

# NSF Science and Technology Centers: Integrative Partnerships

Informational Webinar About Partnerships: Overview & Insights Welcome. We will start shortly.

## Webinar Agenda

- Part I: NSF presentation, Rebecca Morss & Dragana Brzakovic (NSF Office of Integrative Activities)
  - Introduction
  - Overview of STC program and partnerships
  - Answers to frequently asked questions
- Part II: STC partnership presentations, moderated by Justine Foo (Giant Leap Consulting)
  - STROBE (STC on Real-Time Functional Imaging, 2016): Margaret Murnane (University of Colorado Boulder) & John Miao (University of California, Los Angeles)
  - CEMB (Center for Engineering MechanoBiology, 2016): Annie Jeong (University of Pennsylvania) & Jayatri Das (The Franklin Institute)
  - CROPPS (Center for Research on Programmable Plant Systems, 2021): Darius Melvin (Cornell University) & Gregory Bernard (Tuskegee University)
- Part III: Q&A

## **Webinar Information**

- Goals for webinar
  - Highlight key elements of partnerships within the NSF STC program
  - Provide insight into STC partnerships through examples involving different STCs and types of partner organizations
  - Address questions from potential applicants
- Please ask questions using the Q&A in Zoom, at any time during the webinar
  - Indicate whether your question is for NSF or the STC presenters
  - We will begin answering questions later in the webinar (but we do not anticipate having time to answer all questions)
- Webinar slides and recording will be posted on the NSF STC web site in 1–2 weeks.

## **Science and Technology Centers: Focus**

• STC program supports large scale, long term, exceptionally innovative, complex research and education projects in **all areas of research funded by NSF**.

 Individual STCs focus on creating new scientific paradigms, establishing entirely new scientific disciplines and developing transformative technologies which have the potential for broad scientific or societal impact.

## **Science and Technology Centers: History**

- Program was announced in 1987 with new centers announced two year later
- Ten "classes" of STCs to date: 1989, 1991, 2000, 2002, 2005/2006, 2010, 2013, 2016, 2021 and 2023
- Integrative Partnerships emphasis in the program title begins with the Class of 2000
- Class of 2016 "graduating"
  → Class of 2026

## **Science and Technology Centers: Structure**

- **Research** portfolio of integrated frontier investigations
- **Education** evidence-based practices developed in the context of current education research and monitored through a formal evaluation
- **Knowledge transfer** significant intellectual exchange between the Center and external (usually non-academic) stakeholders
- -----Broadening participation-----

# Science and Technology Centers: Integrative Partnerships

- Partnerships enable centers to fulfill program goals
- Center features must be encompassed in an integrated portfolio of the partners' activities
- Lead institution has overall management and budgetary responsibility
- Partners share a common research vision and work on developing sustainable collaborations
- Type of partners vary among centers and may include universities/colleges, national laboratories, research museums, private sector research laboratories, industrial organizations, state and local government laboratories, and international collaborations.

# Answers to frequently asked questions about the NSF STC program

# Science and Technology Centers: Investigators and institutions

#### • How many co-PIs can an STC proposal have?

> 1 PI + up to 4 co-PIs = 5 people listed on cover page (can be from different institutions)

- >Additional significant contributors can be Senior / Key Personnel
- Can an investigator be involved in more than one STC proposal?

A person can be involved in more than one STC proposal only if they are Senior / Key Personnel in all of them

• Can personnel or institutions change between the preliminary and full proposal?

>Yes, but the PI (Center director) and lead institution cannot change

>Additions at the full proposal stage should *strengthen* the STC concept and/or team

# Science and Technology Centers: Proposal review process

- Multi phase review (method of elimination):
  - Preliminary proposals reviewed by multidisciplinary panels
  - Full proposals reviewed by ad hoc reviewers and multidisciplinary panel
  - Site visits—multidisciplinary panels
  - Blue Ribbon panel
- At all phases reviewers consider intellectual merit and broader impacts criteria and solicitation specific criteria outlined in solicitation for that particular phase.

# Science and Technology Centers: Preproposal structure

- Center rationale
- Center plan
- Team description
- Integration strategies
- Institutional Commitment to Broadening Participation (one paragraph)
- References (2 pages)
- Bio sketches, COA information
- List of personnel and list of institutions
- NO OTHER INFORMATION

## **Science and Technology Centers: Budget**

- Budget is submitted at the full proposal stage (no budget at preproposal stage)
- Budget is tentative
- Lead institution is responsible for subawards at partner institutions
- Program specific restrictions:
  - No salaries for employees of Federal agencies or FFRDCs sponsored by other agencies
  - No funding support to foreign organizations

## **Part II: STC partnership examples**

Moderated by Justine Foo (Giant Leap Consulting)

Presentations

1. Margaret Murnane (University of Colorado Boulder) & John Miao (University of California, Los Angeles)

STROBE (STC on Real-Time Functional Imaging), 2016 cohort

- 2. Annie Jeong (University of Pennsylvania) & Jayatri Das (The Franklin Institute) CEMB (Center for Engineering MechanoBiology), 2016 cohort
- 3. Darius Melvin (Cornell University) & Gregory Bernard (Tuskegee University) CROPPS (Center for Research on Programmable Plant Systems), 2021 cohort

Margaret Murnane, CU Boulder John Miao, UCLA

## STROBE STC on Real Time Functional Microscopy

STROBE.Colorado.edu

**Mission** – Build the microscopes of tomorrow to address grand challenges in science and technology, while building a diverse STEM workforce.

FIU

**STROBE** 



FORT LEWIS COLLEGE UNIVERSITY



### **STROBE** Partners need solutions to long-standing microscopy challenges



# **STROBE** Diverse trainee career pathways to broad sectors >165 Ph.D. and postdoc alumni since 2017, >150 undergrads





READ MORE 12

#### Congrats to Olivia Bird for Receiving an NSF Graduate Research Fellowship

The NSF GMPP recognizes and supports outstanding graduate students in NSF-supported STEM disciplines who are pursuing research-based maters' and doctoral degrees at accredited US institutions. The purpose of the NSF Graduate Bearch Followskip Program (GMP) is to ensure the quality viality and diversity of the scientific and engineering workforce of the United States. GMP seeks to broaden participation in science and engineering of undergressented groups, Uniteding women, Mnointer, persons with disabilities, and veterans. The fine-year fellowship provides three years of financial support inclusive of an annual stipend of \$137,000.



#### Congrats to Benjamin Hammel for Receiving an NSF Graduate Research Fellowship April 1, 2023 | National Science Foundation

The NSF GRPP recognizes and supports outstanding graduate students in NSF-supported STEM disciplines who are pursuing research-based materia and doctrand degrees at accredited US institutions. The purpose of the NSF Graduate Breach-Hollowide program (GRPF) is to ensure the quality value) and diversity of the scientific and engineering workforce of the United States. GRPP seeks to broaden participation in science and engineering of underrepresented groups, including women, minorities, persons with disabilities, and vertains. The frequest reliable provides three years of financial support inclusive of an annual bigned of ST37000.



#### Congrats to Emma Nelson for Receiving an NSF Graduate Research Fellowship March 29, 2023 | National Science Foundation

The NSF GMP recognizes and supports outstanding graduate students in NSF-supported STM disciplines who are pursuing research hased matteria and doctoral degrees at accredised US institutions. The purpose of the NSF Graduate Research Fellowship Program (GMPP) is to ensure the quality, stality, and diversity of the scientific and engineering workforce of the United States. GMP seeks to knowled participation in science and animatasterio ef undersamement ensures. United states CMPP seeks to be staded participation in science and animatasterio ef undersamement ensures. United states CMPP seeks to knowled participation in science and animatasterio ef undersamement ensures. United states constraints are not ambit in constraints and individual science and animatasterio ef undersamement ensures.



Congrats to Vivian Wall for Receiving an NSF Graduate Research Fellowship August 1, 2023 | National Science Foundation

The MSF GRP recognizes and supports outstanding graduate students in MSF-supported STEM disciplines who are purning research-based master's and doctoral degrees at accredited US institutions. The purpose of the NSF Graduate Besarch Fellowship Porgam (GRP) is to ensure the quality, vality, and diversity of the scientific and engineering workforce of the United States. GRP seeks to threaden participation in science and engineering of underrepresented groups, including women, minorities, persons with disabilities, and veterans. The five-year's fellowship provides three years of financial support inclusive of an annual stipend of 327,000.



#### Congrats to Livia Belman-Wells for Receiving an NSF Graduate Research Fellowship

The NSF GRPP recoprizes and supports outstanding graduate students in NSF-supported STEM disciplines who are pursuing research-based matter's and doctoral degrees at accredited US institutions. The purpose of the NSF Graduate Research-Felowship Program (GRPP) is to ensure the quality, vitality, and diversity of the scientific and engineering workforce of the United States. GRPS seeks to useden participation is centere and





June 1, 2023 | National Science Foundation

The NSF Mathematical and Physical Sciences Ascending Postdoctoral Research Fellowships (MPS-Ascend) supports postdoctoral fellows performing impactful research in MPS fields while broadening the participation of groups that are underrepresented in the mathematical and physical sciences.

LOCKHEED MARTIN

Cornell University.



Congrats to Stephanie Hart for Receiving a Postdoctoral Fellowship in Chemical Sciences from the Arnold and Mabel Beckman Foundation

#### June 1, 2023 | Arnold and Mabel Beckman Foundation



Stephanie Hart has been awarded the Arnold O. Beckman Postdoctoral Fellowship for her project titled, "Nanoscale imaging of ultrafast energy flow in photosynthetic architectures." The Arnold O. Beckman Postdoctoral Fellowship in Chemical Sciences or Chemical Instrumentation Award Program supports advanced research by postdoctoral scholars within the core areas of fundamental chemistry or the development and build of chemical instrumentation. Congratulations, Stephaniel



Congratulations to Nathan Brooks on a Postdoctoral Fellowship, Academia Sinica, Taiwan

#### May 31, 2023 | Academia Sinica, Taiwan

Congratulations to Nathan Brooks for receiving a Postdoctoral Fellowship from Academia Sinica in Taiwan!

#### Congrats to Ahyoung Kim for Receiving a Schmidt Science Fellowship



Eric and Wendy Schmidt have announced the Schmidt Science Fellows for 2023. This year's cohort of 32 Fellows are all recent PhD's who've been identified as some of the most outstanding early-career scientists in the world.



### Partners help ensure access to STROBE microscopes & methods

#### Enhanced facilities

**STROBE** 

#### Access via user proposals:

- COSMIC @ LBL
- NCEM @ LBL
- SINS @ LBL/ALS
- CL @ MoFo
- Materials database
- Free software



#### New commercial instruments

#### Access via industry partners:

- Bruker (Anasys)
- Horiba
- KMLabs
- DoubleHelix
- Radiabeam
- NanoElectronic Imaging



#### Unique microscopes

Access via collaborations:

- X-ray @ Boulder
- Nano-IR @ Boulder
- StroboSCAT @ Berkeley
- Workshops & user training
- Partnerships with MSI's
- Adoption by NIST, DOE, others via industry partners





**STROBE IR** *nano-imaging* technology transfer: from prototype to product Anasys  $\rightarrow$  Bruker  $\rightarrow$  new partners (Attocube, Horiba)



**STROBE** Tabletop EUV laser sources for quantitative materials microscopy: from use case demonstration to new capabilities  $\rightarrow$  NIST, Intel, 3M, Imec







In 2018, STROBE secured an Approved Program with the Advanced Light Source (ALS) and the National Center for Electron Microscopy (NCEM) at LBNL, increasing access

and facilitating the imaging with adva



#### Accomplishments

Coherent

diffractive

**Sample Holder** 

- has since been suc STROBE has collaborated with LBNL staff to publish several highprofile papers in Nature, Science, Nature Materials, and Nature Nano.
  - STROBE has supported over 10 postdocs stationed at LBNL, with most securing positions in academia or national labs.
  - STROBE has helped the development of scalar and vector tomography methods at the COSMIC of ALS, which has since become a flagship beamline for the ALS upgrade.
  - STROBE has encouraged greater usage of the NCEM and ALS facilities. For example, over 10 new proposals on atomic electron tomography are submitted to NCEM each year.

Interferometer Piezo scanner

COSMIC @ LBL's ALS

Resolution: 1-10 nm

enables the integration of state-of-the-art X-ray and electron imaging capabilities, driving transformative research.

TEAM 0.5 & I @ LBL's NCEM Resolution: 0.47 Å

Atomic Electron Tomography



# NSP

## institute for pure & applied mathematics

#### www.ipam.ucla.edu/CMS2022

## **Computational Microscopy**



September 12 - December 16, 2022

- Opening Day: Sept. 12, 2022
- Tutorials: Sept. 13–16, 2022
- Workshop I: Diffractive Imaging with Phase Retrieval Oct. 10–14, 2022
- Workshop II: Mathematical Advances for Multi-Dimensional Microscopy – Oct. 24–28, 2022
- Workshop III: Cryo-Electron Microscopy and Beyond Nov. 14–18, 2022
- Workshop IV: Multi-Modal Imaging with Deep Learning and Modeling Nov. 28 December 2, 2022
- Culminating Retreat at Lake Arrowhead: Dec. 11–16, 2022

#### Long Programs

rograms > Long Progra



- Brings together experts across disciplines to discuss the status and future of modern microscopy, focusing on computation, mathematics, and deep learning to promote cross-disciplinary research
- Aligns with STROBE's strategic goals
- Miao, Murnane, Osher, Waller, Ginsberg, others

#### Two Green Family Lectures

- "Building the Microscopes of Tomorrow" by Margaret Murnane, Oct. 10, 2022
- "Harnessing Quantum Physics for Tabletop X-Ray Lasers" by Margaret Murnane Oct. 11, 2022
- Participants of the computational microscopy program delivered 27 additional seminars at IPAM

## Annie Jeong, PhD & Jayatri Das, PhD

## Center for Engineering MechanoBiology (CEMB), 2016

The mission of the CEMB is to

- advance the study of mechanical forces in molecules, cells, and tissues in plants and animals
- train the next generation of scientists, engineers, researchers, and leaders to become *life-long learners* that look across disciplines to understand and control force in living systems.





https://cemb.upenn.edu/

## Center for Engineering MechanoBiology Partners









UCLA MERCED

**UNIVERSITY OF CALIFORNIA** 



IN THE CITY OF NEW YORK

University of Colorado Boulder



Washington University in St.Louis



## Partnership with The Franklin Institute





Goal: Inspire a curiosity and love of science in children (pre-college)

• From Philly Science Festival to a **Mobile Museum Exhibit** ...and much more in between!



Traditional outreach

## Partnership with The Franklin Institute

CEMB Center for Engineering MechanoBiology



Goal: Inspire a curiosity and love of science in children (pre-college)

From Philly Science Festival to a Mobile Museum Exhibit • ...and much more in between!



# Mechanobiology Mobile Exhibit: Opening early 2025!



#### **Pilot locally, scale to other CEMB cities:**

- Philadelphia, PA (Franklin Institute)
- St. Louis, MO (St. Louis Science Center)
- State College, PA (Discovery Space)
- Merced, CA (Public Library)

CEMB Trainee Leads: Faviolla Báez-Cruz (Penn) Paula Camacho Sierra (Penn) Matt Rowe (Penn) Josh Coomey (WashU) Suraj Sahu (UC Merced)







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 ...and much more in between!



Traditional outreach









Education Broadening Participation





## Darius Melvin & Dr. Gregory Bernard

### Center for Research on Programmable Plant Systems (CROPPS), 2021

### **CROPPS** Vision

Opening a dialogue with plants to expand:

- Understanding of the living world
- A future of sustainable and nutrient-rich agriculture

### **CROPPS** Mission

To create a diverse community of researchers and educators



#### Cropps.cornell.edu





## HBCU Partnership Tuskegee University

- Longstanding relationship with UIUC
- November 2022 Visit: 80TH PROFESSIONAL AGRICULTURAL WORKERS CONFERENCE
- May 2023 Visit: Partnership Meetings with Engineering and Agriculture Colleges
- Personnel from Tuskegee had multiple Cornell campus visits
- May 2024: Became 5<sup>th</sup> CROPPS partner institution with expertise in plant, soil and agricultural science



Synergistic Partnership with Tuskegee

Advancing CROPPS & Tuskegee Goals for:

- Research
- Education
- Public Engagement



## Autonomous agricultural tools: Bridging the technology gap to small-scale and minority farmers















PR-4DReids



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## Looking Forward





- Growth of Tuskegee Trainee/Senior Personnel participants in CROPPS
- Furthering iBreed (Dr. Marceline Egnin)





Hands on Molecular Laboratory Training; Plant Transformation and regeneration

# Developing Synergistic Partnerships

## 1.Identify a champion(s) in your organization

1. Know your organization

### 2.Prepare

- 1. Educate yourself on potential partners current realities/affairs
- 2. Define synergistic partnership for your organization

## 3.Execute

- 1. Network!
- 2. Be patient, persistent and <u>flexible</u> in partnership talks
- 3. <u>Co-creation</u> that produces a win-win is non-negotiable

## Thank you for joining!

- Webinar slides and recording will be posted on the NSF STC web site in 1-2 weeks
- A previous STC informational webinar (Solicitation Overview & Leadership Insights) was held in September 2024
  - Slides and recording are available on the NSF STC web site
- STC program contact information: stc2026@nsf.gov