NSF RESEARCH IN UNDERGRADUATE INSTITUTIONS (RUI)

California State University-San Bernardino 4 May 2021

HANOVER RESEARCH

AGENDA

- Section 1: Overview of NSF and RUI Funding Mechanism
- Section 2: Preparing a Competitive RUI Proposal
- Section 3: NSF and RUI Merit Review Process
- Q&A

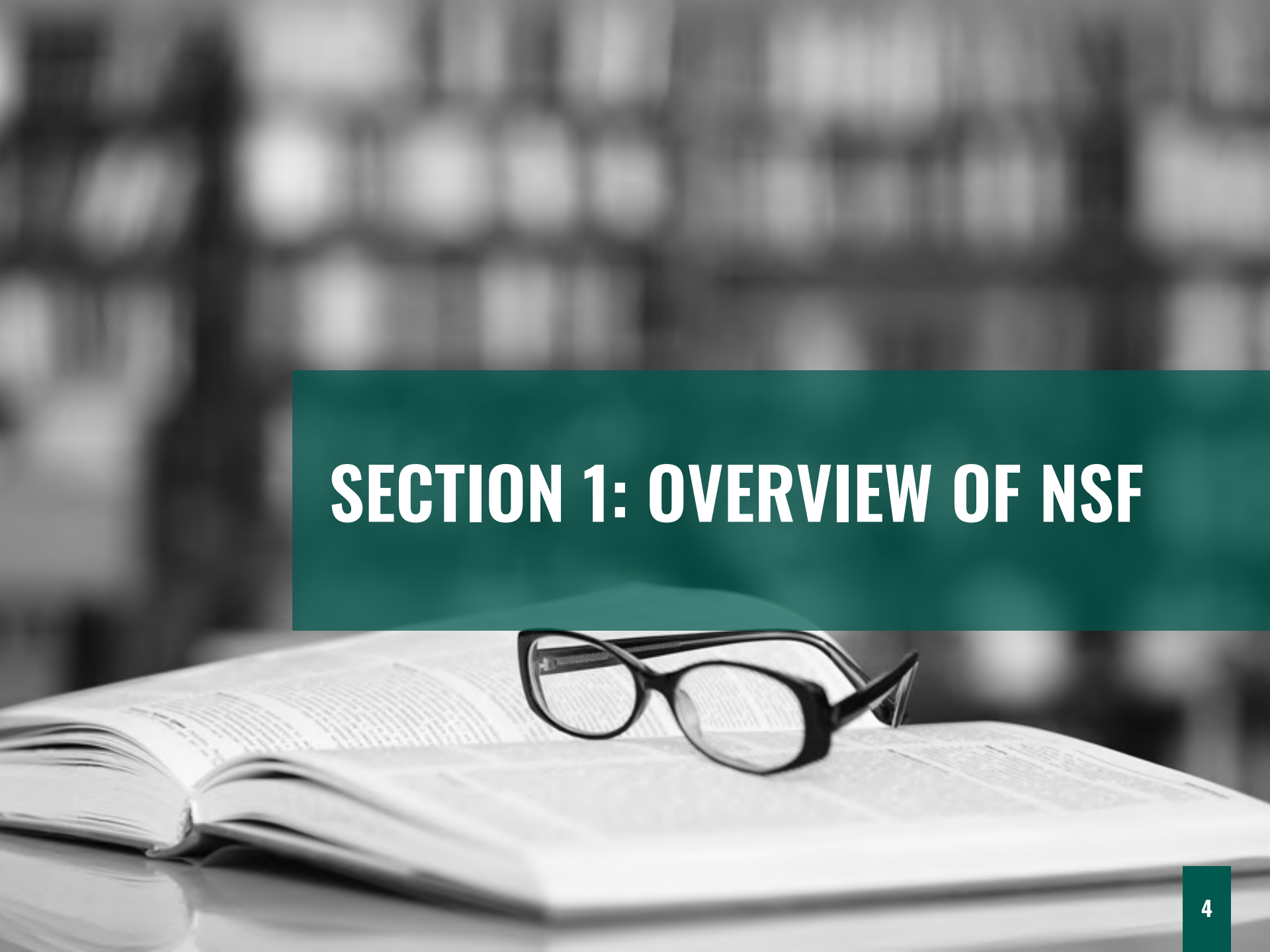
TODAY'S PRESENTER

Michelle Frank, PhD
Grants Consultant

Michelle has over 7 years of experience helping clients develop competitive grants over a broad spectrum of innovation—from robotics and software to applied physics, medical devices, and biomedical technologies. She has helped secure ~$6 million dollars for clients through Phase I and Phase II SBIR and STTR grants from the NSF, NIH, and DOE. Since joining Hanover in 2019, Michelle has helped clients secure over $2.25 million dollars. Her work is focused on providing in-depth review and revision for a broad range of faculty proposals to improve the competitiveness of their submissions through a wide range of mechanisms to NIH, NSF, Howard Hughes Medical Institute, USDA, DOE, Spencer Foundation, and more.

PhD, Physiology, University of Wisconsin-Madison
MS, Biology, West Texas A&M University

SECTION 1: OVERVIEW OF NSF



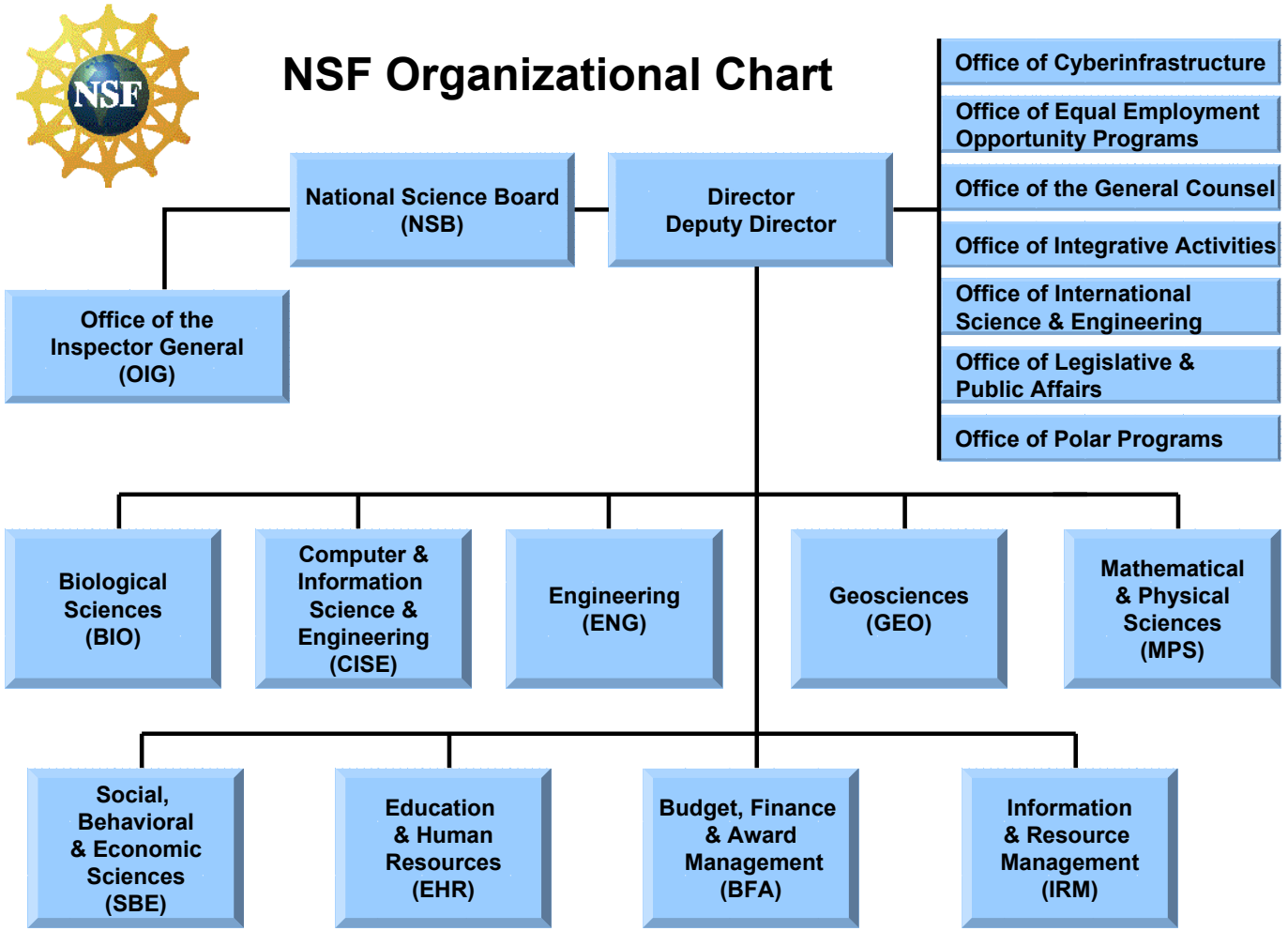
NSF: THE BASICS

Promote scientific progress, national health, prosperity, welfare, and defense

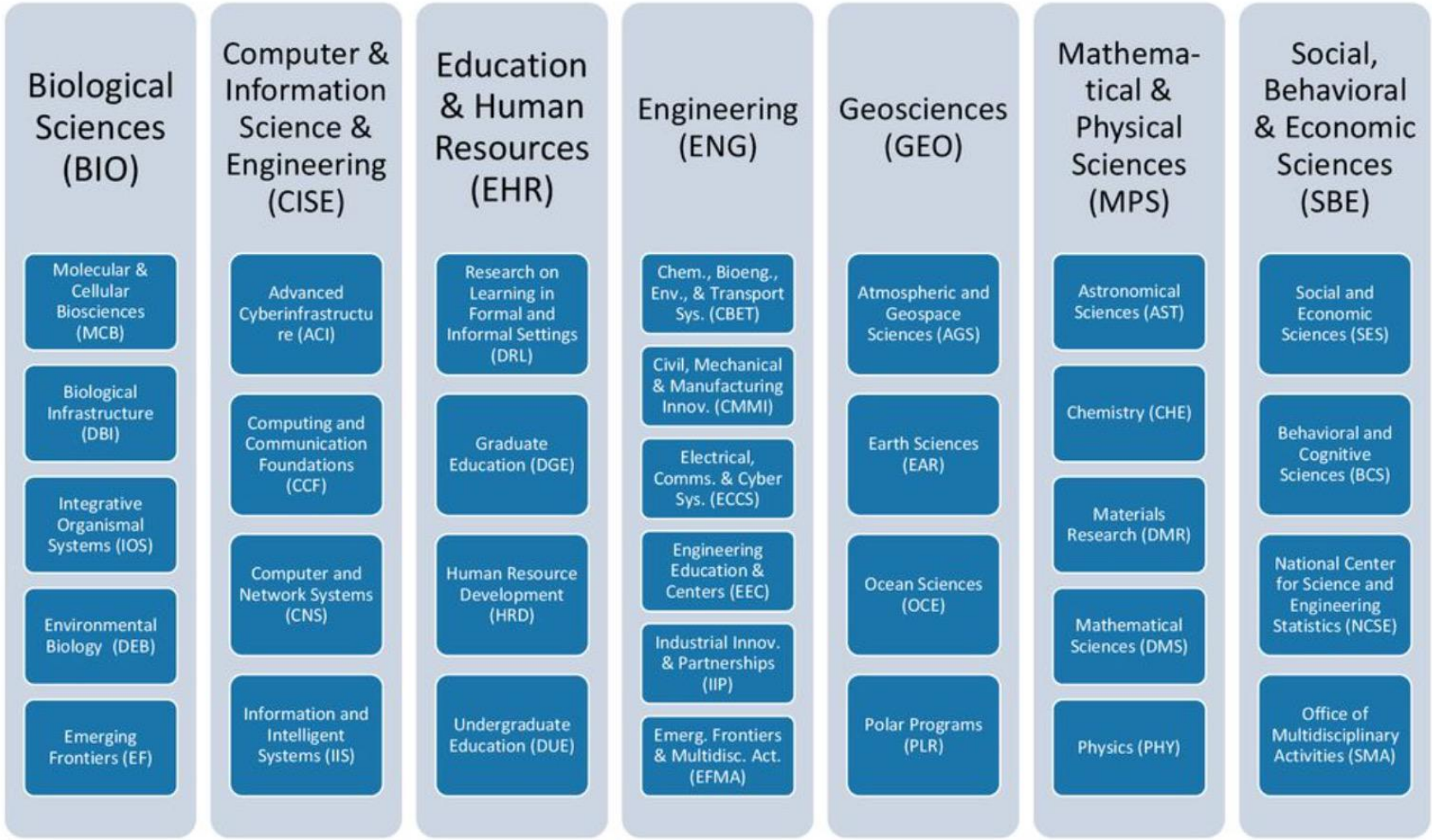
- *Discovery, learning, research infrastructure, and stewardship*
- FY20 budget: $8.3 billion
- ~ 27% of the total federal budget for basic research
- Federal support in STEM fields
- ~12,000 research proposals/yr
- Rigorous, objective merit review system

https://www.nsf.gov/about/glance.jsp

NSF STRUCTURE



NSF DIRECTORATES & DIVISIONS



INTERDISCIPLINARY RESEARCH

- How NSF promotes interdisciplinary research:
  - specific solicitations
  - unsolicited funding opportunities
  - center competitions
  - education and training
  - workshops and conferences
- Novel or emerging areas (e.g., EAGER)
- *Strong interest in engaging PUIs in interdisciplinary research and education*

https://www.nsf.gov/od/oia/additional_resources/interdisciplinary_research/index.jsp

NSF BIG-10 IDEAS

~$30M per year into each Big Idea

https://www.nsf.gov/news/special_reports/big_ideas/index.jsp

RESEARCH IDEAS

Six Big Ideas: research-focused, build on the foundation of NSF-funded research

- Interdisciplinary management
  - Lead directorate, "steward"
  - Other participating directorates
- ~$180 million: developing foundational science and technology for the Big Ideas
  - *In addition to significant foundational investments by individual NSF directorates*
- Growing ***convergent research***
  - Beyond the boundaries of individual NSF directorates

ENABLING IDEAS

Four Big Ideas: research for improving "how science is done"

- ***Workforce***
- ***Developing infrastructure***
    1. *NSF INCLUDES*
    2. *Growing **Convergence Research** at NSF*
    3. *Mid-scale Research Infrastructure*
    4. *NSF 2026 Fund*
- Directed by cross-agency working groups
- $117 million combined investments in FY19

RESEARCH IN UNDERGRADUATE INSTITUTIONS (RUI)
&
RESEARCH OPPORTUNITY AWARDS (ROA)

PUI EMERGING RESEARCH INSTITUTION

PUIs MATTER!

Important contributions to education and research

- ***NSF encourages research by faculty members at PUIs:***
  - Ensures broad national scientific base
  - *Helps PUI faculty members stay on the "cutting edge"*
- ***Faculty research strengthens the unique role of PUIs***
  - Provides undergraduate students with a strong foundation in STEM

Many STEM professionals receive undergraduate degrees from PUIs, including populations underrepresented in STEM

RUI & ROA

RUI

1. Supports PUI faculty in research
2. Builds capacity for research at home institution
3. Supports integration of research and undergraduate education

ROA

- Supports PUI faculty research, **but**
- Enable faculty to work as visiting scientists at research-intensive organizations

RUI & ROA

All NSF directorates support RUI and ROA activities

- Announced through solicitations or program descriptions
- Some programs do not accept RUI/ROA submissions*
- Evaluated and funded by NSF programs in appropriate disciplinary area
- Divisions and program officers have substantial influence
  - Contact cognizant NSF program officers for guidance and alignment

https://www.nsf.gov/crssprgm/rui_roa/contacts.jsp

** Check with appropriate division contact*

FUNDING TYPE, AMOUNT, DURATION

RUI – Standard or continuing grants

- Annual award size for RUI projects: from $75k to several hundred thousand dollars (and even higher)
  - *Awards for collaborative proposals may higher, depending on:*
    - *# faculty involved*
    - *# participants involved*
- 3 years

ROA – supplements, re-budgeting, or standard or continuing grants

- Typical ROA awards up to $80,000
- 2 –12 months

FY19: $56 million for 200 RUI awards; $3 million for 45 ROA awards

BUDGET CONSIDERATIONS

Requested budget should be appropriate for the scope of the project

- Budget depends on:
  - *Nature of the project*
  - *Number of investigators*
  - *Project duration*
- Consult program officer to determine if the proposed budget is appropriate

IMPORTANT: discuss research plan and budget with a PO before considering submitting a RUI or ROA proposal

RUI VS. ROA

RUI supports:

- Individual/collaborative research project involving:
  - PUI faculty
  - students at their own and/or other institutions
- Shared research instrumentation*

ROA supports:

- Supplementary $$ to existing NSF awards for ROA activities involving PUI faculty
- Rebudgeting funds in existing NSF awards to support ROA activities for PUI faculty
- Submission of new collaborative proposal between PUI and other institution(s) with an ROA component
  - subaward OR
  - part of a linked collaborative proposal

** The NSF MRI mechanism should be explored as a first choice for research instrumentation requests*

RUI OVERVIEW

RUI Basics:

- RUI supports research by:
  - individual PUI faculty members
  - groups of collaborating PUI investigators
- Broad range of participating NSF programs
- **Proposals from faculty at PUIs need not be submitted as RUI proposals**
  - If RUI, up-to-five-additional-page *RUI Impact Statement*
  - If RUI, certification of RUI/ROA eligibility

RUI OBJECTIVES

RUI seeks to:

- Support high-quality research by PUI faculty
- Strengthen the research environment
- Promote integration of research and education of undergraduate students
- Support faculty research
    - *But remember: involvement of undergraduate students in that research is important!*

RUI awards augment educational strengths of PUIs by providing students with research-rich learning environments

RUI IMPACT STATEMENT

Potential impact of the proposed research on the PI's institution, department, faculty and student participants

- Required for all RUI proposals!
  - 5 pages
- Impact statement helps reviewers assess:
  1. Likely impact on PUI's research environment
  2. Likely impact on the career(s) of the faculty participants
  3. Ability of the involved department(s) to better prepare students for entry into advanced-degree programs and/or careers in STEM

Impact Statement = Advantage CSUSB!

TYPES OF RUI PROPOSALS

1. ***Single-Faculty Investigator or Collaborative-Faculty Investigators Research Projects***

- All NSF directorates participate in RUI opportunity
  - individual PUI faculty members
  - groups of collaborating PUI investigators
- Research done at the PUI with some exceptions
  - access to critical instrumentation or environments

WHAT AN RUI PAYS FOR

Support for:

- salaries and wages
- research assistantships
  - Usually undergrads, but others may be allowed
- fringe benefits
- travel
- materials and supplies
- publication costs and page charges
- consultant services
- essential equipment
- field work
- research at other institutions
- indirect costs

RUI COLLABORATIVE PROJECTS

Advances in research depend on broad skills and knowledge

- Collaborations within or across disciplinary boundaries can enhance the pace and productivity of faculty research
  - *Students learn teamwork; broader range of research skills*
- Competitive collaborative projects focus on a research problem requiring broad perspectives
- Collaborative proposals include two or more faculty members and several undergraduates from one or more PUIs
  - *Open to a range of PUI, PI, and student involvement*

RUI SHARED RESEARCH INSTRUMENTATION

Shared Research Instrumentation

- Major Research Instrumentation (MRI) program: *look here first!*
- Instrumentation requests that don't fit with MRI may be considered by some NSF programs
  - e.g., requests under $100,000
- Opportunities vary among NSF programs
- *Contact program officers to inquire about instrumentation opportunities*

https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5260

ROA OVERVIEW

ROA Supplements; Re-budgeting of Existing NSF Awards

- Submitted to NSF by the institution holding the existing NSF award
- PUI faculty members interested in ROA make arrangements with existing NSF-supported investigators
- PI of ongoing NSF research grant may initiate ROA collaborations
- PUI ROA-supported researcher and host researcher:
  - work together to develop a research plan and budget!
- Reviewed by NSF PO, ***not subject to external merit review***

ROA OVERVIEW (CONT…)

New Proposals with ROA Components

- May be submitted as:
  - *linked collaborative proposals* or
  - *a single proposal with one or more subawards*
- Enables two or more organizations to collaborate on a research project
  - *At least one of the proposals is from a research-intensive organization*
- Linked collaborative: reviewed as single project
  - *separate awards to each of the submitting institutions*
- One or more of the (non-lead) proposals within a linked collaborative can propose a new ROA activity for a faculty member(s) at a PUI
  - *A PUI that submits a component of the linked collaborative receives and is credited with an award from NSF*

ROA OVERVIEW (CONT…)

Subaward within a new NSF proposal submitted by a research-intensive organization

- Investigator(s) from PUI work closely with a PI from the research-intensive organization
- Incorporate the contribution of the PUI investigator(s) to the project into the proposal (including the subaward budgets)
    - *NSF award goes to the research-intensive organization that then provides funds to the PUI through a subaward*
- Follow guidance and timelines in individual solicitations
- No deadline or target date for submission
- Subject to the standard NSF merit review process
- *Discuss with program officers prior to considering a proposal submission*

BENEFITS TO CSUSB

RUI and ROA offer substantial benefits to CSUSB faculty:

- Advance research, education, and institution strategic goals
- Collaborate with faculty at research-intensive organizations
- ***Both help to:***
  - Advance research
  - Enhance PI credibility
  - Advance preliminary data and publications
  - Collaborate with colleagues at PUIs
  - Pursue interdisciplinary and convergent research at home or across institutions

There is no limit to number of proposals from a PUI

SECTION 2: PREPARING A COMPETITIVE RUI PROPOSAL

INITIAL PLANNING

Determine the topic and scope for the study

- Develop project scope and level of collaboration
- Establish scientific rationale by discussing:
  - *Current research studies and state of field*
  - *Preliminary evidence and motivation*
  - *The project's ability to engage and benefit students and institutional research capabilities*
- How does the topic support the mission of the target directorate, division, and RUI/ROA funding mechanism?
- Get feedback on your science and research design!

CONSULT COLLEAGUES AND REFINE

Concept paper: GET FEEDBACK!

- rationale, research design, and core innovation
- Engage SMEs (e.g., statistician, evaluator, funded PIs)
- You want an honest review/critique
  - *There is no substitute for a colleague who asks good questions*
- Don't forget non-SMEs! (i.e., friends, family, colleagues)
  - Scientifically literate lay readers or practitioners
  - **If they can't understand, you need to revise until they do**
- Refine, revise, and *develop into NSF Project Summary*

WRITE PROJECT SUMMARY

One page with three required sections:

1. *Overview* (~1/2 page): the activities that would result if the proposal were funded, including:
   - Specific objectives
   - Methods
2. Statement on *intellectual merit* (~1/4 page): the potential of the project to advance knowledge
3. Statement on *broader impacts* (~1/4 page) the potential of the project to benefit society and contribute to the achievement of specific, desired societal outcomes

- *Also indicate any program solicitation to which your RUI proposal is responding*

Check the PAPPG for complete instructions*

https://nsf.gov/pubs/policydocs/pappg20_1/nsf20_1.pdf

COMPONENTS OF RUI PROPOSAL

- Project Summary (1 page)
- Project Description (15 pages)
- Biographical Sketch (2 pages)
- RUI Impact Statement (5 pages)
- References
- Budget and Justification
- Current and Pending Support
- Facilities and Equipment
- Certification of Eligibility

Core Written Docs

Core Supportive Docs

PROJECT DESCRIPTION STRUCTURE

Main narrative of the grant application describing proposed research, importance, how it will be conducted, projected outcomes, and merits

1. Introduction
2. Significance of the Proposed Work
3. Preliminary Data
4. Research Plan
5. Outreach/Educational Plan
6. Evaluation and Dissemination
7. **Broader Impacts**
8. Project Timeline
9. **Results of Prior NSF Support**

INTRODUCTION

Every good story has a strong introduction…

- Context and significance
- Challenge, problem, or need
- Literature, evidence, and gap(s) in knowledge
- Proposed idea or solution
  - *How you will contribute to/improve current state of knowledge and societal issue(s)*
- Short- and long-term goals, objectives, and activities
- Summarize implementation approach and methods
- Summarize activities and outcomes
- Talk about PI and team capabilities
- Highlight impact(s) for target beneficiaries
  - You, the PUI faculty, undergraduates, your institution

SIGNIFICANCE OF THE PROPOSED WORK

Explain how the project is grounded in the relevant theory, practice, and literature

- Literature review
- Preliminary success (grant funded and/or published results)

Identify the knowledge gaps that your work will advance or resolve

- Innovation isn't always about paradigm shifts!

Show how work is extension of existing work or new approach

- Use subheadings to assist reviewers who are working to identify key categories of information

Make clear how you work will advance this body of knowledge!

PRELIMINARY DATA

Show how work/data that you have collected alone or in collaboration with others is both relevant and important to the proposed project

- What if I don't have preliminary evidence?

Explain how preliminary data informed your approach

- Provide sufficient detail for reviewers to assess the value of the project

RESEARCH PLAN

Describe how project will be carried out!

- Provide clearly organized goals and objectives
- Describe each of these components:
  - Research objectives
  - Methodology
  - Specific activities
  - Expected outcomes
  - Potential challenges and alternative approaches
  - Impacts, results, etc.

OUTREACH/EDUCATIONAL PLAN

Describe planned outreach/educational activities

- Identify any partners and degree of commitment
  - Build outreach objectives and activities with your expected outcomes in mind
  - Rationale, target audience, expected outcomes, relevance to the research/implementation for each activity
    - DETAILS! Convince reviewers that you can and will accomplish the proposed activities
- Consider the following general outline:
  - Goals
  - Objectives
  - Activities
  - Expected Outcomes

EVALUATION AND DISSEMINATION

NSF requires rigorous evaluation and sharing results…

- Describe the *formative and summative evaluation* plan:
  - specific research questions, data sources, measures, analyses, etc.
- Evaluation plan and evaluator background
- Evaluator must be independent of the project
  - *For research, the PI will often conduct the evaluation*
- Include a plan for *dissemination*
  - e.g., publication and presentation to variety of stakeholders

PROJECT TIMELINE

Help the reviewers "see" the project schedule…

- Include a GANTT chart-type timeline with quarterly resolution

Example:

Activity	Year 1				Year 2			
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Start-up phase (9 months, Goals 1 and 2)	X	X	X					
- Setup and hires (6 months)	X	X						
- Program beta test (2 months)*		X						
- Training staff (2 months)*		X	X					
Program (Goal 3)				X	X	X	X	
- Participant recruitment (6 months)				X	X			
- Intervention (12 months)				X	X	X	X	
- Follow-up measures (9 months)					X	X	X	
Evaluation and reporting (3 months)								X

RESULTS OF PRIOR NSF SUPPORT

Follow the instructions in the PAPPG

- Up to five pages for this section
  - If the results are directly related to the project, move this section up near the significance section
  - If the results are not directly related, keep this section at the end after your research plan to highlight merits

SUPPORTING DOC: RUI IMPACT STATEMENT

Opportunity to promote your activities at three different levels:

1. Institutional
2. Departmental
3. Individual

- State importance of research to all three levels
- Provide success stories within all three levels
- For all three levels, describe the approach to providing students with a better educational experience

RUI IMPACT STATEMENT

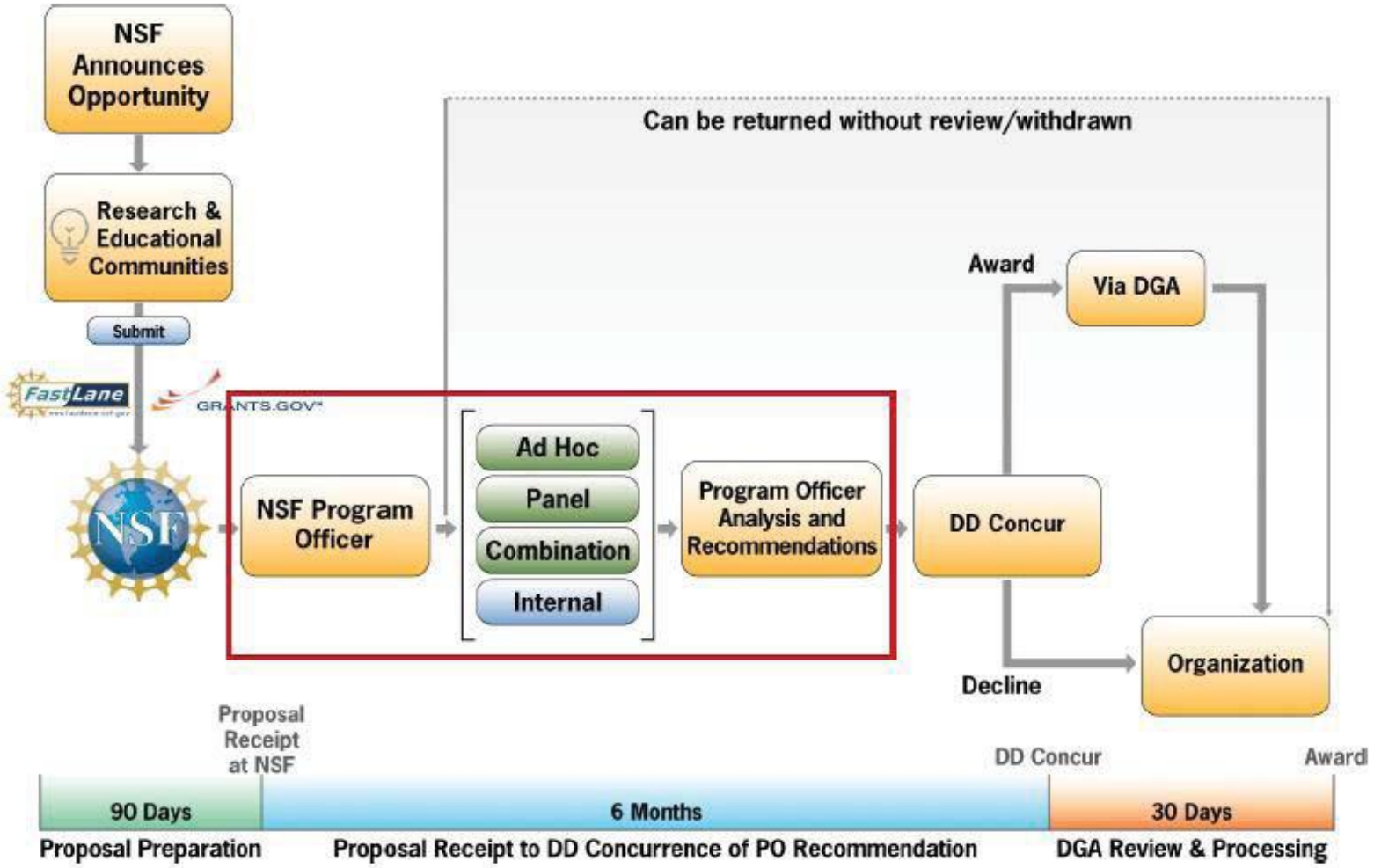
***Sample* outline:**

- **A. *Profile of the STEM at CSUSB***
  - ***A.1. Introduction (general info about CSUSB, student enrollment, demographics, etc.)***
  - ***A.2. Undergraduate training record***
- **B. *[Your Department] at CSUSB***
  - ***B.2. Undergraduate training record***
- **C. *Impact of the proposed project on the research environment***
- **D. *Impact of the proposed project on training of students***
  - ***D.1. Undergraduate recruitment plan***
    - *[How will you attract qualified students, especially from underrepresented groups?]*
  - ***D.2. Measuring the effect of student participation***
    - *[How will you measure the effect of project participation on the participating students during and after their undergraduate years?]*
- **E. *Impact of the proposed project on PI/faculty participants' careers***

see solicitation for complete instructions: https://www.nsf.gov/pubs/2014/nsf14579/nsf14579.htm

SECTION 3: NSF & RUI MERIT REVIEW PROCESS

NSF REVIEW PROCESS



PANEL TYPES

Ad hoc: *Specialized review of proposals*

- Review using specialized expertise in a field related to the proposal
- Primary role is to provide a specialist's opinion to PO and/or reviewers

Panel: *Mix of subject matter and general science reviewers*

- Usually have a broad scientific knowledge and expertise
- Review large number of proposals and participate in a discussion of proposal merits
- Role is to synthesize their own evaluation with that of the *ad hoc* and other panelist reviewers to achieve consensus (i.e., panel summary)

Combination: *Multiple or mixed panels*

- Used mainly for proposals with crosscutting themes (e.g., Big Ideas)

NSF MERIT REVIEW CRITERIA

Reviewers must consider the what, why, and how of the project, including how you'll know if you succeed, and what benefits would accrue.

- **The two merit review criteria**:
  - ***Intellectual Merit*** – potential to advance knowledge
  - ***Broader Impacts*** – potential to benefit society and contribute to the achievement of specific, desired societal outcomes

Know your merit review criteria!

- **Proposal and Award Policy and Procedures Guide**
  - *https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg*
- **RUI/ROA solicitation**
  - *https://www.nsf.gov/pubs/2014/nsf14579/nsf14579.htm*
- **Any program-specific solicitation**

REVIEW OF RUI

RUI-designated proposals are evaluated alongside other proposals submitted to the same NSF program

- IM + BI + additional non-RUI review criteria indicated in a program's solicitation (as applicable)
- *RUI reviewer instructions call attention to the RUI Impact Statement and the special circumstances under which RUI investigators work*
  - *Including PUI faculty on review panels and encouraging them to remind reviewers of PUI challenges and value*
  - *Asking reviewers to consider research merits and timelines accordingly*

SCORING

Scores
Excellent (E)
Very Good (VG)
Good (G)
Fair (F)
Poor (P)

- Focus on the comments!
- Funded? Yay!
  - *review summary = useful advice for enhancing your study*
- Not funded? Don't take it personally!
  - *Review summary = areas for improvement*

RESOURCES

- **RUI/ROA program page (FAQs, previous awards)**
  - https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5518
- **RUI/ROA solicitation**
  - https://www.nsf.gov/publications/pub_summ.jsp?WT.z_pims_id=5518&ods_key=nsf14579
- **PAPPG**
  - https://nsf.gov/pubs/policydocs/pappg20_1/nsf20_1.pdf
- **NSF brochure on Broader Impacts**
  - https://www.nsf.gov/od/oia/special/broaderimpacts/

HANOVER ALERTS

Through a series of newsletters, the Hanover Grants team tracks funding opportunities in line with strategic interests of our members:

GRANT ALERTS
WEEKLY

Every Monday, learn about the previous week's grant solicitations of interest from federal agencies and select private foundations. Alerts are broken up into research and programmatic grant opportunities: Higher Education Programmatic, Higher Education Research, Health Programmatic, and Health Research.

GRANT PROJECTIONS
MONTHLY

Each month, Hanover looks three months ahead at major grant competitions, providing details on program background, key deadlines, and timelines for engaging Hanover for varying levels of assistance. Projections available: Higher Education, Health, and K-12.

GRANTS CALENDARS
MONTHLY

Hanover produces a specialized calendar each month, tracking grant opportunities across the coming year of interest to different types of institutions and to faculty in different areas of focus. These calendars include: Minority-Serving Institution Grants, Arts & Humanities, STEM Program Grants, STEM Research Grants, Health Research Grants, Early Career Faculty Grants.

SIGN UP FOR OUR ALERTS: insights.hanoverresearch.com/sign-up-grant-newsletter

QUESTIONS

HANOVER RESEARCH

Thank you.

CONTACT

Chris Grey

Content Director, Grants

E: cgray@hanoverresearch.com

P: 202.350.4797

hanoverresearch.com