Successful Grant Writing Strategies

Sally Bond
Assistant Director of Research Development Services
Proposal Coordination
Office of the Vice President for Research and Partnerships
Persuasive Writing
## Proposal Preparation Process

**Tailored and intentional plan**

### General 10-week project timeline:

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**Red Text:** Important to have agreement (and explicit text for problem overview) prior to proposal writing
Key Strategies

Strategies for the strongest proposal submission

• tell a compelling story
• respond to solicitation
• answer “Why Purdue?”
• know your reviewer
• conduct internal review
Build the Storyline

Remember...you are not the audience. Don’t write for yourself.

• show something important is at stake
• answer “So what?”
• make it memorable, not complex, and have clear logic flow
• back it up with references...not anecdotal.
A good story is more important than good data.

Jon Lorsch, director of the National Institute of General Medical Sciences at NIH, quoting
Francis Collins, director of NIH
Build the Storyline

Gap analysis

• tell a compelling story

• respond to solicitation

• answer “Why Purdue?”

• know your reviewer

• conduct internal review

Good science is a story that...

• begins with a problem

• provides coherence in narrative

• hooks reviewer so weaknesses are not fatal

• sets “north star”
Build the Storyline

Four key questions

• tell a compelling story
• respond to solicitation
• answer “Why Purdue?”
• know your reviewer
• conduct internal review

• 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?
Build the Storyline

Funnel of logic flow

• tell a compelling story

• respond to solicitation

• answer "Why Purdue?"

• know your reviewer

• conduct internal review

• 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?
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
Build the Storyline

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 understandings of the world around them. The Framework indicates that all children should develop competencies in engineering design, and the NGSS explicitly includes a “conceptual shift” 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 (Abbott, 2007; Appleton, 2007; Melado, Blanco, & Ruiz, 1998) and essentially non-existent formal exposure to engineering (Cunningham & Cotter, 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 science elementary science teachers (Capobianco & Lehman, 2015; Capobianco & Rupp, 2014; Sun et al., 2013; Yoon, et al., 2013; Yoon, et al., 2014). Programs such as the University of Texas’s UTeach Engineering, Boston’s Museum of Science’s Engineering is Elementary, Purdue University’s Science Learning through Engineering Design (SLED) Partnership, The Johns Hopkins University’s STEM Achievement in Baltimore Elementary Schools (SABES) and University of Minnesota’s Engage TEAMS are grounded in the delivery of high-quality, content-rich, engineering design-based experiences for inservice 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 inservice 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 & DeLu, 2015; Capobianco, Lehman, & Kelley, 2015).

While such successful 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 in-service 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 science teachers 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 engineering 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 develop an 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.
Build the Storyline

A Significance

The NIH is committed to translating basic biomedical research into clinical practice and thereby impacting global human health, and Francis Collins identifies high-throughput technology as one of five areas of focus for the NIH’s research agenda. For many diseases, researchers have identified successful novel therapeutics or research probes by applying technical advances in automation to high-throughput screening (HTS) using either biochemical or cell-based assays. Researchers are using genetic perturbations such as RNA interference or gene overexpression in cell-based HTS assays to identify genetic regulators of disease processes as potential drug targets. However, the molecular mechanisms of many diseases that deeply impact human health worldwide are not well-understood and thus cannot yet be reduced to biochemical or cell-based assays.

Ideally, researchers could approach disease from a phenotypic direction, in addition to the traditional molecular approach, by searching for chemical or genetic regulators of disease processes in whole model organisms rather than isolated cells or proteins. Moving HTS towards more intact, physiological systems also improves the likelihood that the findings from such experiments accurately translate into the context of the human body (e.g., in terms of toxicity and bioavailability), simplifying the path to clinical trials and reducing the failure of potential therapeutics at later stages of testing. In fact, for some diseases, a whole organism screen may actually be necessary to break new therapeutic ground; in the search for novel therapeutics for infectious agents, for example, it is widely speculated that the traditional approach of screening for chemicals that directly kill bacteria in vitro has been largely exhausted.

Our work recently identified six novel classes of chemicals that cure model organisms from infection by the important human pathogen *E. faecalis* through mechanisms distinct from directly killing the bacterium itself. Anti-infectives with new mechanisms of action are urgently needed to combat widespread antibiotic resistance in pathogens.

Enabling HTS in whole organisms is therefore recognized as a high priority (NIH PAR-08-024). *C. elegans* is a natural choice. Manually-analyzed RNAi and chemical screens are well-proven in this organism, with dozens completed. Many existing assays can be adapted to HTS; instrumentation exists to handle and culture *C. elegans* in HTS-compatible multi-well. Its organ systems have high physiologic similarity and genetic conservation with humans. *C. elegans* is particularly suited to assays involving visual phenotypes. Physiologic abnormalities and fluorescent markers are easily observed because the worm is mostly transparent. The worms follow a stereotypic development pattern that yields identically-appearing adults such that deviations from wild-type are more readily apparent.

The bottleneck that remains for tackling important human health problems using *C. elegans* HTS is image analysis. It has been recently stated, “Currently, one of the biggest technical limitations for large-scale RNAi-based screens in *C. elegans* is the lack of efficient high-throughput methods to quantitate lethality, growth rates, and other morphological phenotypes.” Our proposal to develop image analysis algorithms to identify regulators of infection and metabolism in high-throughput *C. elegans* assays would bring image-based HTS to whole organisms, and have the following impact:
• 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?
Build the Storyline

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, vagueness 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
Build the Storyline

Where do you put it?

• as soon as solicitation allows!
  – background, rational, vision and goals

• NIH
  – start of specific aims page and expanded version in significance section
What about in a Fellowship Application?

2018 GRFP Application

The 2018 GRFP competition is now accepting applications. Please see the Program Solicitation for full guidelines.

Application Components

The following material is required as part of the 2018 GRFP application.

- Personal, Relevant Background and Future Goals Statement
- Graduate Research Plan Statement
- 3 Reference Letters
- Academic Transcripts

Below is the prompt for the Graduate Research Plan Statement:

Present an original research topic that you would like to pursue in graduate school. Describe the research idea, your general approach, as well as any unique resources that may be needed for accomplishing the research goal (i.e., access to national facilities or collections, collaborations, overseas work, etc.) You may choose to include important literature citations. Address the potential of the research to advance knowledge and understanding within science as well as the potential for broader impacts on society. The research discussed must be in a field listed in the Solicitation (Section X, Fields of Study).

Important questions to ask yourself before writing the statement:

1. What issues in the scientific community are you most passionate about?
2. Do you possess the technical knowledge and skills necessary for conducting this work, or will you have sufficient mentoring and training to complete the study?
3. Is this plan feasible for the allotted time and institutional resources?
4. How will your research contribute to the "big picture" outside the academic context?
5. How can you draft a plan using the guidelines presented in the essay instructions?
6. How does your proposed research address the Intellectual Merit and Broader Impacts criteria?
Key Strategies

Addressing common trouble spots

- tell a compelling story
- respond to solicitation
- answer "Why Purdue?"
- know your reviewer
- conduct internal review
- follow all instructions!
- outline before writing
• Eligibility, due date, length, margins

• But also...
  • prescriptive headings
  • merit review criteria in *multiple* locations
  • cited documents for language, rationale
Respond to Solicitation

Know the agency guidelines as well as solicitation
Respond to Solicitation

Know general guidelines but solicitation overrides.

Part I Overview Information

Department of Health and Human Services

Participating Organizations
National Institutes of Health (NIH) [http://www.nih.gov/]

Components of Participating Organizations
This RFA is developed as a Roadmap initiative. All NIH Institutes and Centers participate in Roadmap initiatives. This RFA will be administ...

Title: Institutional Clinical and Translational Science Award (U54)

Announcement Type
This is a release of RFA-RM-06-002 which was released previously October 12, 2005.

Update: The following update relating to this announcement has been issued:
- March 22, 2007 - This RFA has been released as (RFA-RM-07-037)
- November 4, 2005 (NOT-RR-07-003) - See Notice NOT-RR-07-002 for clarification, Institutional Clinical and Translational Science

Request For Applications (RFA) Number: RFA-RM-07-002

Catalog of Federal Domestic Assistance Number(s)
93.399, 93.310

Key Dates
- Release Date: August 22, 2006
- Letters of Intent Receipt Date(s): December 18, 2006
- Application Receipt Date: January 17, 2007
- Peer Review Date(s): Summer 2007
- Council Review Date(s): September 2007
- Estimated Anticipated Start Date(s): September 30, 2007
- Additional Information To Be Available Date (URL Activation Date): October 2006
- Expiration Date: January 18, 2007

Due Dates for E.O. 12372
Not Applicable

Additional Overview Content

Executive Summary
- Growing barriers between clinical and basic research, along with the ever increasing complexities involved in conducting clinical n...
- The purpose of this initiative is to assist institutions to create a uniquely transformative, novel, and integrative academic home for C...
- Information technologies to promote the application of new investigative and techniques in patient care, Clinical and Translational...

Forms Version D Series
Updated March 24, 2017

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)
Respond to Solicitation

True for fellowships also

Department of Health and Human Services
Part 1. Overview Information

**Participating Organization(s)**
National Institutes of Health (NIH)

**Components of Participating Organizations**
National Cancer Institute (NCI)
National Eye Institute (NEI)
National Heart, Lung, and Blood Institute (NHLBI)
National Human Genome Research Institute (NHGRI)
National Institute on Aging (NIA)
National Institute on Alcohol Abuse and Alcoholism (NIAAA)
National Institute of Allergy and Infectious Diseases (NIAID)
National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS)
National Institute of Biomedical Imaging and Bioengineering (NIBIB)
Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD)
National Institute on Deafness and Other Communication Disorders (NICD)
National Institute of Dental and Craniofacial Research (NIDCR)
National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)
National Institute on Drug Abuse (NIDA)
National Institute of Environmental Health Sciences (NIEHS)
National Institute of General Medical Sciences (NIGMS)
National Institute of Mental Health (NIMH)
National Institute of Neurological Disorders and Stroke (NINDS)
National Institute of Nursing Research (NINR)
National Institute on Minority Health and Health Disparities (NI overlapping)
National Library of Medicine (NLM)
National Center for Complementary and Integrative Health (NCCIH)
Office of Research Infrastructure Programs (ORIP)

**Special Note:** Not all NIH Institutes and Centers participate in this announcement. Please refer to the Table of IC-Specific Information, Requirements, and Guidelines. This announcement will not consider applications for fellowships.

**Funding Opportunity Title**
Ruth L. Kirschstein National Research Service Individual Predoctoral Fellowships

**Activity Code**
F31 Predoctoral Individual National Research Service
Respond to Solicitation

Sleuth what was funded previously to identify trends

- What type of science and how does it compare to yours?
- What was team composition?
- What type of education integration?
- What type of institution?
- What type of budget?
Respond to Solicitation

Agency websites often show what was previously funded.

www.nsf.gov
Respond to Solicitation

Each program page has “what has been funded” and map of recent awards.
Respond to Solicitation

Review related abstracts.

CDS&E/Collaborative Research: The Integration of Data-Mining with Multiscale Engineering Computations
Award Number:1310173; Principal Investigator: Yannis Kevrekidis; Co-Principal Investigator: Amit Singer; Organization: Princeton University; NSF Organization: CMMI Start Date: 08/15/2013; Award Amount: $825,000.00; Relevance: 40.0;

CDS&E/Collaborative Research: The Integration of Data-Mining with Multiscale Engineering Computations
Award Number: 1309955; Principal Investigator: Ronald Coifman; Co-Principal Investigator: Ronen Talmon; Organization: Yale University; NSF Organization: CMMI Start Date: 08/15/2013; Award Amount: $475,000.00; Relevance: 40.0;

Complexity to Clarity: Nonparametric Procedures that Exploit Structured Data and Models
Award Number: 1521786; Principal Investigator: Ann Lee; Co-Principal Investigator: Shirley Ho, Chad Schafer; Organization: Carnegie-Mellon University; NSF Organization: DMS Start Date: 09/01/2015; Award Amount: $400,000.00; Relevance: 40.0;

High-Performance, High-Level Tools for Statistical Inference and Unsupervised Learning
Award Number: 1622501; Principal Investigator: John Owens; Co-Principal Investigator: John Fisher, Alan Edelman, Jeff Bezanson; Organization: University of California-Davis; NSF Organization: DMS Start Date: 09/01/2015; Award Amount: $164,612.00; Relevance: 40.0;

Collaborative Research: Towards an Accurate, High-Fidelity Modeling System for Multiphysics and Multiscale Coastal Ocean Flows
Award Number: 1622459; Principal Investigator: Hansong Tang; Co-Principal Investigator: ; Organization: CUNY City College; NSF Organization: DMS Start Date: 09/15/2016; Award Amount: $100,000.00; Relevance: 40.0;

"Big-Data" Asymptotics: Theory and Large-Scale Experiments
Award Number: 1418362; Principal Investigator: David Donoho; Co-Principal Investigator: Iain Johnstone; Organization: Stanford University; NSF Organization: DMS Start Date: 09/15/2014; Award Amount: $270,944.00; Relevance: 40.0;

Expanding the Computational Statistics Toolbox for General Hierarchical Models
Award Number: 1622444; Principal Investigator: Pierre de Valpine; Co-Principal Investigator: Duncan Temple Lang, Abel Rodriguez, Christopher Paciorek; Organization: University of California-Berkeley; NSF Organization: DMS Start Date: 09/15/2016; Award Amount: $159,929.00; Relevance: 40.0;

Statistical Analysis for Partially-Observed Markov Processes with Marked Point Process Observations
Award Number: 1228244; Principal Investigator: Yong Zeng; Co-Principal Investigator: ; Organization: University of Missouri-Kansas City; NSF Organization: DMS Start Date: 09/01/2012; Award Amount: $278,533.00; Relevance: 40.0;

Collaborative Research: Scalable Statistical Validation and Uncertainty Quantification for Large Spatio-Temporal Datasets
Award Number: 1417657; Principal Investigator: Douglas Nychka; Co-Principal Investigator: Douglas Nychka; Organization: University Corporation For Atmospheric Res; NSF Organization: DMS Start Date: 08/01/2014; Award Amount: $75,090.00; Relevance: 40.0;

Nonparametric Network Comparison
Respond to Solicitation

Review related abstracts.

---

**Award Abstract #1622501**

**High-Performance, High-Level Tools for Statistical Inference and Unsupervised Learning**

**NSF Org:** DMS  
Division Of Mathematical Sciences

**Initial Amendment Date:** September 13, 2016

**Latest Amendment Date:** September 13, 2016

**Award Number:** 1622501

**Award Instrument:** Continuing grant

**Program Manager:** Yong Zeng  
DMS Division Of Mathematical Sciences  
MPS Direct For Mathematical & Physical Sci

**Start Date:** September 15, 2016

**End Date:** August 31, 2019 (Estimated)

**Awarded Amount to Date:** $164,612.00

**Investigator(s):** John Owens (Principal Investigator)  
John Fisher (Co-Principal Investigator)  
Alan Edelman (Co-Principal Investigator)  
Jeff Bezanson (Co-Principal Investigator)

**Sponsor:** University of California-Davis  
OR/Sponsored Programs  
Davis, CA 95618-6134 (530)794-7700

**NSF Program(s):** CDS&E-MSS,  
CDS&E

**Program Reference Code(s):** 7433, 8083, 8084, 9263

**Program Element Code(s):** 8069, 8084

**ABSTRACT**

Using the "Julia" language for scientific computing developed at MIT, the UC Davis, MIT, and Julia Computing, Inc. teams funded by this project will extend the Julia language and runtime to utilize massively-parallel graphics processing units (GPUs) as first-class processors for scientific computing. Julia offers the twin advantages of straightforward, high-level programmability as well as excellent performance; adding GPU capability within Julia opens the door to even greater performance. The team will use Julia and its new GPU capabilities to address several important problems in statistical inference and
Respond to Solicitation

## Respond to Solicitation

**NIH RePORTer** [http://projectreporter.nih.gov/reporter.cfm](http://projectreporter.nih.gov/reporter.cfm)

### Search Results

**Projects**

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<td>AAGAARD, KUBERTI MARIE</td>
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<td>ARDELLI, AHMED</td>
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<td>ARDEL-MAGREED, ASIM</td>
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<td>ACREASIS, GONZALO</td>
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<td>INSULIN RESISTANCE AND MYOCARDIAL AUTOPHAGY</td>
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Respond to Solicitation

# Proposal Preparation Process

**Always outline!**

## General 10-week project timeline:

<table>
<thead>
<tr>
<th>Analysis and Planning</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<td>What has already been done to address problem</td>
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<td>What gaps remain</td>
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<td><strong>Goals</strong></td>
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<td>Identify proposal win themes/discriminators</td>
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</tbody>
</table>

## Program Officer Input

- Contact FO
  - Initial
  - Team debrief on meeting
  - Refine initial analysis/planning

## Proposed Outline

- Discuss/refine outline structure
- More detailed outline, if needed
- Identify graphics needed

## Partnerships

- Recruit collaborative partners
- Produce “selling points” brochure or website
- Recruit industry affiliates
- Recruit advisory board members
- Collect letters of commitment

## Management and Personnel

- Identify basic management structure
- Collect biosketches

## Proposal Writing and Editing

- Draft
  - Assign writing
  - Write section components
  - Compile 1st draft
  - Project team 1st edit
  - Any outside review input/edit
  - Editing iterations
- Check proposal worksheet to verify for DLRC, DF, or other DP center credit
- Write summary or abstract

---

Red Text: Important to have agreement (and explicit text for problem overview) prior to proposal writing
Example of NSF-style proposal outline

1. RATIONALE [2.5 pages]
   - Storyline
     - What is the problem?
     - What has been done already?
     - What is the gap that still remains?
     - 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 computer-related courses in local high schools
   - Role models from HBCU partners on HUBzero webinars
   - Presentation to parent-teacher organizations to include assessment results from DLRC-collected 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
     - Map to goals/objectives
   - Teachers must be involved in research project for at least 6 weeks
   - Must have orientation session at the 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
     - 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 2
   - Provide detailed descriptions of examples of research projects
     - 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.
   - Overview sentence

<table>
<thead>
<tr>
<th>Program Initiative</th>
<th>Year One</th>
<th>Year Two</th>
<th>Year Three</th>
<th>Year Four</th>
<th>Year Five</th>
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<td>Student Recruitment</td>
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</table>

3. RESEARCH ENVIRONMENT [2.5 pages]
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   - Describe institution
     - Include emphasis on cross-disciplinary partnership and past record of success in cross-disciplinary collaborations
Key Strategies

Addressing common trouble spots

• tell a compelling story
• respond to solicitation
• answer “Why Purdue?”
• know your reviewer
• conduct internal review

• win differentiators of expertise, facilities, prior work, campus environment
Key Strategies

Addressing common trouble spots

• tell a compelling story
• respond to solicitation
• answer “Why Purdue?”
• know your reviewer

• writing for expert and non-expert
• busy, rushed
• did not choose to read your proposal

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

—Anna Deavere Smith
Know Your Reviewer

Be kind...you are not writing for yourself.

• use formatting as a roadmap
• be generous with white space
• be clear and concise
• proof proposal
Know Your Reviewer

Parallel formatting provides a roadmap to help your reviewer

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   - Describe institution
     - Include emphasis on cross-disciplinary partnerships and past record of success in cross-disciplinary collaborations
Parallel formatting provides a roadmap to help your reviewer

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)
   o Introductory paragraph

Research Design

Expected Outcomes

Potential Problems and Alternative Strategies

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

Research Design

Expected Outcomes

Potential Problems and Alternative Strategies

Timetable
   • Use Gantt chart

Future Directions (optional)
Know Your Reviewer

Avoid dense text by adding 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 national experimental capacity 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 minerals, PRC, in May 2008, there continue to be a critical need for advances in earthquake-loss reduction. Considering the seismic histories of population centers such as San Francisco, Los Angeles, Kamandu, 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 potential 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 research environment has been achieved. A driving challenge now is to restate what was intended to be the cortex of the system: the information technology that enabled the required catalysis of ideas.

Our overall strategy is designed to: 1) inspire the NEES researcher to pursue a more ambitious research agenda; 2) enlist 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, institutions, 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 ever increasing pace, to employ operational excellence, innovative 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, and the NEEShub community; 3) the advancement of 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.

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Know Your Reviewer

Be concise. Less is better.

There are a growing number of scientists who believe the system is capable of addressing user demands.

(17 words)

A growing number of scientists believe the system can address user demands.

(12 words)
Know Your Reviewer

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)
Know Your Reviewer

Get rid of passive voice

Elemental mapping of animal tissues has been investigated, and results have been documented.

We investigated elemental mapping of animal tissues and documented results.
More detailed evaluations of different policy scenarios will also be developed with input from key decision makers and local communities in each state.

We will also develop more detailed evaluations of different policy scenarios with input from key decision makers and local communities in each state.
The development of a process to screen new high-throughput products for further evaluation is certainly one of the most important features.
Know Your Reviewer

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?
• The fund provides a match to outside investor funding for critical capital.
• The fund provides a match to outside investor funding for critical capital.

• The fund matches outside investor funding for critical capital.
Know Your Reviewer

Sloppy writing = sloppy science
Know Your Reviewer

Be particular...even check that references are compliant

1 This was once revealed to me in a dream.
2 See R. Otto, *Das Heilige*. He has some
Know Your Reviewer

Use high-quality, easy-to-read graphics for conceptual and organizational info
# Program Initiatives

<table>
<thead>
<tr>
<th>Goal 1: Alliance-wide practices</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
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<tbody>
<tr>
<td>Membership approved by Executive Council for working committees</td>
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<td>Partner retreat</td>
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<td>Create I-hub</td>
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<td>Create Passport tracking</td>
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<td>External Advisory Board meetings</td>
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<td>Annual Alliance-wide conference</td>
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<tr>
<th>Goal 2: Effective community college partnership facilitating transfer to four-year STEM programs</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
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<tr>
<td>Co-mentored domestic research experience at partner campuses</td>
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<tr>
<td>Co-mentored international research experience</td>
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<td>Industry guest speakers</td>
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<td>Cross-Alliance teaching symposia and workshops with community college faculty</td>
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<tr>
<th>Goal 3: Aligning experiences with Tinto’s principles of iteration</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
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<tr>
<td>Map activities and identify gaps</td>
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<td>Pair scholars with mentors</td>
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<td>Create individualized portfolios</td>
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<td>Map incentives to Passport Badges</td>
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<td>Cross-Alliance international research cohort</td>
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<td>Disseminate model-based best practices</td>
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<th>Goal 4: Research longitudinal model of Scholar development</th>
<th>Year 1</th>
<th>Year 2</th>
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<th>Year 5</th>
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<td>Compile a list of Scholar attributes</td>
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<td>Test and validate Scholar attributes</td>
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<td>Collect Scholar data</td>
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<td>Analyze Scholar data and portfolios</td>
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<td>Conduct interviews with Scholars</td>
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**Evaluation and Assessment**

| Formative site visits |        |        |        |        |        |
| Formative focus groups/interviews |        |        |        |        |        |
| Formative web-based surveys |        |        |        |        |        |
| Formative analysis and reporting |        |        |        |        |        |
| Summative data plan development |        |        |        |        |        |
| Summative quantitative data gathering |        |        |        |        |        |
| Summative analysis and final reporting |        |        |        |        |        |
Key Strategies

Addressing common trouble spots

• tell a compelling story
• respond to solicitation
• answer “Why Purdue?”
• know your reviewer

• planned from beginning
• formal or informal

• conduct internal review
# Internal Review

New eyes on your draft before submission

| General 10-week project timeline: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|----------------------------------|--|--|--|--|--|--|--|--|--|--|--|
| **Analysis and Planning**        |   |   |   |   |   |   |   |   |   |   |
| Distribute documents noted in RFP|   |   |   |   |   |   |   |   |   |   |
| Identify previously successful proposals | | | | | | | | | | |
| Identify PI                      |   |   |   |   |   |   |   |   |   |   |
| **Notify Pre-Award Center for assigned specialist**|   |   |   |   |   |   |   |   |   |   |
| **Problem Overview**             |   |   |   |   |   |   |   |   |   |   |
| - What is the problem            |   |   |   |   |   |   |   |   |   |   |
| - What has already been done to address problem |   |   |   |   |   |   |   |   |   |   |
| - What gaps remain               |   |   |   |   |   |   |   |   |   |   |
| - How we propose to address gaps |   |   |   |   |   |   |   |   |   |   |
| **Vision**                       |   |   |   |   |   |   |   |   |   |   |
| **Goals**                        |   |   |   |   |   |   |   |   |   |   |
| Identify proposal win themes/discriminators | | | | | | | | | | |
| **Program Officer Input**        |   |   |   |   |   |   |   |   |   |   |
| Contact PO                       | initial |   |   |   |   |   |   |   |   |   |
| Team debrief on meeting          |   |   |   |   |   |   |   |   |   |   |
| Refine initial analysis/planning |   |   |   |   |   |   |   |   |   |   |
| **Proposed Outline**             |   |   |   |   |   |   |   |   |   |   |
| Discuss/refine outline structure |   |   |   |   |   |   |   |   |   |   |
| More detailed outline, if needed |   |   |   |   |   |   |   |   |   |   |
| Identify graphics needed         |   |   |   |   |   |   |   |   |   |   |
| **Partnerships**                 |   |   |   |   |   |   |   |   |   |   |
| Recruit collaborative partners   |   |   |   |   |   |   |   |   |   |   |
| Produce “talking points” brochure or website |   |   |   |   |   |   |   |   |   |   |
| Recruit industry affiliates      |   |   |   |   |   |   |   |   |   |   |
| Recruit advisory board members   |   |   |   |   |   |   |   |   |   |   |
| Collect letters of commitment    |   |   |   |   |   |   |   |   |   |   |
| **Management and Personnel**     |   |   |   |   |   |   |   |   |   |   |
| Identify basic management structure |   |   |   |   |   |   |   |   |   |   |
| Collect biosketches              |   |   |   |   |   |   |   |   |   |   |
| **Proposal Writing and Editing** |   |   |   |   |   |   |   |   |   |   |
| Assign writing                   |   |   |   |   |   |   |   |   |   |   |
| Write section components         |   |   |   |   |   |   |   |   |   |   |
| Compile 1st draft                |   |   |   |   |   |   |   |   |   |   |
| Project team 1st edit            |   |   |   |   |   |   |   |   |   |   |
| *Any outside review input/edit*  |   |   |   |   |   |   |   |   |   |   |
| Editing iterations               |   |   |   |   |   |   |   |   |   |   |
| Write summary or abstract        |   |   |   |   |   |   |   |   |   |   |

Red Text: Important to have agreement (and explicit text for problem overview) prior to proposal writing