Funding Opportunities in the Biological Sciences (BIO) Directorate at the National Science Foundation

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Outline for Today's Talk

- Overview of the National Science Foundation and the Biological Sciences Directorate
 - Mission and organization
 - Scientific priorities and programs
- Getting funded at NSF
 - Funding cycle and review criteria
 - Types of grants
 - Opportunities
- Take home message
 - Talk to a program director!!!





National Science Foundation

- Supports basic research and education via grants
- Annual budget ~\$ 8 billion
 - >50,000 proposals
 - ~12,000 new awards per year
 - ~350,000 scientists, educators and students
- Discipline-based structure
- Cross-disciplinary programs





NSF Organization

OFFICE OF THE DIRECTOR NATIONAL SCIENCE BOARD (NSB) 703.292.8000 703.292.7000 **Director's Office** France A. Córdova Diane L. Souvaine **National Science Board** Director Cha Vacant Ellen Ochoa Deputy Director vice Chair OFFICE OF NATIONAL SCIENCE F. Fleming Crim INSPECTOR GENERAL BOARD OFFICE Chief Operating Officer (OIG) Ilison C. Lerner, spector General r. John J. Veysey, I Executive Officer **Directorates** 703.292.7100 703.292.7000 DIRECTORATE FOR BIOLOGICAL COMPUTER & EDUCATION & HUMAN GEOSCIENCES MATHEMATICAL & SOCIAL, BEHAVIORAL, & ENGINEERING SCIENCES INFORMATION SCIENCE & RESOURCES (GEO) PHYSICAL SCIENCES ECONOMIC SCIENCES (ENG) (BIO) ENGINEERING (CISE) (EHR) (MPS) (SBE) Dawn Tilbury, Assistant Directo Fay L. Cook, Assistant Director ies Kurose, stant Director Illam (Jim) Lew Acting Assistan Director Millam E. Easterling Assistant Director anne 8. Tornow Acting Assistant Director Kellina M. Craig-Linda G. Blevins Deputy AD Soott Borg, Deputy AD In Glanohanda Deputy AD Deborah Lookhart Deputy AD Byllvla M. James, Acting Deputy AD Carol Bessel, Acting Deputy AD Henderson Deputy AD 703.292.8300 703.292.8500 703.292.8800 703.292.8900 703.292.8600 703.292.8700 703 292 8400 BIO CISE EHR **ENG GEO MPS** SBE



"To enable discoveries for understanding life, advance the frontiers of biological knowledge, increase our understanding of complex systems, and provide a theoretical basis for original research in many other scientific disciplines."





...Research with disease-related goals, including work on the etiology, diagnosis or treatment of physical or mental disease, abnormality, or malfunction in human beings or animals, is normally not supported. Animal models of such conditions or the development or testing of drugs or other procedures for their treatment also are not eligible for support.

However, research in bioengineering, with diagnosis- or treatmentrelated goals, that applies engineering principles to problems in biology and medicine while advancing engineering knowledge is eligible for support. Bioengineering research to aid persons with disabilities also is eligible.

Proposal & Award Policies & Preparation Guide <u>http://www.nsf.gov/pubs/policydocs/pappg19_1/index.jsp#A</u>

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Division of Biological Infrastructure (DBI)	Division of Environmental Biology (DEB)	Division of Integrative Organismal Sys (IOS)	f stems	Division of Molecular and Cellular Biosciences (MCB)
Human Resources	Population and Community Ecology	Behavioral Systems		Molecular Biophysics
Research Infrastructure	Ecosystem Science	Developmental Systems		Cellular Dynamics And Function
	Evolutionary Processes	Neural Systems	5	Genetic Mechanisms
	Systematics & Biodiversity Science	Physiological & Structural Syste	& ms	Systems and Synthetic Biology
		Plant Genome - Research Progra	im	



Biological Infrastructure (DBI) Supports infrastructure for contemporary research in biology

- Research Resources
 - Infrastructure Innovation
 - Biological informatics
 - o Instrument Development
 - Infrastructure Capacity
 - Collections
 - Cyberinfrastructure
 - Improvements to Field Stations & Marine Laboratories
 - o Instrument Capacity
 - Advances in Digitization of Biological Collections





Biological Infrastructure (DBI) Supports infrastructure for contemporary research in biology

- Human Resources
 - Research Experiences for Undergraduates
 - Postdoctoral Research Fellowships
 - Research Coordination Networks for Undergraduate Biology Education
- Centers
 - NEON: National Ecological Observatory Network
 - CyVerse: Cyberinfrastructure for the Life Sciences
 - Synthesis Centers
 - Science and Technology Centers





Credit: © 2012 Jupiter Images Corporation



Credit: Nicolle Rager Fuller, NSF



Environmental Biology (DEB)

Supports research on origins, functions, relationships, interactions, and evolutionary history of populations, species, communities, and ecosystems

- Ecosystem Science
- Evolutionary Processes
- Population and Community Ecology
- Systematics and Biodiversity Science

Credit: Oscar Johnson, LSU



Credit: Clint Penick, The Biomimicry Center, Arizona State University

Credit: Anna Johnson, Biological Sciences, Univ Pittsburgh



Integrative Organismal Systems (IOS)

Supports research to understand organisms as integrated units of biological organization, with emphasis on systems-level approaches to the study of their development, function, behavior, and evolution

- Behavioral Systems
- Developmental Systems
- Neural Systems
- Physiological and Structural Systems
- Plant Genome Research

https://www.nsf.gov/funding/programs.jsp?org=IOS



Credit: (L), Mikhail Matz, Univ Texas-Austin; (R), Willow Gabriel, Goldstein lab, Univ North Carolina at Chapel Hill



Credit: American Society of Plant Biologists



Credit: Z. Jeff Chen Laboratory, Univ Texas-Austin



Supports quantitative, predictive and theory-driven research to understand complex living systems at the molecular, subcellular, and cellular levels

- Molecular Biophysics
- Cellular Dynamics and Function
- Genetic Mechanisms
- Systems and Synthetic Biology



Credit: Beckman Institute for Advanced Science and Technology



Credit: Diana Chu, San Francisco State Univ



Life innovates, biology integrates





BIO Priorities: FY 2020



Advancing convergence opportunities

Continental scale ecosystem science

Workforce development



Understanding the Rules of Life (URoL): One of NSF's Ten Big Ideas





RoL Rules of Life (across BIO)	URoL Understanding Rules of Life
A track for submissions to the BIO directorate	One of NSF's Ten Big Ideas
Crosses BIO divisions	Crosses NSF directorates
Projects integrate approaches across biological scales	Projects integrate approaches from more than one discipline
Topics up to you	Solicitations on specific topics
No deadlines	Deadlines apply



Rules of Life Research Examples





Funding Opportunities for Biological Research Outside the BIO Directorate



Biological Sciences



Engineering



Mathematical & Physical Sciences



Computer & Information Science & Engineering



Geosciences



Integrative Activities



Education & Human Resources



Social, Behavioral & Economic Sciences



International Science and Engineering

Engineering Biology and Health Cluster

Physics of Living Systems Polar Programs (Arctic and Antarctic) Advanced Biomanufacturing of Therapeutic Cells

Biological Oceanography Biological Anthropology

Chemistry of Life Processes

Environmental Engineering and Sustainability Cluster



Where to Find Program Information

NSF website: www.nsf.gov





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Getting Funded

- Identify possible programs that fit with your research
- Discuss your idea with a program director!!!
- Understand the review process and the merit review criteria
 - Intellectual Merit
 - Broader Impacts
- Review and adhere to submission guidelines in the solicitation and the Proposal & Award Policies & Procedures Guide



The Proposal Cycle From the PI's Perspective





Review Criteria

INTELLECTUAL MERIT and BROADER IMPACTS

- **1.** What is the potential for the proposed activity to:
 - a) INTELLECTUAL MERIT: advance knowledge and understanding within its own field or across different fields; and
 - b) BROADER IMPACTS: benefit society or advance desired societal outcomes?
- 2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
- 3. Is the plan for carrying out the proposed activities **well-reasoned, well organized, and based on a sound rationale**? Does the plan incorporate a mechanism to **assess success**?
- 4. How well **qualified** is the individual, team, or institution to conduct the proposed activities?
- 5. Are there **adequate resources** available to the PI (either at the home institution or through collaborations) to carry out the proposed activities?



My Advice to PIs for Writing an Excellent Proposal

- Identify your audience
- Frame a big picture
- Identify significant needs, gaps, and hypotheses
- Describe the plan to address the needs, gaps, and hypotheses

- Emphasize creative or innovative aspects
- Provide proof-ofconcept
- Describe the expected outcomes, metrics, and evaluation
- Relate the outcomes to what you set out to do



Questions I Hear from Pls About Broader Impacts

- What's the formula?
- Pick two from a smorgasbord?
- How much time should I devote?
- Can I use existing programs at my institution?
- How do I pay for this?
- What if my institution won't support this concept?
- How do I assess broader impacts?



Advice

- It's not a formula
 - Do something that interests you, has measurable outcomes, and matches the time you are willing to devote
 - Go above and beyond what you are already paid to do
- Ask for money if you need it
- Use existing infrastructure, as appropriate
 - But...Give, as well as take
 - Realize that institutions certify to support your efforts
- Ask for help with assessment
- Consult <u>broaderimpacts.net</u>



National Alliance for Broader Impacts

Types of proposals and submissions

- Solicited vs. unsolicited proposals
 - Solicitation describes a specific funding program
 - Some programs do not have specific solicitations; submissions are submitted in response to the general NSF Proposal & Award Policies & Procedures Guide (PAPPG)
- Dear Colleague Letters (DCLs)
 - Usually announce a new funding opportunity or program emphasis
- Deadlines vs. Target Dates
 - Firm vs. flexible
 - No deadlines for some programs and some proposal types (small grants, workshops, supplements)



Most BIO Programs: No Deadlines

- Proposals may be submitted at any time to Core programs in MCB, IOS, DEB and DBI
- Two tracks
 - Core Program Track for proposals relevant to individual division's priorities
 - Rules of Life Track for proposals that integrate across scales in biological sciences for projects that would not normally fit in one BIO division
- No limits on number of proposals per researcher





Faculty Early Career Development Award (CAREER)

- For untenured, tenure-track faculty
- For development of activities that can effectively integrate research and education at your institution
- Five-year awards, > \$100,000 per year
- Deadlines in July



More Funding Opportunities

- RAPID
 - Grants for Rapid Response Research
 - Maximum \$200,000, 1 year
- EAGER
 - EArly-concept Grants for Exploratory Research
 - High-risk, potentially transformative research
 - Maximum \$300,000, 2 years

Supplement

- For those with NSF awards, provides funds for unanticipated opportunities
- Within scope of the original award
- Support for students, teachers, minority participation, research
- Usual amount <20% of the original award total

Contact your program director to discuss your ideas



Postdoctoral Research Fellowships in Biology

• Eligibility

- U.S. citizen or permanent resident
- You must <u>not</u> have served in postdoctoral capacity for more than 12 months prior to the application deadline

Current areas

- Broadening Participation of Groups Under-represented in Biology
- Research Using Biological Collections
- National Plant Genome Initiative (NPGI) Postdoctoral Research Fellowships
- Support for 2-3 years: \$54,000 plus \$15,000 allowance, annually
- Deadlines: Usually in November



Graduate Research Fellowships Program

- Eligibility
 - U.S. citizen or permanent resident
 - Planning to attend graduate school in an NSFsupported field of study in Fall of the following year, or have not completed more than 12 months of a graduate program
- Support provided for 3 years: \$34,000 plus \$12,000 cost of education allowance
- Deadlines usually in October



Where We Have Been

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NSF Needs You!

