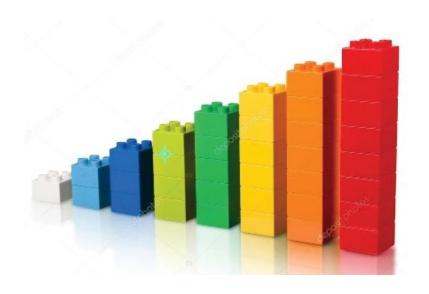


Data and Facts are Not a Story



Tell a Compelling Story

No "arbitrary" story beats or building blocks/action points.



A compelling story is not a series of "this...and then this...and then this."



Build momentum and tension with story shifts.



Instead, a compelling story has <u>causation</u> between thoughts and facts.

"This...but then this...so therefore this."



Thur

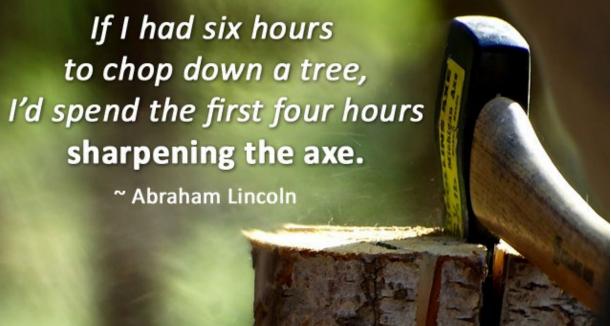
12/19

12/16

Persuasion begins with the story

CISE Expeditions Full Proposal Development Schedule

	Aug	Sep
Team mtg on proposal development		
process/schedule		
Develop Storyline		
What is the problem?		
What has been done to address this problem?		
What is the gap that still remains?		
How do you propose to address this gap?		
Collaborate on prototyping projects		
Identify win theme and Red Panel Review team		
members		
Debrief on preproposal reviews		
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Mon 3/17

3/10 3/14

3/3

Tell a Compelling Story

Strategies for the strongest proposal submission



Tell a compelling story









Plan for

- Identifies a problem beyond "it has not been done yet"
- Provides rationale and coherence for approach
 - Written for intelligent lay person
 - Hooks reviewers at outset



Strategies for the strongest proposal submission



Tell a compelling story



Answer "Why you?"



Be resp



Know



Plan for

What is the problem?

- What has been done already to address the problem?
- What is the gap that remains?
- How do you propose to address this gap?

Tell a Compelling Story

Strategies for the strongest proposal submission



Tell a compelling story



Answer "



Be resp



Know



Plan fo

What is the problem?

- What has to address
- What is the §
- How do you pi address this ga

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bse to



I propose to prepare preservice teachers to teach engineering design concepts to their elementary students.

Tell a Compelling Story

Start with phrase answers (Example from Brenda Capobianco NSF IUSE)

What is the problem?

- Next generation standards highlight integration of engineering and technology into science education
- However, current K-12 science curriculum/pedagogy does not equip teachers to include engineering in their classroom. Particularly a problem at elementary level where teachers have less preparation in science and no formal exposure to engineering

What has been done to address this problem?

- Texas UTeach, Boston Museum of Science's Engineering is Elementary, Purdue's Science Learning through Engineering Design
- Integrate engineering design for **inservice** elementary teacher
- Strong proof-of-concept that elementary teachers can effectively translate concepts

What is the gap that remains?

- Despite strong local/regional impact, not scalable or sustainable
- Requires continual district resourcing and limited capacity to reach 1.6 million elementary science teachers

How do you propose to address this gap?

Immerse preservice teachers in authentic engineering design-based science learning

Turn phrases into narrative

Continued scientific and technological innovations are critical to fostering sustained economic growth, global competitiveness, and, most importantly, meeting an increased demand for STEM talent. To harness the nation's great scientific and technological potential, attention must be given to improving the state of STEM education and to build a robust STEM workforce (PhRMA, 2014). As noted by the President's Council of Advisors on Science and Technology, "the most important factor in ensuring excellence in K-12 STEM education is great STEM teachers" (PCAST, 2015). Compounding this demand for high-quality STEM teachers is the introduction of new academic standards (NGSS Lead States, 2013). Reform documents such as A Framework for K-12 Science Education (NRC, 2012) and the Next Generation of Science Standards (NGSS Lead States, 2013) highlight the significant role science and engineering practices play in building students' early understanding of the world around them. The Framework indicates that all children should develop competencies in engineering design, and the NGSS explicitly includes a "conceptual shiff" toward "the integration of engineering and technology into the structure of science education." However, such an imminent shift cannot be realized without adjustment of K-12 science curriculum and pedagogy and a national transformation in the preparation of K-12 teachers so that teachers possess the knowledge and skills necessary to include the discipline of engineering in their classrooms. This is especially important at the elementary school level where teachers tend to have the most limited academic preparation in science (Abell, 2007; Appleton, 2007; Mellado, Blanco, & Ruiz, 1998) and essentially non-existent formal exposure to engineering (Cunningham & Carlson, 2014; Wendell, 2014).

To fill this void in professional training of elementary science teachers, considerable national strides have been made to integrate engineering design for incarrice elementary science teachers (Capobianco & Lehman, 2015; Capobianco & Rupp, 2014; Sugianis, Yang, & Cunningham, 2012; Vasar, et al., 2013; Yoon, at al., 2014). Programs such as the University of regas's **UTeach Engineering*, Boston's Museum of Science's **Engineering is **Elementary*, Purdue University's **Science Learning | **through Engineering Design (SLED) Partnership, The John Hopkins University's **STEM Achievement in **Baltimore Elementary Schools (SABES), and University of Minnesots's Engi. **TEAMS* are grounded in the delivery of high-quality, content-rich, engineering design-based experiences for insertice elementary science teachers. Results show strong proof-of-concept that elementary teachers can effectively translate engineering basics into the classroom environment. The successful NSF-funded SLED Partnership, for example, demonstrated that elementary insertice science teachers can develop deep conceptual knowledge of engineering practices, translate knowledge into teaching that facilitates students' science learning, and address both first and second-order classroom challenges with implementing engineering design-based science instruction (Capobianco & Del. isi, 2015; Capobianco, Lehman, & Kelley, 2015).

While such inequipe training has had strong impact on students and teachers across various elementary school settings, a significant gap remains in developing a nationally scalable and sustainable solution. Current insertice efforts rely on an existing base of teaching experience, require continual district resourcing for on-site or workshop-oriented training, and have limited capacity to reach the more than 1.6 million elementary science teachers nationwide (NCES, 2015). We lack a strategic, research-based nationwide process for elementary ecinocetasches appropriate to answer the call for implementing new engineering standards (Capobianco, 2012, 2015; Wendell, 2014).

To address this gap in engaged student learning, we propose a research-based project that will create an innovative, scalable, and sustainable model for elementary science teacher preparation that can address the unprecedented need to prepare elementary science teachers to teach engine enring practices nationwide. In our IUSE Using Principles of Design to Advance Teacher Education (UPDATE) project, we will draw on STEM and education expertise to collaboratively transform elementary science teacher preparation by immersing preservice teachers in authentic engineering design-based science learning tasks in a sequence of core required undergraduate science content courses. We will utilize the constructs of situated learning and teacher as learner to uncover, evaluate, and explain the multiple and diverse ways preservice elementary teachers learn engineering practices, how they begin to conceptualize engineering design, and how they most effectively teach elementary school science using engineering practices.

Tell a Compelling Story

Libai Huang, Biomedical Engineering

What is the problem?
What has already been done to address this problem?
What is the gap that still remains?
How do you propose to address this gap?

Simultaneous spatial and temporal resolutions are crucial for probing dynamic processes that span multiple time and length scales in materials and biological systems. However, while electron microscopy can provide atomic spatial resolution, it has little temporal resolution; similarly, ultrafast spectroscopy offers excellent femtosecond temporal resolution but limited spatial resolution. These resolutions remain separately optimized in conventional spectroscopy and microscopy methods and hinder the elucidating of structural and dynamic factors.

To achieve combined spatial and temporal resolutions, researchers have combined ultrafast nonlinear spectroscopy with microscopy approaches, including optical microscopy, electron microscopy, scanning tunneling microscopy, and scanning probe microscopy. Importantly, using nonlinear spectroscopic signals as imaging contrast has the advantage of providing chemical, structural, and excited-state specific information and is especially useful in probing complex and dynamic interactions.

However, as the nonlinear optical processes are generally much weaker than linear ones, these signals require long integration time at each pixel. As a result, ultrafast nonlinear optical microscopy experiments are time intensive—acquisition time for a single image frame is minutes or hours—and interpretation of nonlinear spectroscopic signals is a daunting task for nonspecialists. Due to these obstacles, ultrafast microscopy has been almost exclusively available in specialized laboratories, which limits wide-range application.

We will address this research gap by developing a novel machine learning multimodal ultrafast optical imaging platform with adaptive sampling across the multidimensional spatiotemporal hypersurface to reduce optical exposure and measurement time by ~100 fold with no significant loss in reconstructed image quality. This novel microscope will enable investigations on energy and heat flow in complex materials and biological systems over a wide range of time scales (10 fs-μs) and length scales (50 nm-μm), which is not currently possible with conventional spectroscopy and microscopy methods.

INFEWS/T2: Identifying Sustainability Solutions through Global-Local-Global Analysis of a Coupled Water-Agriculture-Bioenergy System

The global Food-Energy-Water (FEW) system is under increasing pressure to meet rising demands for food, energy, and water while maintaining ecosystem services provided by natural lands and waters. With growing population, rising per capita incomes, and climate change, researchers predict unprecedented resource challenges in the next 30 years. Global crop output is expected to increase by anywhere from 70% to more than 100%; global freshwater demand by 55% as one of the most fiercely contested resources; and global bioenergy demand by more than 1,000%. These challenges are interconnected—both across systems and across scales—so that addressing one system or location will inevitably cascade into others. Decision makers without the capacity to factor in these interconnections risk inadvertently pursuing unsustainable solutions and unintended consequences flowing from FEW system interventions.

Research has focused on analyzing effects within socioeconomic systems and within natural systems and is moving toward increased integration that emphasizes the role of spillover effects from one system to another. Global integrated assessment modeling research provided critical inputs to address tradeoffs between alternative sustainability solutions. However, such analyses typically omit at least one of the four systems— food security, bioenergy, water quality, and groundwater scarcity—and do not account for socioecological feedbacks. As a result, despite significant investments made by the integrated assessment communities at both global and regional scales, a critical research gap remains in our ability to assess sustainability solutions that have both cross-system and cross-scale components. The absence of feedback from local actions to regional, national, and global effects makes it nearly impossible to achieve a complete analysis of tradeoffs associated with alternative policy and management interventions.

We will address this knowledge gap by building an integrative framework for analysis of FEWS solutions that highlights synergies and tradeoffs resulting from multiple policy levers and thereby allows the development of more comprehensive sustainability solutions. We will begin with the analysis of individual interventions (levers) and progress to multiple interventions that reveal how policy levers interact across systems and scales for a Global to Local to Global community of practice. Our three goals are to:

- **Goal 1. Single-lever analysis**: Establish system behavior and identify the performance of individual levers and feedbacks to the larger integrated system via cascading pathways of impacts.
- Goal 2. Multiple-lever analysis: Using the integrated system, identify high-performing strategies composed of multiple levers that reveal the trade-offs, synergies, and economic costs associated with managing FEWS challenges.
- **Goal 3. Community of Practice:** Foster development of a community of practice utilizing Global-Local-Global methods to examine integrative solutions to these FEWS challenges.

Tom Hertel
Distinguished
Professor of
Agricultural
Economics
NSF INFEWS 2018

What is the Problem?

The global Food-Energy-Water (FEW) system is under increasing pressure to meet rising demands for food, energy, and water while maintaining ecosystem services provided by natural lands and waters. With growing population, rising per capita incomes, and climate change, researchers predict unprecedented resource challenges in the next 30 years. Global crop output is expected to increase by anywhere from 70% to more than 100%; global freshwater demand by 55% as one of the most fiercely contested resources; and global bioenergy demand by more than 1,000%. These challenges are interconnected—both across systems and across scales—so that addressing one system or location will inevitably cascade into others. Decision makers without the capacity to factor in these interconnections risk inadvertently pursuing unsustainable solutions and unintended consequences flowing from FEW system interventions.

What has been Done Already?

Research has focused on analyzing effects within socioeconomic systems and within natural systems and is moving toward increased integration that emphasizes the role of spillover effects from one system to another. Global integrated assessment modeling research provided critical inputs to address tradeoffs between alternative sustainability solutions.

What is the Gap that Still Remains?

However, such analyses typically omit at least one of the four systems— food security, bioenergy, water quality, and groundwater scarcity—and do not account for socioecological feedbacks. As a result, despite significant investments made by the integrated assessment communities at both global and regional scales, a critical research gap remains in our ability to assess sustainability solutions that have both cross-system and cross-scale components. The absence of feedback from local actions to regional, national, and global effects makes it nearly impossible to achieve a complete analysis of tradeoffs associated with alternative policy and management interventions.

How do You Propose to Address this Gap?

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Maggie O'Haire (NIH R01)

What is the problem?
What has been done already to address this problem?
What is the gap that still remains?
How do you propose to address this gap?

With an estimated 16.8 military Veterans committing suicide each day, posttraumatic stress disorder (PTSD) is a critical public health concern. This disorder is complex, often comorbid, and difficult to treat. Although current psychosocial rehabilitation strategies are successful for some individuals, limited effectiveness and palatability for some Veterans have led to treatment dropout and non-response rates as high as 50%. Many of these Veterans seek complementary and integrative health interventions² such as partnership with a PTSD service dog³. To evaluate this intervention and prepare for the proposed large-scale project, we conducted an NIH-funded feasibility and preliminary efficacy trial (R21HD091896). Our results indicated clinically significant reductions in PTSD symptoms for Veterans with service dogs. Yet despite our preliminary results and encouraging initial findings from independent research groups, substantial gaps remain in understanding how, why, and for whom PTSD service dogs are most effective. Without such knowledge, this human-animal interaction strategy will continue to be minimized as a poorly evaluated distraction from evidence-based treatment rather than a valuable addition with clinically meaningful impacts.

Our <u>research goal</u> is to evaluate the longitudinal efficacy, mechanisms, and moderators of service dogs as a complementary intervention to enhance biopsychosocial functioning. We will conduct a methodologically rigorous, multi-site, randomized clinical trial to quantify the therapeutic efficacy of service dogs for N=240 Veterans with PTSD.

Where does the storyline belong in the proposal?

As soon as solicitation allows!

- In overview, rationale, or vision and goals
- ~1/2 to 2/3 page

NIH

- In significance section and condensed version at start of specific aims page
- ~ 1/4 to 1/3 page on specific aims page



Tips

- Color code to check the funnel of logic
- Adjust level of specificity
- Use "umbrella language" to avoid lists
- A need is an answer and not a problem

Storyline Practice

- What is the problem? (and so what)
- What has been done already to address this problem?
- What is the gap that still exists?
 (and so what)
- How do you propose to address this gap?



Storyline to One-Page Concept Paper



Preparing for a Successful Meeting with Your Program Officer

- ♦— You are more likely to receive valuable insight into the funding potential of your idea if you follow these steps:
 - Make contact early (at least several months in advance).
 - Do not make a "cold call." Email a one-page concept paper along with your agency biosketch and request a phone appointment to discuss.
 - Develop your concept paper using the format below. Grant writers in the Office of Research and Partnerships can help you develop this text. Email sbond@purdue.edu to request help.
- Why a one-pager? Distilling your ideas into a brief summary one that starts with a compelling storyline — will best communicate project relevance, highlight the logic of your approach, and allow targeted rather than general feedback. Many program officers will not read more than one page since multiple pages represent a proposal review rather than an idea review. While you will not be told if you are "fundable," the program officer can assess for program fit.

For NIH Use Specific **Aims Page**

- Start with storyline:
 - · What is the human health problem?
 - What has been done already to address this problem?
 - What is the gap that still exists?
 - How do you propose to address this gap?
- Briefly mention why this team is ideal for the project.
- Aim X: Use a bold, concrete objective for each aim. Describe each aim in one to three sentences that convey why this work needs to be done as well as what and how.
- End with paragraph on expected outcomes.

For All Other Funding Agencies Use Concept Page

- Start with storyline:
 - · What is the problem?
 - What has been done already to address this problem?
 - What is the gap that still exists?
 - How do you propose to address this gap?
- List your goals/objectives.
- Describe why this team is ideal for the project.
- Overview methodology.
- Summarize impact of your success.



Office of the Executive Vice President for Research and Partnerships



Storyline to One-Page Concept Paper



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List your goals/objectives.

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- Overview methodology.
- Summarize impact of your success.



Office of the Executive Vice President for Research and Partnerships

Final Production for Email Request

INFEWS/T2: Identifying Sustainability Solutions through Global-Local-Global Analysis of a Coupled Water-Agriculture-Bioenergy System

Thomas Hertel (PI) Distinguished Professor of Agricultural Economics Purdue University

The global Food-Energy-Water (FEW) system is under increasing pressure to meet rising demands for food, energy, and water while maintaining ecosystem services provided by natural lands and waters. With growing population, rising per capita incomes, and climate change, researchers predict unprecedented resource challenges in the next 30 years. Global crop output is expected to increase by anywhere from 70% to more than 100%; global freshwater demand by 55% as one of the most fiercely contested resources; and global bioenergy demand by more than 1,000%. These challenges are interconnected—both across systems and across scales—so that addressing one system or location will inevitably cascade into others. Decision makers without the capacity to factor in these interconnections risk inadvertently pursuing unsustainable solutions and unintended consequences flowing from FEW system interventions.

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- Goal 3. Community of Practice: Foster development of a community of practice utilizing Global-Local-Global methods to examine integrative solutions to these FEWS challenges.

Our open-source framework will strategically build on a portfolio of internationally vetted tools we have previously authored as global models of hydrology and water quality (WBM), food systems (SIMPLE-G), bioenergy (ENVISAGE), and U.S. agro-ecology (Agro-IBIS). Our experienced, interdisciplinary team of researchers have a history of productive collaboration across areas of global economic analysis of agriculture and environmental issues, policy trade-offs, and synergies associated with sustainability challenges, hydrology, and water quality. Our novel geospatial science gateway Geo-Hub, will provide a proven cyber platform to accelerate progress toward project milestones.

The proposed system of systems will allow us to evaluate trade-offs and synergies across the FEW system for a suite of sustainability solutions. This framework will inform local/regional decision-making about sustainability goals by developing an open source, gridded FEW modeling system. Powered by NSF-funded technologies GeoHub on HUBzero and utilize GABBs (geospatial data building blocks), as well as the XSEDE computational backbone, the framework will allow fine-scale analysis across broad geographies. We will analyze global drivers of local sustainability stresses as well as feedbacks to national and international levels stemming from local adaptations to national/international FEWS stressors. This will deliver a more complete analysis of tradeoffs associated with different policies and pathways. Education and outreach on the GeoHub will provide spatial analysis capabilities to stakeholders and non-experts without requiring local software resources.



Storyline to One-Page Concept Paper

One-page...taste of your entire grant in a single, bite-sized piece

It forces you to distill all aspects down to their essences and to find a way of piecing things together that is economical, coherent, logical, and compelling [...] is totally unforgiving, revealing problems in the clarity of your thinking and presentation, weaknesses in the logic of your research, vaqueness in your methods, and failures in the all-important 'so what?' realm. Given the luxury of length, additional verbiage has a way of camouflaging weaknesses (at least from the writer but not so often from the reviewer).

—Robert Levenson, UC-Berkeley



Strategies for the strongest proposal submission



Tell a compelling story



Answer "Why you?"



Be resp



Know wh



Plan for in

- Identify win differentiators of expertise, facilities, prior work, campus environment, location
- Build team strategically not out of convenience
- Think people and institutions

Answer "Why You?"

Our open-source framework will strategically build on a portfolio of internationally vetted tools we have previously authored as global models of hydrology and water quality (WBM), food systems (SIMPLE-G), bioenergy (ENVISAGE), and U.S. agro-ecology (Agro-IBIS). Our experienced, interdisciplinary team of researchers have a history of productive collaboration across areas of global economic analysis of agriculture and environmental issues, policy trade-offs, and synergies associated with sustainability challenges, hydrology, and water quality. Our novel geospatial science gateway, GeoHub, will provide a proven cyberplatform to accelerate progress toward project milestones.



Requirement mapping



Tell a compelling story



Answer "Why you?"



Be responsive to agency



Know wha



Plan for int

- Follow all instructions
- Always outline before writing



Know agency guidelines as well as solicitation

NATIONAL SCIENCE FOUNDATION

PROPOSAL AND AWARD POLICIES AND PROCEDURES GUIDE





Effective May 20, 2024 NSF 24-1 OMB Control Number 3145-0058

Faculty Early Career Development Program (CAREER)

Includes the description of NSF Presidential Early Career Awards for Scientists and Engineers

PROGRAM SOLICITATION

NSF 22-586

REPLACES DOCUMENT(S):

NSF 20-525



National Science Foundation

Directorate for Biological Sciences Directorate for Computer and Information Science and Engineering

Directorate for STEM Education

Directorate for Engineering

Directorate for Geosciences

Directorate for Mathematical and Physical Sciences

Directorate for Social, Behavioral and Economic Sciences

Office of Integrative Activities

Office of International Science and Engineering

Directorate for Technology, Innovation and Partnerships

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):

July 27, 2022

Fourth Wednesday in July, Annually Thereafter

IMPORTANT INFORMATION AND REVISION NOTES

Deadline changed to the 4th Wednesday of July at 5:00pm local time. Changed from the 4th Monday of July.

New optional single copy document for PECASE eligibility statement

Clarification language added for departmental chair letter supplementary document.

Other Important Information

- The PI needs to meet all eligibility criteria as of the annual deadline
- Clarification regarding the minimum percentage appointment (tenue-track and tenure-track equivalent) for eligibility to the program
 Only one annual deadline applies to all CAREER submissions, regardless of Directorate
 Added guidance on the CAREER proposal submission timeline

Innovating and migrating proposal preparation and submission capabilities from FastLane to Research.gov is part of the ongoing NSF information technology modernization efforts, as described in Important Notice No. 147. In support of these efforts, research proposals submitted in response to this program solicitation must be prepared and submitted via Research.gov or via Grants.gov, and may not be prepared or submitted via FastLane

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised NSF Proposal & Award Policies & Procedures Guide (PAPPG) (NSF 22-1), which is effective for proposals submitted, or due, on or after October 4, 202

SUMMARY OF PROGRAM REQUIREMENTS

General Information



Know agency guidelines as well as solicitation

Department of Health and Human Services

Part 1. Overview Information Participating Organization(s) National Institutes of Health (NIH) Components of Participating Organizations National Institute of General Medical Sciences (NIGMS) **Funding Opportunity Title** Biomedical Technology Optimization and Dissemination Center (BTOD)(RM1-Clinical Trial Not Allowed) **Activity Code** RM1 Research Project with Complex Structure Announcement Type Reissue of PAR-20-104 See Notices of Special Interest associated with this funding opportunity Related Notices August 25, 2023 - Notice of NIGMS Informational Webinar for PAR-23-110, See Notice NOT-GM-23-052 NOT-OD-22-195 - New NIH "FORMS-H" Grant Application Forms and Instructions Coming for Due Dates on or after January 25, 2023 NOT-OD-22-189 - Implementation Details for the NIH Data Management and Sharing Policy NOT-OD-22-198 - Implementation Changes for Genomic Data Sharing Plans Included with Applications Due on or after January 25, 2023 NOT-OD-23-012 - Reminder: FORMS-H Grant Application Forms & Instructions Must be Used for Due Dates On or After January 25, 2023 - New Grant Application Instructions Now Available Funding Opportunity Announcement (FOA) Number PAR-23-110 **Companion Funding Opportunity** None Number of Applications See Section III. 3. Additional Information on Eligibility Assistance Listing Number(s) **Funding Opportunity Purpose** This Funding Opportunity Announcement (FOA) encourages applications for NIGMS Biomedical Technology Optimization and Dissemination (BTOD) Centers to support late-stage technology optimization and sustainable dissemination of the technology to the wider biomedical research community. A BTOD Center should be at the leading edge of its field with respect to both technology development and engagement with relevant research communities BTOD projects should address biomedical research areas within the NIGMS mission. This FOA is an update of the funding opportunity for the Biomedical Technology Development and Dissemination (BTDD) Centers (PAR-20-104). Potential

applicants are strongly encouraged to consult with NIGMS staff about adherence of their proposed research strategy to the

FORMS VERSION G SERIES

Released: October 25, 2021



GENERAL INSTRUCTIONS FOR NIH AND OTHER PHS AGENCIES

SF424 (R&R) Application Packages

Guidance developed and maintained by NIH for preparing and submitting applications via Grants.gov to NIH and other PHS agencies using the SF424 (R&R)



Requirement mapping

- Eligibility, font, page limits
- Prescriptive organization
- Key language and cited documents
- Merit review criteria in multiple locations

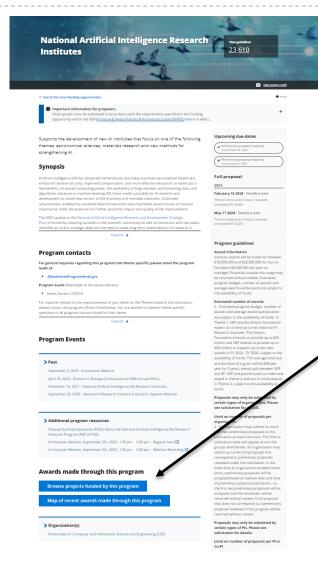


Do some sleuthing

- Project scope and budget
- Team composition and institution
- Education and diversity integration
- Translation expectations
- For NIH, what institute and study section



Do some sleuthing



Awards made through this program

Browse projects funded by this program

Map of recent awards made through this program

AI Institute: Institute for Foundations of Machine Learning

Award Number: 2019844; Principal Investigator: Adam Klivans; Co-Principal Investigator:; Organization: University of Texas at Austin; NSF Organization: CCF Start Date: 09/01/2020; Award Amount: \$17,500,000.00; Relevance: 48.0;

AI Institute: AI Research Institute for Fundamental Interactions

Award Number: 2019786; Principal Investigator: Jesse Thaler; Co-Principal Investigator: Matthew Schwartz, Taritree Wongjirad, Mike Williams, James Halverson; Organization: Massachusetts Institute of Technology; NSF Organization: PHY Start Date: 11/01/2020; Award Amount: \$16,300,000.00; Relevance: 48.0;

PARTNER: An AI/ML Collaborative for Southeast Florida Coastal Environmental Data and Modeling Center

Award Number: 2331908; Principal Investigator: Jason Liu; Co-Principal Investigator: Philippe Tissot, Ruoying He, Leonardo Bobadilla, Jayantha Obeysekera; Organization: Florida International University; NSF Organization: IIS Start Date: 09/01/2023; Award Amount: \$2,624,092.00; Relevance: 48.0;

Molecule Maker Lab Institute (MMLI): An AI Institute for Molecular Discovery, Synthetic Strategy, and Manufacturing

Award Number: 2019897; Principal Investigator: Huimin Zhao; Co-Principal Investigator: Scott Denmark, Martin Burke, Saurabh Sinha, Ying Diao, Jian Peng; Organization: University of Illinois at Urbana-Champaign; NSF Organization: CHE Start Date: 09/01/2020; Award Amount: \$19,000,000.00; Relevance: 48.0;

Institute for Trustworthy AI in Law and Society (TRAILS)

Award Number:2229885; Principal Investigator:Hal Daume; Co-Principal Investigator:Thomas Goldstein, Katherine Shilton, Susan Aaronson, David Broniatowski; Organization:University of Maryland, College Park;NSF Organization:IIS Start Date:06/01/2023; Award Amount:\$7,626,273.00; Relevance:48.0;

CAP: AI-Ready Institution Transforming Tomorrow's Research and Education with AI Focused on Health and Security (Jag-AI)

Award Number: 2334243; Principal Investigator: Jeong Yang; Co-Principal Investigator: Zechun Cao, Gongbo Liang, Young Lee; Organization: Texas A&M University-San Antonio; NSF Organization: IIS Start Date: 01/01/2024; Award Amount: \$385,475.00; Relevance: 48.0;

AI Institute for Future Edge Networks and Distributed Intelligence (AI-EDGE)

Award Number: 2112471; Principal Investigator: Ness Shroff; Co-Principal Investigator: James Kurose, Elisa Bertino, Robert Nowak, Gauri Joshi; Organization: Ohio State University; NSF Organization: CNS Start Date: 10/01/2021; Award Amount: \$13,487,334.00; Relevance: 48.0;

AI Institute: Planning: Institute for AI-Enabled Materials Discovery, Design, and Synthesis

Award Number: 2020243; Principal Investigator: Vasant Honavar; Co-Principal Investigator: Dane Morgan, Adri van Duin, Elsa Olivetti, Mehrdad Mahdavi; Organization: Pennsylvania State Univ University Park; NSF Organization: DMR Start Date: 09/01/2020; Award Amount: \$500,000.00; Relevance: 48.0;

AI Institute for Adult Learning and Online Education (ALOE)

Award Number: 2247790; Principal Investigator: Ashok Goel; Co-Principal Investigator:; Organization: Georgia Tech Research Corporation; NSF Organization: DRL Start Date: 11/01/2022; Award Amount: \$10,063,655.00; Relevance: 48.0;

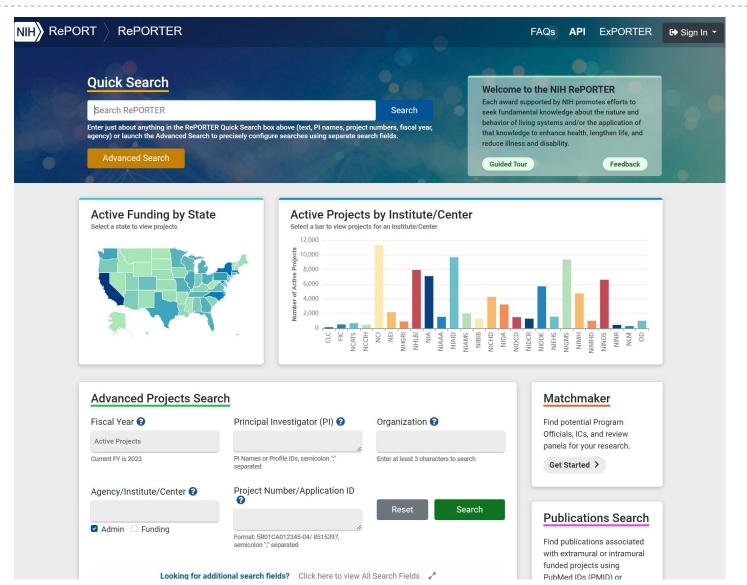
Collaborative Research: EarthCube Data Capabilities: Enabling Analysis of Heterogeneous, Multi-source Cryospheric Data

Award Number: 2026962; Principal Investigator: Morteza Karimzadeh; Co-Principal Investigator: Walter Meier, Siri Jodha Khalsa, Andrew Barrett; Organization: University of Colorado at Boulder; NSF Organization: RISE Start Date: 09/01/2020; Award Amount: \$948,184.00; Relevance: 48.0;

AI Institute for Edge Computing Leveraging Next Generation Networks (Athena)



NIH RePORTer http://projectreporter.nih.gov/reporter.cfm.





Never write without an outline!

		Aug	Sep	0ct	Nov	Mon	Mon	Thur	Thu	Jan	Mon	Tue	Mon	Mon	Mon	Mon	Fri	Mon	Fri	Tue	Wed	Fri
						12/2	12/16	12/19	12/19		2/10	2/11	2/17	2/24	3/3	3/10	3/14	3/17	3/21	3/25	3/26	3/28
	Team mtg on proposal development																					
	process/schedule																					
	Develop Storyline																					
	What is the problem?																					1
	What has been done to address this problem?																					1
	What is the gap that still remains?																					1
	How do you propose to address this gap?																					
	Collaborate on prototyping projects																					
	Identify win theme and Red Panel Review team																					1
	members																					
	Debrief on preproposal reviews																					
	Revise storyline, vision/goals, thrust/theme																					1
	strategy, diagram																					
	Initial thrust strategizing/preplanning for template																					
0	Finalize org chart/ basic management structure																					
녍	Conduct review panel for competitive win theme				8th																	
Visioning	and storyline review with advisory board members																					
>	Deprietrevise after win therne review																					
	Finalize team organizations and personnel																					
	Draft initial task/milestone Gantt timeline and																					
	discuss for integration																					
	Identify additional graphics																					
9	Collect facilities, bios, COA, C&P, synergistic																					
tegration	activities																					
je																						
-	Review outline & assign leads				15th																	
	Team writing																					
	Draft1 compile																					
	Editing iterations																					
	Draft2 compile																					
	Core team walk through of draft2																					
	Editing iterations																					
	Draft3 compile for red panel review									20th												
	Write summary									20th												
	Send draft to red panel reviewers									27th												
	Write data management plan																					
	Write mentoring plan																					
	Conduct Red Panel Review				1																	-
	Debrief with core team																					
	Editing iterations																					
	Conduct final Gold Team Review										1											
	Editing iterations for final narrative																					
	Submit non-tech docs to PreAward																					_
	Submit tech docs to PreAward																					
	Submit list of project personnel to cise-										†											_
	expeditions@nsf.gov																					ı
	Develop summary ppt slide										†											_
	Submit to NSF				†																	



Map requirements to outline

Example of NSF-style proposal outline

1. RATIONALE [2.5 pages]

- Storyline
 - o What is the problem?
 - o What has been done already?
 - o What is the gap that still remains?
 - o What do you propose to do to address this gap?

Goals and Objectives

· List goals and objectives (per goal)

Team Partnership

- Team expertise
- Targeted teacher and/or community college faculty participants
- Institutional commitment

Broader Impacts

- · curriculum accessed by underrepresented students through targeted teacher recruitment
- community-based research activities
- integrating research activities into computing-related courses in local high schools
- · role models from HCBU partner on HUBzero webinars
- presentation to parent-teacher organizations to include assessment results from DLRCcollected metrics
- presentations at both technology education conferences as well as K-12 STEM learning

2. NATURE OF TEACHER ACTIVITIES [3.5 pages]

- · Need clearly articulated research projects and activities
 - o Map to goals/objectives
- · Teachers must be involved in research project for at least 6 weeks
- Must have orientation session at beginning of the program for the teachers to acquaint them with laboratory methods, safety procedures, analytical methods, etc
- · Address approach to research training being undertaken

Research Project

· Include overview statement of spectrum of research projects

Project 1

- · Provide detailed descriptions of examples of research projects
 - o Include who is doing what role
- · Present plans that will ensure the development of RET participant-faculty interaction and
- How will you facilitate development of collegial relationships and interactions as teachers work closely in teams with university faculty and students?

- · Provide detailed descriptions of examples of research projects o Include who is doing what role
- Present plans that will ensure the development of RET participant-faculty interaction and communication
- · How will you facilitate development of collegial relationships and interactions as teachers work closely in teams with university faculty and students?

Project Timetable

- · Need Gantt-style chart such as this.

Program Initiatives	Year one	Year Two	Year Three	Year Four	Year Five		
CICAWEST Administration			•	•			
Advisory Board Meeting							
D&I Team and COD meeting							
Mentoring Academy							
Training of coaches/chairs							
Mentoring pairs							
Departmental Transformation			•	•			
Diversity Forums							
Chairs/Dept Heads @ PU							
All Three Institutions							
Transformational Team Visits							
NCWIT Visiting Committees							
Promotion and Tenure Review							
Building Networks			•				
Summit							
Invited Lectures							
Evaluation and Assessment							
STEM Climate Assessment							
Space/Resource Inventory							
Coaching Measures							
Mentor/Mentee percp/self-eff/prod Attitudinal Surveys							
Deans and Heads							
Faculty							
Network Analysis							
External Project Analysis							
Dissemination							
Website							
CIC Women in Academia							
Summit Attendees Mailings							
Publications							
National Presentations							

3. RESEARCH ENVIRONMENT [2.5 pages]

- Describe the experience and record of involvement with K-12/community college education and research of the PI
- Describe faculty who may serve as research mentors. Consider table such as:

Mentor Name	Dept/School	Expertise

- Describe institution
 - o Include emphasis on cross-disciplinary partnership and past record of success in cross-disciplinary collaborations



Map requirements to outline

- 1. Integrative Research
- 2. COMMUNITY ENGAGEMENT
- 3. MANAGEMENT PLAN
- 4. EVALUATION PLAN
- 5. SCALABILITY, TRANSFERABILITY, AND SUSTAINABILITY
- 6. Broader Impacts



Map requirements to outline

- 1. INTEGRATIVE RESEARCH
- 2. COMMY MENT
- 3. MAN NT PLAN
- 4. EVA TION N
- 5. SCALLILITY, THE SILITY, AND SUSTA PILITY
- 6. Broader ...



Supposted SCC Outline

1. INTEGRATIVE RESEARCH

- How do you propose to address this gap. Include how you will:
 address basic, foundational research
- address both technological and social science dimensions
 engage a clearly identified community and how they will be integral to the

- concepts

 o Short, medium, and long-term impact on engaging technological and social science
- o Potential for transferability and scalability

1.1 Integrated Social and Technological Goals and Research Questions [1 page including figure] List 3-4 high-level project goals

Research Questions

o detail the specific technological and social science research questions, hypotheses, and research
gaps you will address in order to accomplish your project goals

- Social and Technological Integration

 Summarize how your team will meaningfully integrate across both social and technological research dismensions to address these questions and accomplish these goals (reference figure)

 frame the social and technological dimensions as how you are exploring them in concert as they impact one another in the short, medium and long term.

Background and Preliminary Work [1-1.5pgs]
 overview 1-3 sentences that provide a roadmap for this section
 arrange topically

Tonical Title

Topical Title

- 1.3 Research Plan [-6-7 pgs]
 o overview of approach: how research is organized and integrated
 - summarize in what ways (if any) this is high risk, high reward research how this is a multidisciplinary effort

- Thrust 1 (title)
 Name, Institution (lead); Name, Institution (Co-Lead), Name, Institution
 o thrust challenges
 o key objectives of the thrust
 o roadmap of tasks
- Task 1.1[title]. Inline text of methodology.
- Task 1.2 [title]. Inline text of methodology

Thrust 1 Deliverables:

Thrust 2 [title] Name, Institution on (lead): Name, Institution (Co-Lead), Name, Institution

- thrust challenges key objectives of the thrust roadmap of tasks

- Task 2.2 (title) Inline text of methodology
- Task 2.3 [title] Inline text of methodology

Thrust 2 Deliverables:

- Thrust 3 [title]
 Name, Institution (lead); Name, Institution of thrust challenges
 o key objectives of the thrust
 o roadmap of tasks on Goods: Name Institution (Co. Lead). Name Institution
- Task 3.1[title], Inline text of methodology
- Task 3.2 [title]. Inline text of methodolog-

Thrust 2 Deliverables: Risk Mitigations Since this is high risk high reward research, describe any risk mitigations for your integrated

- 2. COMMUNITY ENGAGEMENT [1.5-2pgs]

- Participating Community Stakeholders
 describe each stakeholder and provide rationale for inclusion
 consider a table at outset to overview stakeholder team and the

- 2.2 Collaborative Subhabder Experiment

 of deliveriment and include the effect energy of the commonly experiment that is integral to the research
 include way in which investigation commonly stateholders will work closely to
 develop, pilet, and evaluate centeries approaches to accomplish project goals

 how they are involved in project and proposal formulation?

 or clarify how then engineement will be estimated forcelypools accessor of sewed

3. MANAGEMENT PLAN [2.5-3 pgs]



describe specific roles and responsibilities
 systematically walk through the org chart and describe roles of each box

3.1 Team Technical and Social Science Expertise

- selected communities

 ohighlight how the expertise of each PI or co-PI will enable the project team to address the technical and social sciences research dimensions of the project and work with the
- selected communities

 bold first mention of each person

 consider organizing either per person or (preferably) in topical paragraphs of types of

3.2 Results from Prior NSF Support • report on one project per PI and co-PI. Use common format, e.g.

NEES Operations (2021/119, \$11,12,128) (20000-2020) P. P. Julio Emmer. Product University in Competitive agreement, will have image, operant, and manatement Concept E. Ricoru. J. Newcork (2021) P. P. Scholler and Competitive Competiti experimental data from work at NELS Laborations also from international partners, extensive simulation resources, and an other of research-pedie inquiry tools and streamlisted data sharing capabilities. NEESSing now has 700 registreed users, thousands of data downloads from the Project Warehouse per quarter, and more than 5,500 contributor from over 182 rations. Publications, products, products, rotod: NEESSing platform for cyber collaboration; Buckle and Ramirez, 2010, Ramirez, 2010, and Browning et al. 2013.

3.3 Collaboration Mechanisms and Timeline

- Collaboration Mechanisms and Limetime
 describe communication methods, processes, platforms, gg, that will help you manage across
 disciplines, institutions, and community entities
 describe how tasks will be integrated over course of project
 provide timeline with principal tasks, milestones and associated interactions, e.g. example format

4 EVALUATION PLAN (1 pc)

finition of success related to goals and including metrics to evaluate

- Milestones (with embedded evaluation) to track progress are shown for each themes below.

 Theme | Activity Milestones (examples) | Vision of Final Outcomes | Thomax Activity Mideotones (exemples) | Misson Plant Outeness | Misson Plant · describe criteria, metrics, and methods for assessing progress and outcomes, appropriate to the
- proposal.

 Si Violustion may employ say of a variety of systematic methods: qualitative and/or quantitative methods, public participation in data collection, perside and/or longitudinal successfully evaluate the regular observation requires to intensively improve the successfully evaluated the requires the intensively improved to intensively improved.

 I deemly key time point ministension at which you will assess progress towards achieving successful contension of research and politonic (reference intension ministension as appropriate)

5. SCALABILITY, TRANSFERABILITY, AND SUSTAINABILITY [3/4 PAGE]

- identify expected outcomes that have the potential to be scaled and transferred to other communities, the population size that will be directly affected by them in their project, and the characteristics of other communities (e.g.,demographics, size, geographics) that could benefit
- -marateristics or ourse communities of the project team have the capability (e.g., influence experience and networks) to develop pathways to sustain successful project customes in the los

6. BROADER IMPACTS 13/4 PAGE

- Describe the project's potential desired societal outcomes. E.g. ial to benefit society and contribute to the achievement of specific
- inspact of transferanciary and resistancy
 in significant control in the control of the control o
- support/broader-impacts.php



Map requirements to outline

Goal 1: [title] (1.5 pages)

Name (lead); Names

Provide overview of objectives so reviewers have a roadmap

Objective 1.1 [Title]

- Describe tasks
 - o Include one technical figure
 - Identify novel methodology
- Outline risk mitigations
- Describe outcomes and integration

Objective 1.2 [Title]

- Describe tasks
 - o Include one technical figure
 - Identify novel methodology
- Outline risk mitigations
- Describe outcomes and integration

Goal 2: [title] (1.5 pages)

Name (lead); Names

Provide overview of objectives so reviewers have a roadmap

Objective 2.1 [Title]

- Describe tasks
 - o Include one technical figure
 - Identify novel methodology
- Outline risk mitigations
- Describe outcomes and integration





Tell a compelling story



Answer "Why you?"



Be responsive to agency



Know what reviewers need



Plan for in

- Enable fast/quality review
- Use formatting as roadmap
- Think visually
- Write clear and concise

Enable a fast and quality review

The secret to editing your work is simple: you need to become its reader instead of its writer.

—Anna Deavere Smith

Parallel organization as a roadmap

1.3 Research Plan [~6-7 pgs]

- o overview of approach: how research is organized and integrated
- summarize in what ways (if any) this is high risk, high reward research
- how this is a multidisciplinary effort

Thrust 1 [title]

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Thrust 2 [title]

Name, Institution (lead); Name, Institution (Co-Lead), Name, Institution

- o thrust challenges
- key objectives of the thrust
- o roadmap of tasks

Task 2.1[title]. Inline text of methodology.

Task 2.2 [title]. Inline text of methodology.

Task 2.3 [title]. Inline text of methodology.

Thrust 2 Deliverables:



Parallel organization as a roadmap

Research Strategy (usually 12 pages) Option 2 with common preliminary studies

- A. Significance
- B. Innovation
- C. Approach
 - Overview sentence on the team and the approach

Preliminary Studies (for all the aims together)

· For all the aims together

Title of Specific Aim #1 (verbatim from your specific aims section)

o Introductory paragraph

Research Design

Expected Outcomes

Potential Problems and Alternative Strategies

Title of Specific Aim #2 (verbatim from your specific aims section)

Introductory paragraph

Research Design

Expected Outcomes

Potential Problems and Alternative Strategies

Title of Specific Aim #3 (verbatim from your specific aims section)

Introductory paragraph

Research Design

Expected Outcomes

Potential Problems and Alternative Strategies

Timetable

· Use Gantt chart

Future Directions (optional)

Importance of white space

The NEES collaboration created a total of 15 advanced equipment sites for experimental work dedicated to the reduction of the earthquake threat (Figure 4). The current experimental reach of the equipment ranges from the marine to the geotechnical to the structural environments and can address almost any technical question that may arise on issues related to the safety of the built-environment in earthquakes. Development of this massive array of experimental capabilities demanded an intense and sustained effort. In retrospect, it would appear that the leaders of research groups involved in the creation of the 15 sites were totally absorbed, as they should have been, in the proper development of a magnificent experimental capability across the U.S. Unfortunately, there were three unplanned and unintended results: 1) a negative perception among a portion of the research community that equipment access was not equitable; 2) most, if not all, of the research work initiated has not yet been of a quality to transform the engineering community culture; and 3) the information technology infrastructure, which had initially inspired the NEES concept of a network of interconnected laboratories, has yet to reach its potential. The metaphor of a powerful fleet of battleships at anchor is not irrelevant to the current status. Our goal is to get the fleet moving in harmony.

Rapid advance in engineering knowledge and capability requires at least four ingredients: 1) a driving need: 2) a large community of well-educated professionals; 3) financial support, and 4) competing centers of research and development. As emphasized by the tragic disaster in Wenchuan, PRC, in May 2008, there continues to be a critical need for advances in earthquake-loss reduction. Considering the seismic histories of population centers such as San Francisco, Los Angeles, Katmandu, and Istanbul, there is no basis for expecting the earthquake threat to abate in the foreseeable future. In large measure because of the encouragement of the National Science Foundation since the early 1970's, the U.S. is blessed with an impressively large community of professionals well trained in earthquake engineering and related sciences. The first two ingredients are very much in place. As long as the U.S. continues to have a strong economic profile and maintains its proven ability to plan beyond the immediate future, financial support for research and development in earthquake issues will continue. Our mission, then, is for NEES to take the lead in providing the competing centers of research and development to achieve catalysis of the existing essential ingredients as described below. The seminal idea for the NEES network was the creation of an experimental-research infrastructure with many visions and capabilities at different research centers connected with a single purpose through the opportunity provided by information technology. The objective of creating a successful equipment infrastructure has been achieved. A driving challenge now is to resuscitate what was intended to be the cortex of the system: the information technology (IT) that can enable the required catalysis of ideas.

Our overall strategy is designed to: 1) inspire the NEES researcher to pursue a more ambitious research agenda; 2) entice the rest of the research community to compete for the opportunity to benefit from the sites; 3) encourage academic researchers to interact with the professional engineers in order to accelerate the implementation of new knowledge in practice; and 4) develop a NEES community that will include all individuals, institutes, agencies, corporations, professional societies, and non-governmental organizations (NGO) interested in protecting society from the harmful consequences of earthquakes.

A brief look at the history of civilizations will reveal that the nuclear ingredient in their development has been the "agora," or the market Using the opportunities provided by information technology, we plan to develop the intellectual equivalent of the agora in order to get, the "fleet at anchor" moving at an everincreasing pace. We will employ operational excellence, immovative computational tools, outreach that advances knowledge, and an environment for the catalysis of ideas. Among the qualitative and quantitative performance metrics for measuring our success and developing a compelling basis for continued operation are: 1) the satisfaction of users (including both physical and analytical researchers). NEEShub, users; and education, outreach and training targets; 2) a greater diversification of users, research sponsors, operations sponsors, outreach community, and the NEEShub community, 3) increased research productivity in earthquake engineering, including the increased use of NEES equipment by remote users; 4) greater impact on codes, technical committees, professional societies, and research directions; and, eventually, 5) reduced losses from earthquakes.



Importance of white space and visuals.

and rount answer i relative constant, sector, the evolutions treatment areas. Its comparison for the power predictions, food and energy security, clean water, bodievestly, and climate change entities from While local currentmenters require fine-value analyses, market forces and operations doing obtack-danges that compete measure-local analyses, market forces and operations colver plants changes that compete measure-local analyses, market forces and operations of the contract changes that compete measure-local analyses, possible and saturable resource disciplines. The critical terrif for each analyses is land, and water related SDGs imports our proposed contractions developed of stroving Challe Level Analysis of Papers Estimate-Bill (CLESTEEL).

GLASINIT. Nonesté d'Necoto Radonale

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the au l'uitag nich Admipmence en Georgia-quand Shommer 2000) as humano inflorace die evolution of

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established and emerging networks overlap in mission and interests, cross-network collaborations remain opportunistic and piecemeal. Many analytical frameworks are proprietary or excessively complex opportiunitie and piecemeal. Many analytical funerworks are propertury or excessively complex (Obstructure et al. 1961) and are incomplisher—evering join on ever we joshed science communities of practice (Roseazoveje et al. 2018). The need to list global communities of practice on more than a researcher-to-researcher has unemply calls for a collaborative inflavoration and communication studyer to be remo-complementary experies, a statistic consideration and analysis, and systematically studies communication, cultural, and specificating para mora protoxols, disciplines and earlier of markets studies communication.

address communication, cultural, and procedural papes among networks, disciplines, and scales of analysis.

We propose to address used harriers through deep integration series so inclinific team are research communities in an international network of activories, CLASSNET (Fig. 1), with a combination of the communities in an international network of activories, CLASSNET (Fig. 1), with collaboration supported by a powerful Qued Legheld principle, criterial research care. CLASSNET will applied in the communities of the comm



Figure 1. Four matter, U.S.-Issued global networks and five counterpart networks in Germany, Austria and Switzerland share common goals and build a beninge for intellectual intendange and level resources. Testibed engagement with China, Brook, and Mediterran on research institutes will extract GLASSNET into culturity parts of the world and test effectiveness for local and regional decision making.

three grominent U.S.-based networks (GTAP, Nation and CUAHSI) will partner with five vibrant foreign based networks (GGCMI, GlobEcon, ISIMIP, GLP, and UNGKIDD) in a network of networks to:

Enable transformative analysis to facilitate decision making for austainable development
 Develop diverse human capital for analysis of tradeoffs and watergies among SDGs
 Form a network of networks to facilitate integration across research teams to advance knowledge and accelerate innovation towards austainable pathways for development

GLASSNET will build on a proven Purdue-based interdisciplinary research team. Global to Loca Analysis of System Sustainability (GLASS) to provide open-source analysis of SDGs via the NSF-funded Austrays on a system assumming (cu. Nos) in provine open-nature analysis on SAAP with the Province of Confidence of the Zero Hunger; SDG 6 Clean Water and Santiation; SDG 12 Responsible Consumption and Production; SDG 13 Climate Action; SDG 14 Life Below Water; and SDG 15 Life on Land.

Our portners offer strategic complementarity of vision, infrastructure, expertise, models, and data.

Natural Capital Project (NetCap) developed the Integrated Valuation of Environmental Services and Schmidt Capiell Projects (SecCopy development the Indiquital Volations of Environmental Services and manufactures of the Indiana Capiella (Indiana Capiella Offertie et al., 2010; Yue et al. 2018; SajiGyand GTAP integrate market analysis of prices, stude, and some flows with the economic and environmental effects of abuses in encoysten arrives studing with pollutation, countil protection, and water availability (chanses et al. 2019; The NST-supported Consections of Universities in the Advancement of Hydologue Science (CLASS) reviews a function of the advancement of Hydologue Science (CLASS) reviews a function of the advancement of Hydologue Science (CLASS). The effect of the Advancement of Hydologue Science (CLASS) reviews a function of the advancement of Hydologue Science (CLASS). The effect of the Advancement of Hydologue Science (CLASS) reviews a function of the advancement of Hydologue Science (CLASS). The effect of the Hydologue Science analysis group (GLASS) made (appendix of Agriculture of Agriculture analysis group (GLASS) made (appendix of Agriculture analysis group (GLASS). The student of the Advancement of the

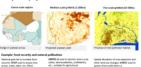
differences across disciplines; 3) computational challenges; 4) poor interoperability of data, models, and software; and 5) a lack of institutional support and incentives for collaboration (Antle et al. 2017; Antle software; and 5 a lack of institutional support and incentives for collaboration (Aufir et al. 2017, Aufir 2019). We will acceptant new involvation of court in the contract of the contract contract of the court of with achieving UN SDGs? Can we identify transformative pathways toward a more sustainable use of the

Mapping Research Fields: Catalyzing Communities to Address Sustainable Developm Mapping Research Futer: Camping Commenters in Annual Statements Development, and the latest Just a decade remains to reach the goals of the 2020 Agenda for Suztainable Development, and the latest UN report finds that the world is not on track to achieve most of the 169 SDG targets that fall within the 17 anals (UN, 2019). The preency of understanding sustainability stresses has been clearly laid out (Rockstrom

et al. 2009, Steffen et al. 2015) with calls for "new approaches that have the potential to match the necessary scale of monitoring with sufficient accuracy and at reasonable cost" (Rosenstock et al., 2017). In a Nature commentary, Shepherd et al. (2015) farther asserted that simple targeting of goals can be constructioned. and argued for a greater focus on expert modeling of intervention decisions and analysis of subsequen and agood for a greater focus on expert medicing of intervention decisions and analysis of subsequent terminate public inscriments. This is closed in the World While Furth report calling for compenhences contains inalysis of bodiversity and ecosystem sowices (BES) (Consum et al. 2018). There is no effective to behealted product contained in cases the service-convenier respects at plotal scale. Early includes greatest national tiph-resolution escipuit, but more of feater models are looked on models of the plotal for registeral geometry. Alternatively, related sequences of models are looked as the controlled agont of the

extrement, see at GTAP ... contain or use relatively enter representations of BES.

Public agencies also call for integrated analysis of local consequences of global drivers (CARB, 2016) while grivate companies seek information to organize sustainable supply chains (2017 #almort



linking global change is the challenge of bridging data and model results across scales (Fig. 2). Each GLASSNET net operates at different spotial scales and applies different definitions to key variables. The global economic analysis community (GTAP)

Figure 2. Melinical reader histographic based plated document intended an country scales and and social neares social science and in formula. Social reader and a social reader and a social reader and individual control of the social plate and individual reader and individual reader and individual formula of the social to the social reader and the social forms. This information is critical to interestiming how plothed change drivers reasonal control flower. This information control is social reader and the social control of the social reader and the social control of the social reader and ciated impacts can currently be modeled at alohal and broad regional scale. However, understanding associated impacts an currently be modeled at goosti and mosa regional scale. However, materialization consequences for water quality, buildivensity, and many econystem services requires a much fines scale (e.g., 10 - 300m). This is the resolution at which disaggregate economic impact assessment models and most economic land use models operate as well as the <u>disagregate</u> economic land used models. While opportunities for fine-scale analysis are rapidly increasing with the flood of fine resolution data newly available through remote sensing, mobile and stationary sensors, and drones (Capalbo, Antle, and Seavert 2017), current solutions to bridging spatial scales remain largely piecemeal. By linking multiple existing networks as well as research institutes (testbeds) in key regions. GLASSNET will improve parameterizat of existing models and incomprate new analytical tools to innovatively rem biophysical constraints (Fig. 3). These advances will be re-produced by global solectars working at both marre and level scales and bringing different disciplinary, calcural, and professional backgrounds is undertake unallyses in a global framework that authentically represents local conditions.

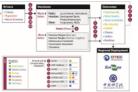


Figure 3. GLASNET resource complementarity enabled by first-time communitarities at Gardiele Todo, data, models, and expertise synapsiscissis) intig about diverse across description and scales. These inflantencedeates medicing at more—indicated metabolises that of GATA and GATAM and GA quantity (CUAHSI), biodiversity and terrestrial curbon, as well as greenhouse gas emissions. These outcoms, from with GTAP outsuts, will feed back to the altebal level.

GLASSNET Shared Vision and Network Alianment of Goals

Our vision is to accelerate the process of scientific discovers and grepare the next-generation of researchers needed to assess and attain SDGs linked to the world's land and water resources. In addition,

reserviews needed to assess and attent SDG invited in the world' lead and vater reservees. In shiftion, we seek to assument the analysis of SDG invited as the world lead of water reservees.

Table 1. Notwork Alienment of the state of the s | Description | tools that bridge between the coarse resolutions of



Figure 4. Placed funding of GLASSNET activities. Place 1 builds sheed vision, harmonizes data, design and dring tools on Cachest and began farange mixitians. Place 2 below which there is no vision and process causes for the place of the pl

(understanding expertise, competencies, and roles), geographic dispersion (disparate time zones and languages; dependence on electronic communications), and communication (varying week styles, cultural expectations, values, terminology, methods, and traditions) (Vogel et al., 2014), we will styles, cidinal eterocisions, values, terminologi, methods, and traditiona) (Verget et al., 2014, by we will converse a fair-left, and i-Id-CASNET metring at project outset—the "listing campaign" model of Geocorne-A failusee (Dabelture et al. 2017). We will hold term trust and atterprates with discussions that actual exclusion of mescach and predictional development of some wice-thospherest of comments weakbulley, bactions, task suspenses, disciplinary methods, and the Geglifey, workflow support as well as help within the foundation of the control of the will include downscaling, aggregation (upscaling), format conversion, and filtering. Godby (see Section 3 Coordinating Infrastructure stableading) will serve as a data harmonization virtual center where such custing data access and processing posts are available, new data transformation tools created, and processed

data, along with documentation (metadata), are shared among networks and publicly as appropriate Given SDG emphasis on food, land, and water systems, we will focus on food production pericultural and non-pericultural uses of land and water, provision of natural ecosystems services, and the agricultural and non-agricultural uses of land and water, provision of natural composters services, and the internation of consonic activity among the time seales shown in Fig. 2. This harmonic distance will distribute the consequence of the two harminozation: "case studies" cased year with reprise proposed by statementers and network portners and selected by the Science Committee. Collective experience by stams in our network on relevant metrics for decision making will help inform data standards. Our data protocol will be a key GLASSNET deliverable. Beginning with the GLASSNET Visioning Meeting at project outset, activork members will together identify new data transformation tools needed to address our research challenges.

Development of a Knowledge Hub to Facilitate Cross-Network Workflows: To address the lack of support for cross-network modeling workflows, Gooding (Section 3) will host spatially resolved datasets in usable formulas and scales accessible by GLASSNET researchers and usable directly in resolved distates in stable formula and scales accessible by GLASSNET rescuedes and unable districtly in their medicies and scientific accessible accessible by GLASSNET rescuedes and unable districtly in their medicies and scientific accessible accessib into web applications and publish on Goodbib for training and sharing across GLASSNET and beyond

Population of a Learning Hub for Prantice and Education in 2DG Analysts. We will host course and learning modules where active learning (using interactive tools and workflows) interactive into formal classrooms, training workflows, and hand-one intorinsis (See Section 4 Student and Larly-Career Development Plan). Leveraging a new PAIR (finishing, accessible, assessment interprepatible, results) science cyber training curriculum (Merward et al., 2019) developed in build expertise in data access, geo-processing, time series analysis, computational simulation, visualization and experies in data access, ges-processing, time series analyses, companionan simulation, visualization may publication, we will develop online short courses around or Aprile-posed to the build compatisental skills that can enablyze interdisciplinary science. In the vintual GLASSIFT Tool Competition (Year 4), students will compette to develop innovative new tools to be gubbled to Guddel and featured in GLASSIFT communications. Winners will be receive travel funds to attend the Year 5 GLASSIFT meeting.



Stannual Meanings and Streambly Communications, Following the all-team Stannual Meetings and Bimonikly Communications. Following the all-team with the control of the c



If I said...

Did you see in your mind's eye these words?

Red Fire Truck



Or this picture?





Wired to "see" words as well as patterns and categories



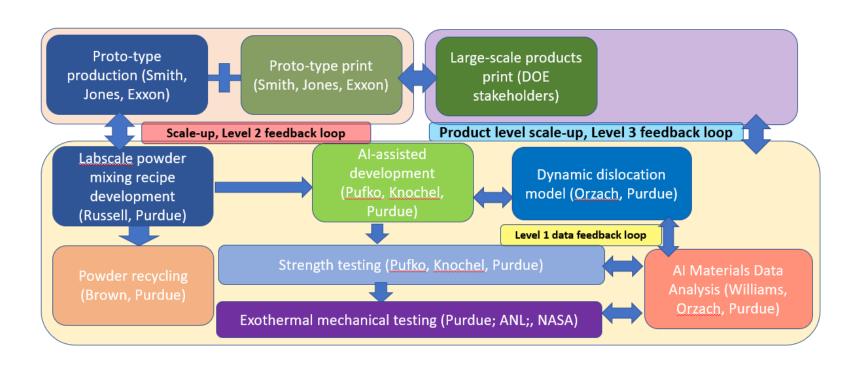
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Keys to making graphics that work

- Never save space by shrinking graphics so they are not easily readable
- Have a starting point
- "Chunk" organizational components
 - message is easily synthesized and recalled because of coherent grouping
 - icons used for repeating elements
- Show integration and not siloed components
- Write rich captions. Don't just label.
 - ☐ Articulate main takeaway point
 - ☐ Walk reviewers through process diagrams

Know Your Audience

Have a starting point and "chunk" to show groupings

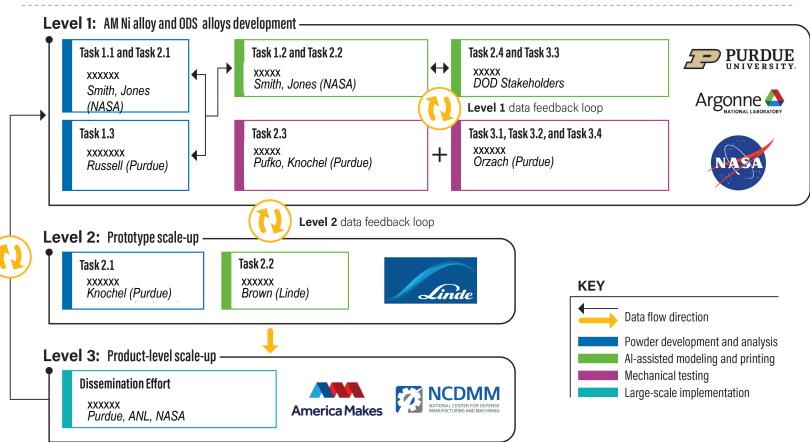




Level 3 data feedback loop

Know Your Audience

Use graphics to organize in "categories"

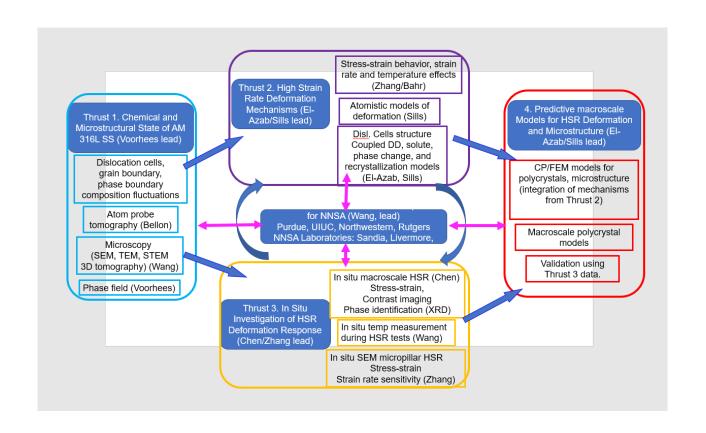


- Categorized boxes (color code) and data flow (icon)
- Mapped to tasks and partners for richer communication



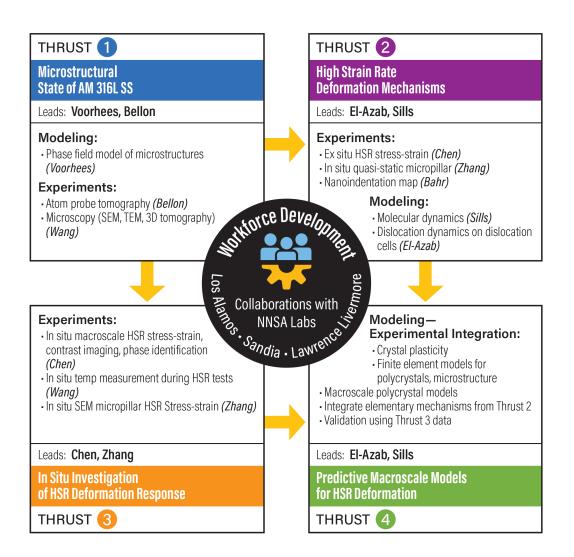
Know Your Audience

Make sequencing clear





Make sequencing clear



Simplified message that Thrust 1 provides two routes forward to Thrust 4



How can we pull out meaningful patterns?

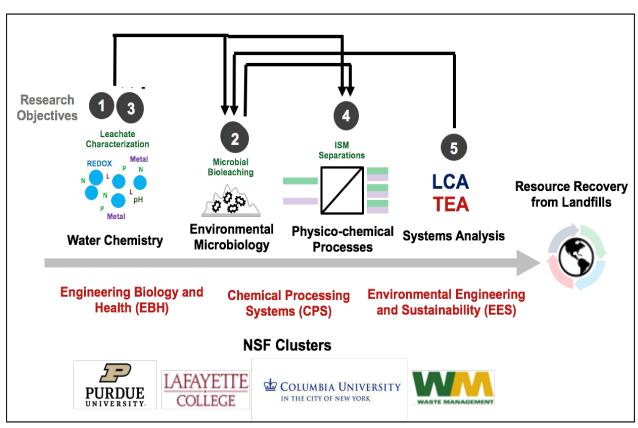
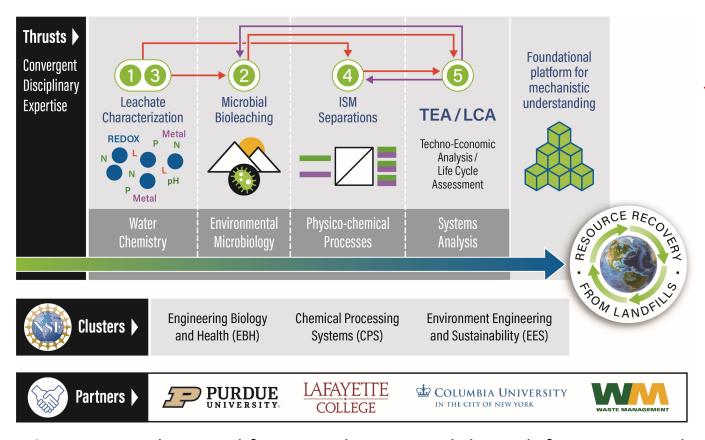


Figure 1: Five project thrusts.





Color code to show forward integration (red arrows) vs feedback loop (purple arrows)

Figure 1: Fundamental framework examined through five integrated thrusts at convergence of multiple NSF cluster areas.

Provide main take away point in the caption rather than just labeling as "Five Project Thrusts"



What do the colors mean? What is the take away message?

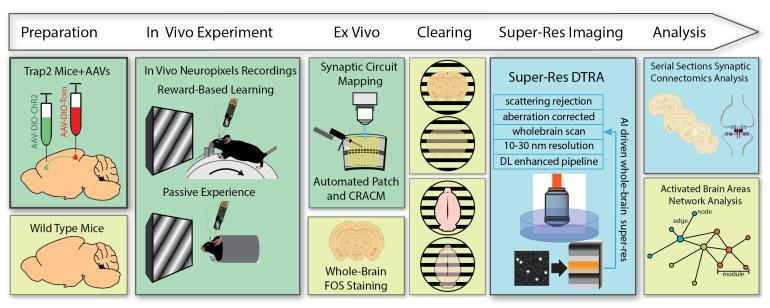
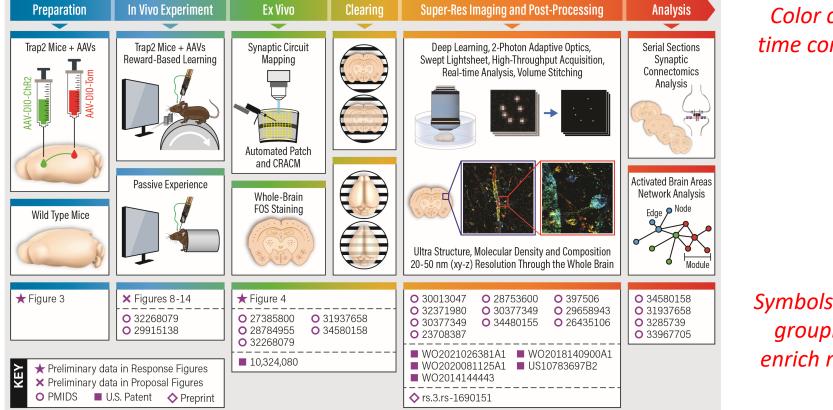


Figure 1. Experimental and Analysis Pipeline





Color code to time continuum

Symbols used for groupings to enrich message

Figure 1: Experimental and Analysis Pipeline correlated to risk-mitigated preliminary work.

Label in caption changed to take away message



Use symbols and icons to chunk into groups

LEVERS -			GHGs	K.D
Hydrological infrastructure	+	+	_	?
Artificial recharge of aquifers	+	?	_	?
Irrigation efficiency	+	+	?	?
Groundwater restrictions	+	_	?	?
R&D in ag productivity	+	_	?	?
Irrigation expansion	_	+	?	?
Bioenergy production		_	+	-
Carbon pricing	?	_	+	_
Nitrogen leaching charge	?	-	+	+
Tile/controlled drainage	?	-	?	+
Increased nitrogen efficiency	?	+	+	+
Wetland restoration	+	_	_	+
Non-ag nitrogen removal	?	_	?	+
Conservation rotation	?	_	+	+

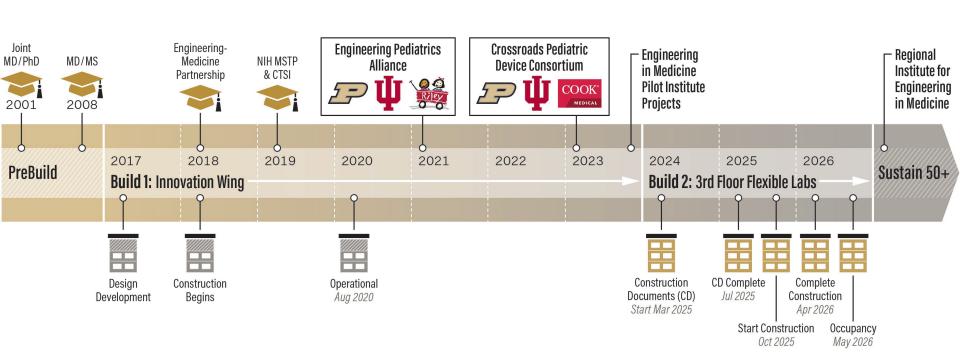
Institutions		Radiation Hardened	Heterogeneous Integration/ Adv. Packaging	Supply Chain	Embedded Systems Security	System on Chip
Purdue University	•	0	0	0	0	0
Vanderbilt University	•	0				
Air Force Institute of Technology	•	0				
Arizona State University	•	0	0	0		
Brigham Young University	•	0				
Georgia Tech	•	0	0	0	0	0
Indiana University	•				0	0
University of Michigan	•	0				
St. Louis University	•	0				
SUNY-Binghamton	•		0			
Draper Laboratory)	0				
Sandia National Laboratory	•	0				

Initial targeted institutions: Boeing, Lawrence Livermore, Honeywell, BAE, IBM, Northrop Grumman, Raytheon, Rolls Royce, Saab, Lockheed Martin, TechSource

			MEASUREMENT MODALITIES											
		TM	FFM	SMIM	SthM	C-AFM	MFM	CR- AFM	KPFM	PFM	Wafer Scale	Auto- mation		
Asylum Research Cypher S*	•	0					0	0	0	0		0		
Asylum Research Cypher ES	•	0				0	0	0	0	0		0		
Asylum Research MFP3d Bio*	•	0				0	0	0	0	0		0		
Bruker Dimension	•	0	0				0	0	0	0	0			
Bruker Catalyst	•	0	0				0	0	0	0				
Bruker Multimode	•	0	0				0	0	0	0				
Asylum Research Jupiter XL*	•	0	0	0	0	0	0	0	0	0	0	0		



Use phased timelines to clarify your trajectory





Use graphics to organize in "categories"



BEFORE



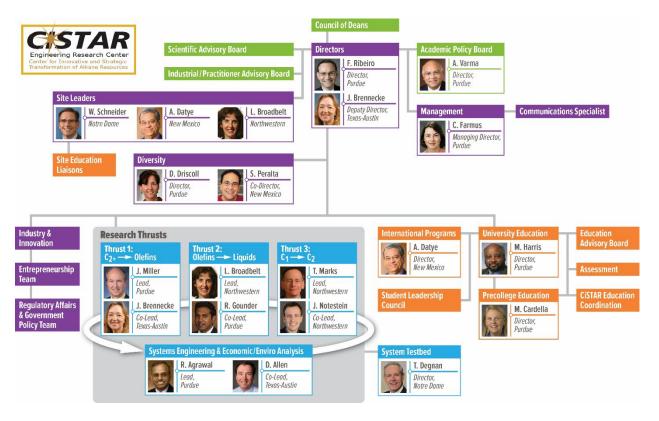
Use icons to represent categories and patterns



AFTER



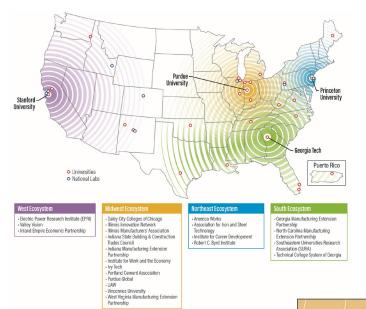
Use color codes to communicate categories



Larger org charts color coded by role is a helpful grouping



Use icons, colors, symbols to clarify partnership patterns



Partners categorized by type or location depending upon what is the strategic emphasis.





Use even simple visuals to summarize narrative when possible.

Research Schedule		Year 1				Year 2			Year 3				Year 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Aim 1: Develop a large animal acquired hydrocephalus model																
Task 1.1: IACUC approval																
Task 1.2: Finalize kaolin injection protocol																
Task 1.3: Finalize MRI protocol																
Task 1.4: In vivo evaluation of acquired hydrocephalus model																
Aim 2: Quantify the lifetime of self-clearing catheter in vivo																
Task 2.1: Fabrication of dual-pore self-clearing catheter																
Task 2.2: Quantify impact of MRI on self-clearing catheter																
Task 2.3: Publication on MRI Interaction																
Task 2.4: Quantify self-clearing catheter performance and failure rate																
Task 2.5: Publication on self-clearing catheter in vivo performance																
Aim 3: Quantify the effect of microactuation duty cycle																
Task 3.1: Quantify the impact of prophylactic actuation																
Task 3.2: Quantify the impact of rescue actuation																
Task 3.3: Publication on the impact of prophylactic vs. rescue actuation																



Less is More.



#writingtips

aninconsistentwriter

Edit Ruthlessly

Somebody has said that words are a let like inflated money-the more of them that you use, the less each one of them is worth.

Right on Go through your entire letter just as many times as it takes. Search out and annihilate all unnecessary words, and sentences—even ontire paragraphs.

Malcolm Forbes
("How to write a business Letter
CR MAKE A SPEECH

Avoid long, dense sentences.

There are several innovations of this proposed research, including: a) analysis of air contaminant mixtures and health, particularly with extremely high spatiotemporal resolution; b) consideration of climate change impacts; and c) incorporation of novel risk assessment methodology. (37 words)

Our key innovations include: a) analyzing air contaminant mixtures and health with extremely high spatiotemporal resolution; b) considering climate change impacts; and c) incorporating novel risk assessment methodology. (28 words)

Get rid of passive voice

Elemental mapping of animal tissues has been investigated, and results have been documented. (80 characters)

We investigated elemental mapping of animal tissues and documented results.

(65 characters)

Delete words that do not add anything

The development of an entire process in order to screen new high-throughput products for further evaluation is certainly one of the most important features.

Remove ambiguity particularly with reference words.

When Nature published research that explored gene editing of embryos using CRISPR—Cas9 to correct a specific genetic mutation, it did not include embryos from IVF clinics.

What is "it"? The paper? The research? The gene editing? CRISPR-Cas9?





Tell a compelling story



Answer "Why you?"





- Be respons •Leave time for team editing
- Plan review date at
 Formal or informal Plan review date at start

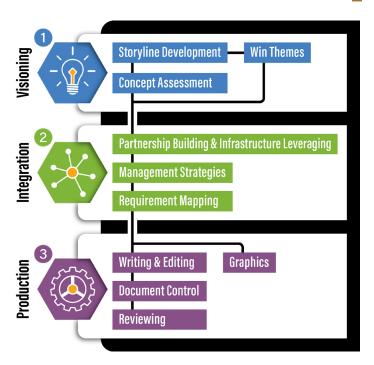


Plan for internal review

		Aug	Sep	0ct	Nov	Mon	Mon	Thur	Thu	Jan	Mon	Tue	Mon	Mon	Mon	Mon	Fri	Mon	Fri	Tue	Wed	Fri
						12/2	12/16	12/19	12/19		2/10	2/11	2/17	2/24	3/3	3/10	3/14	3/17	3/21	3/25	3/26	3/28
	Team mtg on proposal development																					
	process/schedule																					<u></u>
	Develop Storyline																					l
	What is the problem?																					l
	What has been done to address this problem?																					l
	What is the gap that still remains?																					l
	How do you propose to address this gap?																					<u> </u>
	Collaborate on prototyping projects																					<u> </u>
	Identify win theme and Red Panel Review team																					l l
	members																					
	Debrief on preproposal reviews																					<u> </u>
	Revise storyline, vision/goals, thrust/theme																					l
	strategy, diagram																					<u> </u>
	Initial thrust strategizing/preplanning for template																					
0	Finalize org chart/ basic management structure																					
Ė	Conduct review panel for competitive win theme				8th																	
Vision	and storyline review with advisory board members																					
_	Debrief/revise after win theme review																					
	Finalize team organizations and personnel																					
	Draft initial task/milestone Gantt timeline and																					
	discuss for integration																					
	Identify additional graphics																					
ration	Collect facilities, bios, COA, C&P, synergistic																					$\overline{}$
重	activities																					
ě	Collect letters of collaboration																					
-	Review outline & assign leads				15th																	
	Team writing																					
	Draft1 compile																					$\overline{}$
	Editing iterations																					$\overline{}$
	Draft2 compile																					$\overline{}$
	Core team walk through of draft2																					$\overline{}$
	Editing iterations																					$\overline{}$
	Draft3 compile for red panel review									20th												$\overline{}$
	Write summary									20th												$\overline{}$
	Send draft to red panel reviewers									27th												$\overline{}$
	Write data management plan																					$\overline{}$
	Write mentoring plan																					
	Conduct Red Panel Review																					
	Debrief with core team																					
	Editing iterations																					$\overline{}$
	Conduct final Gold Team Review																					
	Editing iterations for final narrative																					
	Submit non-tech docs to PreAward																					
	Submit tech docs to PreAward																					
	Submit list of project personnel to cise-																					$\overline{}$
	expeditions@nsf.gov																					l
	Develop summary ppt slide				\vdash							\vdash				\vdash						$\overline{}$
	Submit to NSF			-	—	 					_		_			-						

ause someti	mes what is obv	vious to you is n	ot obvious to ot	hers	

How Can We Help You?



- Agency analysis
- Storyline logic flow
- One-page concept paper
- Campus resources
- Outlining and compliance matrices
- Writing and editing
- Document control
- Ancillary documents
- Graphics

Online Resources



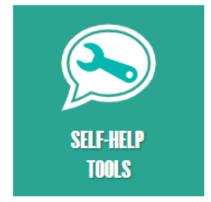














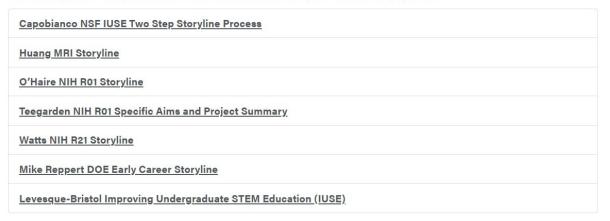


Templates and Step-by-Step Guidance



Sample Storylines

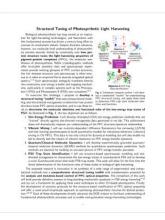
What exactly does a storyline look like? Access color-coded examples from funded proposals.



One-Page Concept Papers

This "how to" document turns your storyline into a tool you can use to talk with program officers, vet your idea with mentors, and recruit collaborators.







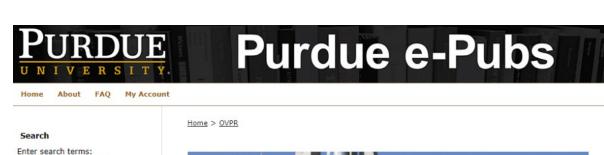
Drop-in Text for Resource/Facilities

Browse

Collections Disciplines Authors

> Libraries and School of Information Studies







<u>The Office of the Executive Vice President for Research and Partnerships (EVPRP)</u> supports faculty in all aspects of research, including funding access, proposal development, research integrity, corporate and foundation relations, and interdisciplinary infrastructure. Suresh Garimella, Ph.D. is the current executive vice president for research and partnerships.

Follow

Browse the Office of Research and Partnerships Collections:

University General Facility Boilerplate Descriptions

University Research Core Facility Boilerplate Descriptions



Data Management Plans



DMP Development Resources

- Purdue Libraries Data Management Guidelines
- Purdue-Affiliated dmptool.org for data management plans templates, sample documents, and funder guidance.
- <u>Purdue's Research Repository (PURR)</u> contains step-by-step instructions for completing the data management plan requirements and citable boilerplate text that can be inserted into your DMP.
- . Data Storage Options at Purdue explains different data storage options available to the Purdue community

Sample DMPs from funded Purdue projects

NSF Division of Engineering Education and Centers (CISTAR 2017)

NASA Space Technologies Research Institutes (Dyke 2019)

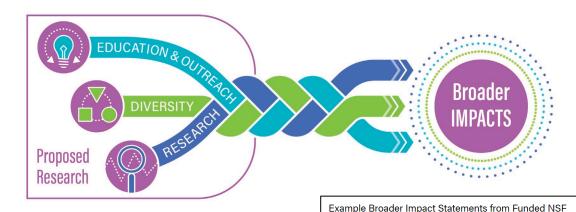
NSF Division of Behavorial and Cognitive Sciences (Ma 2017)

NSF Division of Research on Learning (Ryu 2018)

Broader Impacts & Broadening Participation



Proposed





- "Cords" of research, education and outreach, and diversity-related activities integrate through your project to deliver **broader impacts**. For instance:

 Fuller Participation of Women, Persons with Disabilities, and
- Underrepresented Minorities in STEM

 Improved STEM Education and Educator Development
- Increased Public Scientific Literacy
- Improved Well-Being of Individuals
- Development of a Diverse, Globally Competitive Workforce
- Increased Partnerships among Academia, Industry, Government, and Non-Profits
- Improved National Security
- Increased U.S. Economic Competitiveness
- Informed Public Policy
- Enhanced Research and Education Infrastructure

Example Broader
Impact Statements
from Funded NSF
Proposals

Steps to Develop an Education and Workforce Development Plan (Coming Soon!

Tips for Broadening Participation Diversity, Equ and Inclusion

Other Broader Impact Resources

Request a Broader Impa

SZFEWS starting from the farmle

Steps to an Education and Workforce Development Plan

The Best Education and Workforce Development (EWD) Plans:

- Are tailored to the specific research
- Are sustainable and scalable
- Include the right expertise
- Leverage institutional resources
- Leverage institutional resources
 Have rationale from the literature
- · Advance diversity, equity, and inclusion when possible
- · Add an appropriate budget
- Do not name partners without permission

Click each step for details.



Proposals
(Permission given for Purdue faculty and staff use only)

INFEWS/T2: Solar Solutions for Food, Energy and Water Systems

PI Rakeeh Agrawal, #1855882, \$2.5M, 09/2019

Our research outcomes will impact the grand challenges of food, energy, and water and affect how solar energy harmessing and conversion processes are developed through integration and land use intensification. We envision that all basic human needs can be produced from elements of nature—solar energy, land, at, and water—within the time scale that is commensurate with use practic. The development of SEPEV's will lead to a lauge demand for a new loss of solar calls optimized for the IR portion of the solar spectrum as the harmonicus use of the solar spectrum for all three elements of food, electricity, and clean water will excellent solar energy investments and enable a sustainable economy, SEPEV's will eleminate competition for faul to either grow food or generate electricity from the incident solar energy. The adoption of SEPEV's will impact local farm practices as electricity will be colladly generated on farmand, local water management and purification practices will be reduced or elementated, impact and the properties of the solar energy. The adoption of SEPEV's will impact local farm practices as electricity will be locally generated on ferminand, color water management and purification practices will be changed, and even the quantity of nitrogen and phosphorous fertilizers used will be potentially affected. The flow of N and P from farmands to the description of electricity from a farmand to adjoining water boring algo bellooms in likes and rivers. The ability to dispatch excess output in electricity from a farmand to adjoining varied and used an externation of the entire SEPEVIS starting from the farmand, extending to the adjoining population centers (counties), and then reaching to the state and comments. The comments and associal immental, and social imme

linary solids through in-depth exposure to multiple disciplines of process systems gronomy, naterial science, chemical engineering, electrical engineering, physics, and detast will develop integrative concepts assembla for innovative veriforce solutions and of training leveraged from the Solar Economy (SERT and the current NRT. Close community college students, and farmers will heighten the deviational experience. raining by mentioning undergrounder seasorches and participating in outresch activities those in the colleges of Engineering and Apriculture at Purche, we will increase project

: Networking Global to Local Analyses to vestments in Land and Water Resources

lan

IESS networks to broadly identify, engage, and support diverse and talented participants Stakeholder Advisory Board, Science Committee, and Network Council are diverse in

Next Steps

- Write a color coded storyline
- Draft a one-page concept paper
- Create a basic milestone schedule for your proposal development
- Develop a compliant, detailed outline with parallel formatting

Next Steps

- Read proposal for visual ideas
- Line up reviewers
- Do your agency/program homework
- Familiarize yourself with grant writing website resources

Next Steps



Email
 GrantHelp@purdue.edu