NATIONAL SCIENCE FOUNDATION

Earnestine Easter
Program Director
Directorate for Education and Human Resources
EHR’S ORGANIZATIONAL STRUCTURE

Office of the Assistant Director

- Division of Graduate Education (DGE)
- Division of Human Resource Development (HRD)
- Division of Research on Learning in Formal and Informal Settings (DRL)
- Division of Undergraduate Education (DUE)
DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES
CORE INVESTMENT THEMES

▶ Learning and learning environments
  ▶ Understanding the cognitive and non-cognitive foundations of STEM learning and the creative use of formal and informal STEM learning environments

▶ Broadening participation in STEM
  ▶ Understanding how to effectively ensure access to and success in high quality STEM education for underrepresented groups

▶ STEM professional workforce development
  ▶ Educating and preparing a STEM workforce ready to capitalize on scientific advances and to address global, social, and economic challenges yet to be imagined
STEM LEARNING AND LEARNING ENVIRONMENTS
GOALS

Promote the development, use, and testing of instructional practices and curricular innovations that engage and improve students learning and retention in STEM.

Promote community and institutional transformation that will increase opportunities for the application of highly effective STEM teaching methods

PROGRAM TRACKS - Exploration, Design and Development, or Research

Engaged Student Learning

Institutional and Community Transformation
IUSE PROJECT TYPES AND FUNDING

- Exploration Projects
  - Maximum of $250,000 for up to two years

- Design and Development
  - Level I – Maximum of $600,000 for up to three years
  - Level II – Between $601,000 and $2,000,000 for up to five years

Only one level within the Institutional and Community Transformation track – Maximum of $3,000,000 for up to five years
ADVANCING INFORMAL STEM LEARNING (AISL) NSF 14-555

GOALS

- Advance new approaches to and evidence-based understanding of the design and development of STEM learning in informal environments for public professional audiences.
- Provide multiple pathways for broadening access to and engagement in STEM learning experiences.
- Advance innovative research on and assessment of STEM learning in informal environments.
- Develop understandings of deeper learning by participants.
AISL PROJECT TYPES AND FUNDING

- Pathways - $300,000 for two years
  - Exploratory development or feasibility studies

- Research in Service to Practice - $300,000 from two to five years
  - Project that advance knowledge and the evidence base for practices, assumptions, broadening participation, and emerging educational arrangements in STEM learning in informal environments

- Innovations in Development - $500,000 to $3 million for five years
  - Expected to result in innovative models, programs, technologies, assessments, resources, and/or systems for any area of STEM learning in informal environments
AISL PROJECT TYPES AND FUNDING CONT'D

- Broad Implementation - $500,000 to $3 million for five years
  - Expansion of models, programs, technologies, assessments, resources, research and/or systems that have a documented record of success, innovation, and/or evidence-based knowledge building
- Conferences, Symposia, and Workshops - $250,000 for two years
  - Focused, relevant to program goals, and generate product(s) usable by practitioners and researchers
- Science Learning+ - funding varies
  - Partnership program with The Wellcome Trust and Economic and Social Research Council in the United Kingdom and NSF
  - Designed to improve the knowledge bases and practices of informal STEM experiences to better understand, strengthen and coordinate their vital role in STEM engagement and learning.
BROADENING PARTICIPATION
LOUIS STOKES ALLIANCES FOR MINORITY PARTICIPATION (LSAMP) NSF 12-564

- Congressionally mandated to significantly increase the quality and quantity of minorities who successfully complete baccalaureate degrees in STEM disciplines and continue to graduate school.

- Projects emphasize baccalaureate degree production, student retention and progression, successful transfer from 2-year to 4-year institutions, and seamless transition to graduate school.
LSAMP PROJECT TYPES AND FUNDING

- Alliances (New, Mid-Level, Senior-Level, B2B) – varies
- Bridge to the Doctorate
- Broadening Participation Research
- International Research Component
- Community College Component
HISTORICALLY BLACK COLLEGES AND UNIVERSITIES UNDERGRADUATE PROGRAM (HBCU-UP) AND TRIBAL COLLEGES AND UNIVERSITIES PROGRAM (TCUP)

- Competition limited to these qualifying institutions
- Designed to build institutional capacity for undergraduate STEM education and research
- Encourage the inclusion of veterans
HBCU-UP AND TCUP PROJECT TYPES

- Targeted Infusion Projects – curriculum enhancement
- Research Initiation Projects – young investigators
- Implementation Projects – institutional transformation
- Broadening Participation Research Projects

Funding - $350,000 to $1.5 million for three to five years
STEM PROFESSIONAL WORKFORCE DEVELOPMENT
Focuses on the education of technicians for the high-technology fields that drive the nation’s economy.

Involves partnerships between academic institutions and industry to promote improvement in the education of S&E technicians at the undergraduate and secondary school levels.

Includes articulation between two-year and four-year programs for K-12 prospective STEM teachers that focus on technological education.
ATE PROJECT TYPES

- ATE Projects – Up to $300,000 for three years
  - Program Development and Improvement
  - Curriculum and Educational Materials Development
  - Professional Development for Educators
  - Leadership Capacity Building for Faculty
  - Teacher Preparation
  - Business and Entrepreneurial Skills Development for Students
  - Small Grants for Institutions New to ATE - $200,000 for three years
- Conferences and Workshops
- ATE Coordination Networks
ATE PROJECT TYPES contd

- Targeted Research on Technician Education - $150,000 to $800,000 for three years

- ATE Centers
  - National Center - $4,000,000 for five years
  - Regional Center - $3,000,000 for three years
  - Support Center - $1,600,000 for four years
GRADUATE RESEARCH FELLOWSHIP PROGRAM (GRFP)

GOALS

- To select, recognize, and financially support individuals with the demonstrated potential to be high achieving scientists and engineers, early in their careers.

- To broaden participation in science and engineering of underrepresented groups, including women, minorities, persons with disabilities, and veterans.
GRFP KEY ELEMENTS

Five Year Award – $132,000

- Three years of support
  - $32,000 Stipend per year
  - $12,000 Educational allowance to institution

- Professional Development Opportunities:
  - GROW: International Research
  - GRIP: Internships

- Supercomputer access: XSEDE

- Career Life Balance (family leave)
GRFP UNIQUE FEATURES

- Awarded to individual
- **Flexible:** choice of project, advisor & program
- **Unrestrictive:** No service requirement
- **Portable:** Any accredited U.S. institution
  - MS, MS and PhD, PhD

- **2010 - 2014:** 2,000 Fellowships each year
  - 2014: 14,000 Applications - ~14% success rate
GRFP ELIGIBILITY

- U.S. citizens and permanent residents
- Early-career: undergrad & grad students
- Pursuing research-based MS and PhD
- Science and Engineering fields
- Enrolled in accredited institution in US by Fall

Academic Levels

1: Seniors/baccalaureates; no graduate study
2: First-year graduate students
3: Second-year grad students
   - ≤ 12 months of graduate study by August
4: >12 months graduate study
   - Interruption in graduate study of 2+ years (can have MS degree)
GRFP RESOURCES

- NSF GRFP Website (nsf.gov/grfp)
  - Solicitation and links
- NSF GRFP FastLane Website (fastlane.nsf.gov/grfp)
  - Application, guides, announcements
- GRFP Website (www.nsfgrfp.org)
- Graduate Research Opportunities Worldwide (GROW) www.nsf.gov/grow
- Graduate Research Internship Program (GRIP) www.nsf.gov/grip or http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505127
- Current & former fellows
- Phone & e-mail
  - 866-NSF-GRFP (673-4737)
  - info@nsfgrfp.org
GOALS

- Catalyze and advance cutting-edge interdisciplinary research in high priority areas.

- Prepare STEM graduate students more effectively for successful careers within or outside academe.

- Develop models and knowledge that will promote transformative improvements in graduate education.
KEY FEATURES

- Development and testing of potentially transformative and scalable models for STEM graduate education

- Extension of benefits to STEM graduate students across the institution and broad dissemination of successful models

- Facilitation/advancement of interdisciplinary research in areas of high national importance

- Broad training of STEM graduate students for both research and research-related careers
KEY FEATURES (CONT)

- Evidence-based strategies to broaden participation of students from diverse backgrounds

- Robust formative assessment that is central to the traineeship and routinely informs and improves practice
NRT RESEARCH THEMES

 Data-Enabled Science and Engineering (DESE) theme
   Address fundamental challenges in data-enabled science and engineering
   Provide for educating the next generation of researchers and workers in this space

 Other crosscutting, interdisciplinary theme
   Align with national STEM priority research areas
   Have high potential for development of innovative practices of graduate education
NRT PROGRAM TRACKS

- Trainee Track
  - Comprehensive traineeship model that is innovative, evidence-based, aligned with changing workforce needs, and scalable.
  - Priority interdisciplinary research theme

- Innovations in Graduate Education (IGE) Track
  - Piloting, testing, and evaluating novel, innovative, and potentially transformative approaches to graduate education
  - Test-bed projects with high potential to enrich, improve, and extend the knowledge base with attention to transferability and innovation
FUNDING LIMITATIONS

- Traineeship Track: Up to $3,000,000 for five years

- IGE Track: $300,000 - $500,000 for 2-3 years

- Stipend requirements
  - For trainees whose research is aligned with the project’s research theme
  - Minimum of $32,000 for 12-month appointment
  - No charge for tuition and any other required costs of education while receiving NRT stipend
PROPOSAL CONTENT – TRAINEESHIP TRACK

- Comprehensive traineeship approach that is innovative, evidence-based, aligned with changing workforce and research needs, and scalable
- List of core participants, including evaluator
- Description of theme, vision, and goals
  - Integration of research and training elements
  - Potential to provide added value to current degree programs and methods of graduate training
  - Graduate training needs in thematic research field at host institution(s) and nationally
  - Scalability potential for proposed approaches
PROPOSAL CONTENT – TRAINEESHIP TRACK

- Education and training
  - Description of and rationale for traineeship model and components
  - Explicit approaches to provide training for academic and non-academic careers
  - Collaboration with non-academic partners
  - Timeline of logically phased, progressive training elements over the degree program

- Major research efforts
  - Potentially transformative research that NRT will catalyze

- Recruitment, mentoring and retention plans
The CyberCorps(R): Scholarship for Service (SFS) program seeks to increase the number of qualified students entering the fields of information assurance and computer security and to increase the capacity of the United States higher education enterprise to continue to produce professionals in these fields to meet the needs of our increasingly technological society.

The SFS program is composed of two tracks:

- **The Scholarship Track** provides funding to colleges and universities to award scholarships to students.
- **The Capacity Building Track** providing funds to support curriculum, outreach, faculty, institutional, and/or partnership development.
CyberCorps®: SFS Scholarship Track

- **Scholarship Component:**
  - Funding: tuition, fees, and stipends ($20K/$32K per year)
  - Length: 2-3 year scholarship for final years of undergraduate or graduate (master’s or doctoral) education
  - Obligation: Summer internship, post-graduation service requirement (work in Federal agency equal to scholarship length)

- **Student Eligibility:**
  - U.S. Citizen
  - Enrolled in IA program, within 2-3 years of graduation
  - Eligible for Federal employment (must be able to acquire security clearance)
  - Awardee institutions set additional selection criteria

- **Institution Eligibility:**
  - National CAE/IAE designation or equivalent (DC3 Forensics, NSA Cyber Ops or alternative evidence)
  - Offer full-time program of study in IA field(s)
FUNDING LIMITATIONS

- CyberCorps®: Scholarship for Service
  - $300,000 - 900,000 per Capacity project
  - $1-5M per Scholarship project
EHR CORE RESEARCH (ECR)

FUNDAMENTAL RESEARCH IN SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM) EDUCATION

NSF 15-509
ECR PROGRAM GOAL

Provide a coherent foundation of theory and research evidence to guide and improve STEM learning and the design of learning environments for all citizens, along with the research evidence to support STEM workforce development and broadening participation in STEM education and the workforce.
Investing in fundamental research in STEM education about critical areas that are essential, broad and enduring.

Seeking proposals that help synthesize, build and/or expand research foundations in the focal areas.

Contributing to the accumulation of robust evidence to inform efforts to understand, build theory to explain, and suggest interventions and innovations.
ECR PROGRAM FEATURES

- Addressing persistent challenges in STEM interest, education, learning, participation and workforce development.

- Developing foundational knowledge in STEM learning and learning contexts, both formal and informal, from childhood through adulthood, for all groups, and from the earliest developmental stages of life through participation in the workforce.
PROGRAM STRANDS

¬ STEM Learning and Learning Environments

¬ STEM Professional Workforce Development

¬ Broadening Participation in STEM
STEM LEARNING AND LEARNING ENVIRONMENTS

Topics

STEM learning
- Neural and cognitive bases of STEM learning
- Affective dimensions of learning
- Education policy and policy-relevant research

STEM learning environments
- Improvements in a range of learning outcomes
- Alignment of curriculum, instruction and assessment
- Development of diagnostic and performance assessments
STEM PROFESSIONAL WORKFORCE DEVELOPMENT

Topics

- Impact of different funding models on undergraduate and graduate preparation for 21st century workforce
- Persistence in STEM majors and careers
- Influence of public/private partnerships on workforce preparation
- Use of big data for interpreting implications of labor market trends on STEM education and training
BROADENING PARTICIPATION

- General topics
  - Increasing retention and degree attainment
  - Metrics to assess impact of broadening participation programs
  - Impact of diversity on innovation and productivity
- Research in Disabilities Education
  - Disability-based differences in STEM education and workforce participation
  - Physical barriers that impact STEM learning
- Research on Gender in Science and Engineering
  - Gender-related differences in learning and educational experiences
  - Gender gaps in STEM
BROADENING PARTICIPATION

- Underrepresented groups: women and girls, persons with disabilities, underrepresented minorities, English-language learners, veterans, students from rural or lower socio-economic backgrounds

- Complements broadening participation research tracks in other programs
PROPOSAL TYPES AND FUNDING

Three levels

- Level I - $500,000 – maximum of three years
- Level II - $1,500,000 – maximum of three years
- Level III - $2,500,000 – maximum of five years

Synthesis and conference/workshop proposals

Deadlines: February 3, 2015
- September 10, 2015
- Second Thursday in September Annually Thereafter
The Common Guidelines will be referenced in many EHR solicitations that include a research strand or focus.

Reading and attending to the Common Guidelines will be important for those submitting education research proposals of any kind.
ELEMENTS OF ECR PROPOSALS

- Linkages to theory and extant research in the field
  - Relevance and significance
  - Theoretical framework

- Research plan
  - Research questions and/or testable hypotheses relative to framework
  - Detailed methodology for research and data collection
  - Description of and rationale for sample selection

- Contributions to implementation (where applicable)
  - Implications for subsequent enactments of the intervention
ELEMENTS OF ECR PROPOSALS

- Contributions to foundational knowledge and theory
  - Coherent and persuasive argument that the research claims are warranted
  - Explanation of how research results will add new insights

- Communication strategy
  - Broad dissemination plan
  - Potential for peer review publication

- Objective external feedback
  - Strategy for ongoing objective external feedback using benchmarks, indicators, logic models, roadmaps, etc. to document progress towards proposed goals, objectives, and outcomes
ATTRIBUTES OF BROADENING PARTICIPATION RESEARCH IN STEM EDUCATION PROPOSALS

The Broadening Participation in STEM Education (BPR) proposals should:

- Create and study new models and innovations in STEM teaching and learning.
- Enhance the understanding of the underlying issues affecting the differential participation and success rates of students from underrepresented groups.
- Add to the research knowledge base.
- Inform STEM education practices and interventions.
ATTRIBUTES OF BROADENING PARTICIPATION RESEARCH IN STEM EDUCATION PROPOSALS-2

- Describe evidence-based research studies that contribute to understanding the participation of and successful outcomes for underrepresented groups in STEM.

- Consider new evidence-based strategies and practices and institutional structure models for broadening participation in STEM and increasing the capacity of MSIs to conduct this type of research.

- Be grounded in appropriate theory and incorporate recent innovations and advances in research methodologies, conceptual frameworks, and/or data gathering and analytic techniques.
ATTRIBUTES OF BROADENING PARTICIPATION RESEARCH IN STEM EDUCATION PROPOSALS-3

- Reflect relevant advances in quantitative, qualitative, and mixed-methods research and evaluation methodologies and provide a compelling argument about how the methodologies proposed are appropriately matched with the strategic research questions of the project.

- Demonstrate how the methods chosen will result in rigorous, cumulative, reproducible, and usable findings to merit peer review and publication.

- As appropriate, describe mechanisms to effectively transfer findings into educational practice for use by other researchers and policymakers.
EHR MAJOR INVESTMENTS FY 2016

- Cyberinfrastructure Framework for 21st Century Science, Engineering, and Education (CIF21)

- Graduate Research Fellowship Program (GRF)

- NSF Innovation Corps (I-Corps)

- NSF INCLUDES

- Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS)
EHR MAJOR INVESTMENTS FY 2016 CONT’D

- Improving Undergraduate STEM Learning (IUSE)
- NSF Research Traineeship (NRT)
- Secure and Trustworthy Cyberspace (SaTC)
- Understanding the Brain (UtB)