

# Director's Report

National Advisory Council  
for Biomedical Imaging and Bioengineering

January 23, 2020

Bruce J. Tromberg, Ph.D.

Director

National Institute of Biomedical Imaging and Bioengineering





Pam  
Glikman



Alisha  
Hopkins



Asha  
Storm



Julia  
Ringel



Jacklyn  
Ebiasah



Ahmad El  
Hendawy

# Thank You!

<https://videocast.nih.gov/watch=35689>





# Thank You!

NIBIB Strategic Plan working groups met Jan 22, 2020  
>55 participants in 7 sub-groups  
**9:40 – 10:40 am Update**

## Data Science and Computation

Christine Cooper  
Qi Duan  
Maryellen Giger  
Jay Humphrey  
Lydia Kavraki  
Kyle Myers  
Grace Peng  
Behrouz Shabestari  
Hari Shroff  
Andrew Weitz

## Engineered Biology

Paula Hammond  
Joshua Leonard  
Jessica Meade  
Robert Nerem  
David Rampulla  
Gordana Vunjak-Novakovic  
Ron Weiss

## Sensing Health and Disease

Samuel Achilefu  
Nancy Allbritton  
Zane Arp  
Tatjana Atanasijevic  
David Grainger  
Amy Herr  
Thomas Johnson  
Tiffani Lash

## Imaging Health and Disease

Richard Buxton  
Shawn Chen  
Vincent Ho  
Elizabeth Jones  
Randy King  
Richard Leapman  
Guoying Liu  
Cynthia McCullough  
Kathy Nightingale  
Bruce Rosen  
Daniel Sodickson  
Patricia Wiley  
George Zubal

## Advanced Therapies/Cures

Kate Egan  
Ranu Jung  
Brian Pogue  
Marjolein van der Meulen  
Michael Wolfson

## Technology Development Pipeline

Andrea Belz  
Richard Leapman  
Jack Linehad  
Raymond MacDougall  
Ed Margerrison  
Todd Merchak  
Sohi Rastegar  
Greg Sorensen

## Biomedical Imaging & Bioengineering Workforce

Gilda Barbino  
Rashid Bashir  
Zeynep Erim  
Ilana Goldberg  
Raphael Lee  
Carolyn Meltzer  
Julia Ringel

**NIBIB Organization:** Kris Kandarpa, Kate Egan, Jill Heemskerk, David George, Jackie Martinez, Saltant Satabayeva

# Budget Update

**FY 2020 Appropriation\* for NIH, enacted Dec 2019:** total of \$41.45B reflects a \$2.5B or 6.4% increase to FY 2019 allocation of \$38.95B.

**FY 2020 Operating Budget for NIBIB:** total of \$404.638M reflects a \$16.525M or 4.26% increase to the FY 2019 final allocation \$388.133M.

**NIBIB R01 2019 Payline:** 19<sup>th</sup> percentile

\*Consolidated Appropriations Act, 2020 (HR 1865) funds NIH full year.





# Congressional Hearing: 9/25/2019



# Welcome!



Samuel Achilefu, Ph.D.

- *Michel M. Ter-Pogossian Professor of Radiology; Professor of Medicine, Biomedical Engineering, Biochemistry & Molecular Biophysics; Chief, Optical Radiology Laboratory; Vice Chair, Innovation and Entrepreneurship, Mallinckrodt Institute of Radiology; Washington University*
- Optical imaging of tumors and angiogenesis; design and development of new molecular probes and nanomaterials for imaging genes, proteins, and pathophysiologic processes.
- Tissue-specific multi-modal imaging agents and technology: optical, MRI, PET, SPECT; Wearable surgical guidance and visualization tools.

# Welcome!



Jennifer Barton, Ph.D.

- *Director, BIO5 Institute; Department head of Biomedical Engineering; Associate Vice President for Research; Professor of Biomedical Engineering, Electrical and Computer Engineering, Optical Sciences, and Agriculture and Biosystems Engineering; University of Arizona*
- Develops miniature, multi-modal optical endoscopes w/ optical coherence tomography (OCT) and fluorescence spectroscopy for early cancer detection & diagnosis in patients and pre-clinical models.
- Work on light-tissue interactions and dynamic optical properties of blood foundational for vascular phototherapies



# Welcome!



Amy Herr, Ph.D.

- *Lester John & Lynne Dewar Lloyd Distinguished Professor of Bioengineering, University of California, Berkeley*
- *Chan Zuckerberg Biohub Investigator, Faculty Scientist, Biological Systems & Engineering Division, Lawrence Berkeley National Laboratory; Faculty Director, UC Berkeley Bakar Fellows Program*
- Advanced microfluidic technologies for quantifying biomolecules in complex biological fluids down to single cell and sub-cellular resolution.
- Focus on POC clinical diagnostics, proteomics, & biomarker validation.

# *Thank you!*



Sanjiv Gambhir, Ph.D.  
*Former NIBIB Council Member*

- *Virginia and D.K. Ludwig Professor in Cancer Research, Stanford University SOM*
- *Chair, Department of Radiology*
- *Director, Molecular Imaging Program at Stanford (MIPS),*
- *Director, Canary Center for Cancer Early Detection,*
- *Director, Precision Health and Integrated Diagnostics Center*

# AI-based Breast Cancer Diagnosis w/MRI: *QuantX*



Maryellen Giger, Ph.D.

- Professor Maryellen Giger, University of Chicago: Developed QuantX, AI-based software for breast cancer diagnosis.
- First FDA-cleared software to aid in breast cancer diagnosis for use in radiology
- NIH top AI highlight for OSTP





# New Program Leadership Appointments



**Zeynep Erim, Ph.D.**  
**Director, Division of  
Interdisciplinary Training**



**Behrouz Shabestari, Ph.D.**  
**Director, NIBIB National  
Technology Centers Program**



**David Rampulla, Ph.D.**  
**Director, Division of Discovery  
Science and Technology (DDST)**

# New Program Leadership Appointments

## ESTEEMED Concept Clearance



**Zeynep Erim, Ph.D.**  
**Director, Division of  
Interdisciplinary Training**

## P41 Concept Clearance



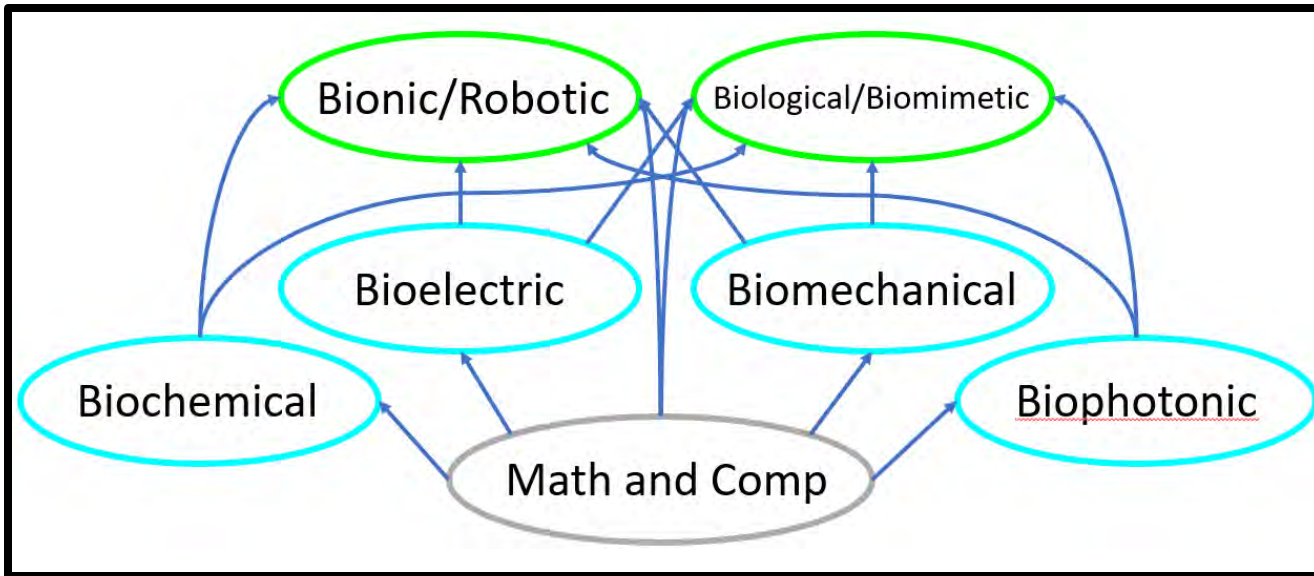
**Behrouz Shabestari, Ph.D.**  
**Director, NIBIB National  
Technology Centers Program**



**David Rampulla, Ph.D.**  
**Director, Division of Discovery  
Science and Technology (DDST)**

# The Future of DDST

## Division of Biosystems Engineering...



...mathematical and computational methods, biotransducers, and engineered systems to recapitulate, manipulate, and interface with biology...



*More in May 2020*



# *Thank you!*

## **DDST Program Change**



Šeila Selimović, Ph.D.  
*Program Director (DDST)*

- Left NIH to lead ENACT (Early Notification to Act, Control, and Treat) program at BARDA
- NIBIB: 2015-2019, biosensors, tissue chips, and tissue engineering.
- NIH Director's Award  
Coordinated collaboration between NIBIB and DOD agencies in trauma/critical care technologies.

# Welcome!

## DDST Program Change



- BS, Mechanical Engineering, University of Michigan
- PhD, Bioengineering, Univ of Ill, Chicago; Rehab Inst of Chicago
  - Robotic therapies for post-stroke rehabilitation*
- Post-doc: University of Wisconsin, computational biomechanics
- NINDS, Health Program Specialist supporting BRAIN Initiative
  - BRAIN diversity early career funding opportunity*
- NIBIB: biomechanics and bioelectrics

Moria Bittmann, Ph.D.  
*DDST Program Director*

# NIBIB Intramural Research Program Review

**BSC + Ad Hoc: *Dec 8-10, 2019***



**Leon Axel (Chair)**  
*NYU Langone*



**Kathy Ferrara**  
*Stanford*



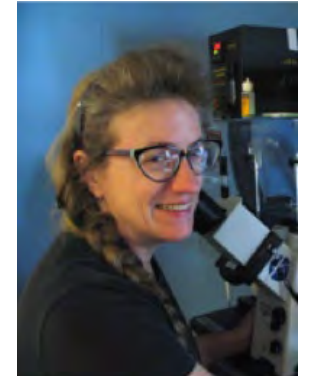
**Tom Meade**  
*Northwestern*



**Carolyn Larabell**  
*UCSF / LBNL*



**Larry Wald**  
*Harvard*



**Linda Wordeman**  
*Univ. Washington*



**Marcel Bruchez**  
*Carnegie Mellon*



**Wah Chiu**  
*Stanford*



**Vinayak Dravid**  
*Northwestern*



**Michael Fried**  
*Kentucky*



**Peter Lollar III**  
*Emory*



**Ammas Periasamy**  
*Virginia*

# NIBIB Intramural Research Program Review

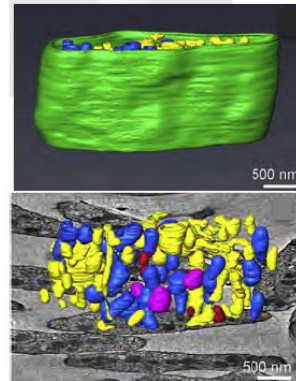
**BSC + Ad Hoc: Dec 8-10, 2019**

## Cellular Structure / Electron Microscopy



**Richard Leapman**

Marcel Bruchez  
*Carnegie Mellon*

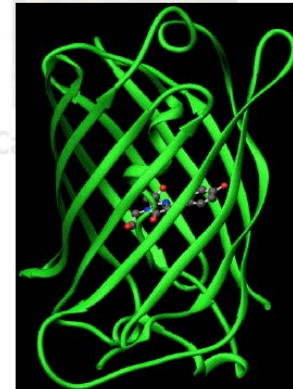


Wah Chiu  
*Stanford*



**George Patterson**

Vinayak Dravid  
*Northwestern*

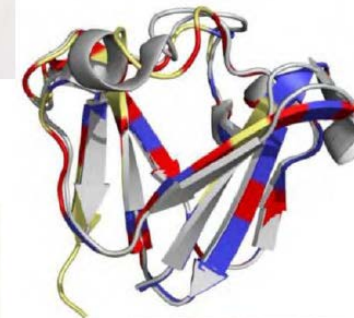


Michael Fried  
*Kentucky*



**Peter Schuck**

Peter Lollar III  
*Emory*



Ammas Periasamy  
*Virginia*

*More in May 2020*

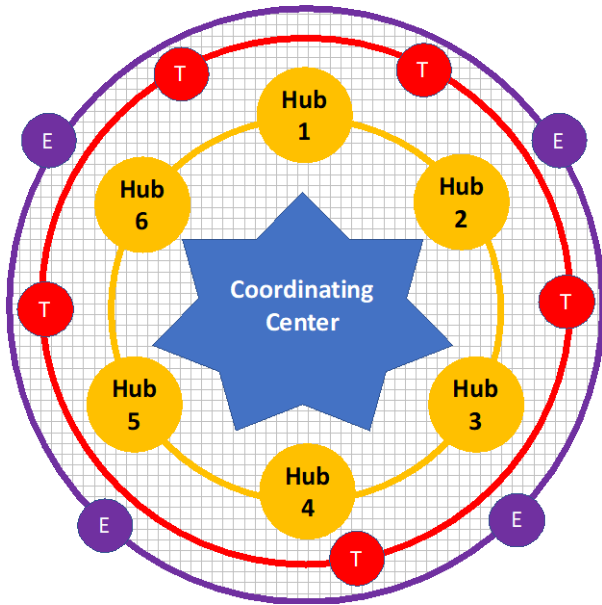


# Harnessing Data Science for Health Discovery and Innovation in Africa

<https://commonfund.nih.gov/africadata>



DS-I Africa



1. Research Hubs focused on key health problems

2. DS-I Training Programs

3. Ethical, Legal and Social Implications of DS-I Research

4. Open Data Science Platform and Coordinating Center

5. Symposia (years 1 and 6)

- Implementation Plan under review;
- Symposium planned for June 24-26, 2020 in Nairobi, Kenya
- Working groups for each Initiative are assembled and functioning;
- Notices of Intent (NOSIs) are scheduled to be announced in February 2020;
- FOAs planned to be published April 2020;



Tiffani Lash

# NIH launches new collaboration to develop gene-based cures for sickle cell disease and HIV on global scale

October 23, 2019, 11:30 AM EDT



Behrouz Shabestari

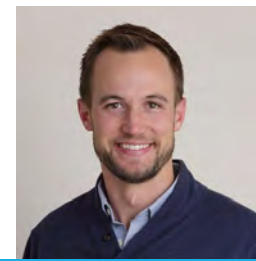


\$1,000,000 Challenge:  
*NIBIB, OD, NIAID, NIDDK, FIC*



Jill Heemskerck

## NIH TECH ACCELERATOR CHALLENGE FOR GLOBAL HEALTH



Taylor Gililand,  
NIH OD

**BMGF POC team:** *Dan Wattendorf, Andrew Trister, Arunan Skandarajah, Jessica Lee*

# NTAC: Non-invasive Diagnostic Technologies for Global Health



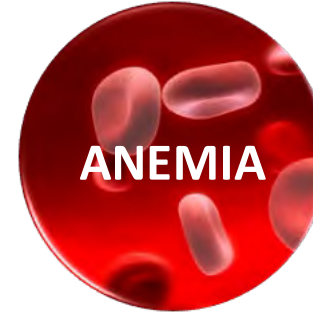
NIH TECH ACCELERATOR  
CHALLENGE  
FOR GLOBAL HEALTH



MALARIA



SICKLE CELL  
DISEASE



ANEMIA

BILL &  
MELINDA  
GATES  
*foundation*

## CHALLENGE

Non-invasive platform device with the potential to diagnose, track disease state and/or response to therapy for least two diseases in the vasculature.

One or more must be malaria, sickle cell disease, or anemia, given the high burden of disease in global health settings.

Participants present design and initial feasibility for non-invasive diagnostic platform based upon preset judging specifications.

Winners can receive additional funding and in-kind support from BMGF for technology acceleration, commercialization

### Platform criteria

Concept, design and feasibility data

Plan to achieve use case (cost, time to results, portability, ease of use, lifespan)



# 2019 ML-MSM Meeting

October 24 – 25, 2019

➤ Integrate math & physics w/  
computer science

➤ Apply to Human Safety

➤ Apply to Digital Twins

❖ Spread the word!

❖ Will be videocast

❖ **REGISTER!** Search: IMAG wiki



Grace Peng



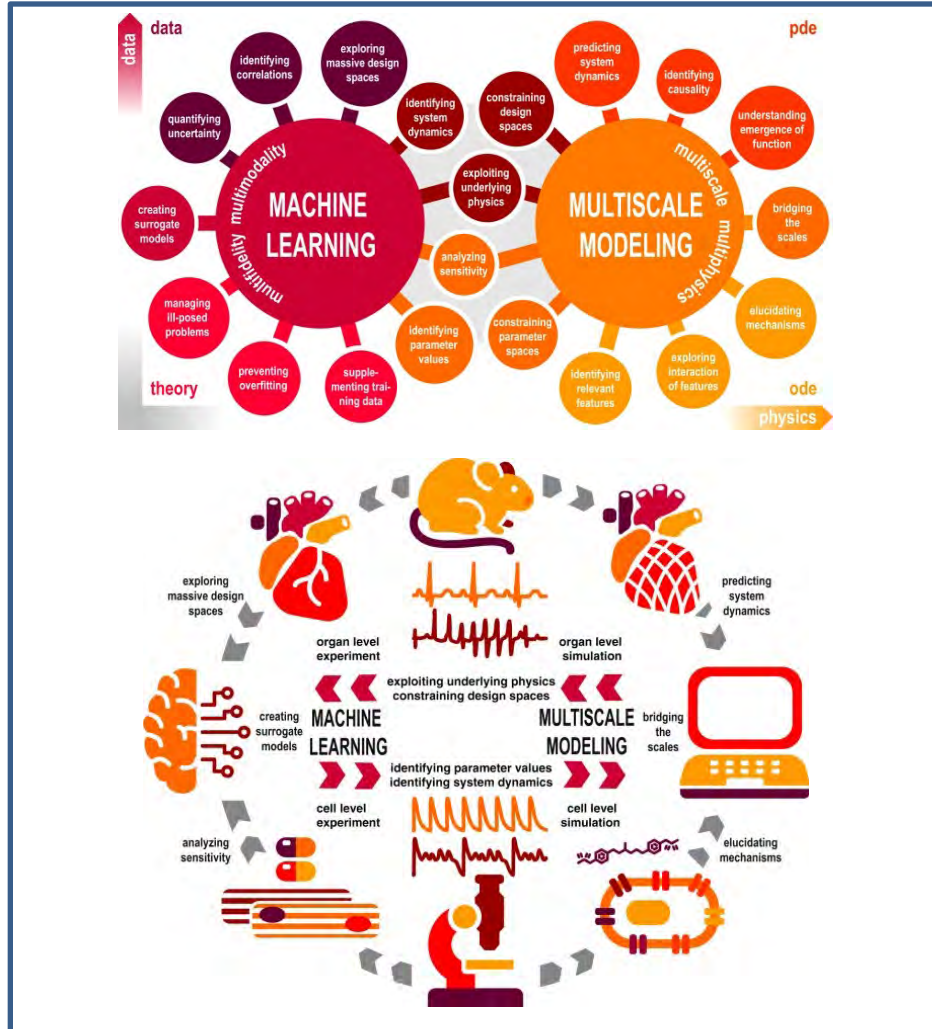
INTEGRATING  
MACHINE LEARNING WITH  
MULTISCALE MODELING FOR  
BIOMEDICAL, BIOLOGICAL AND  
BEHAVIORAL SYSTEMS

OCTOBER 24-25, 2019

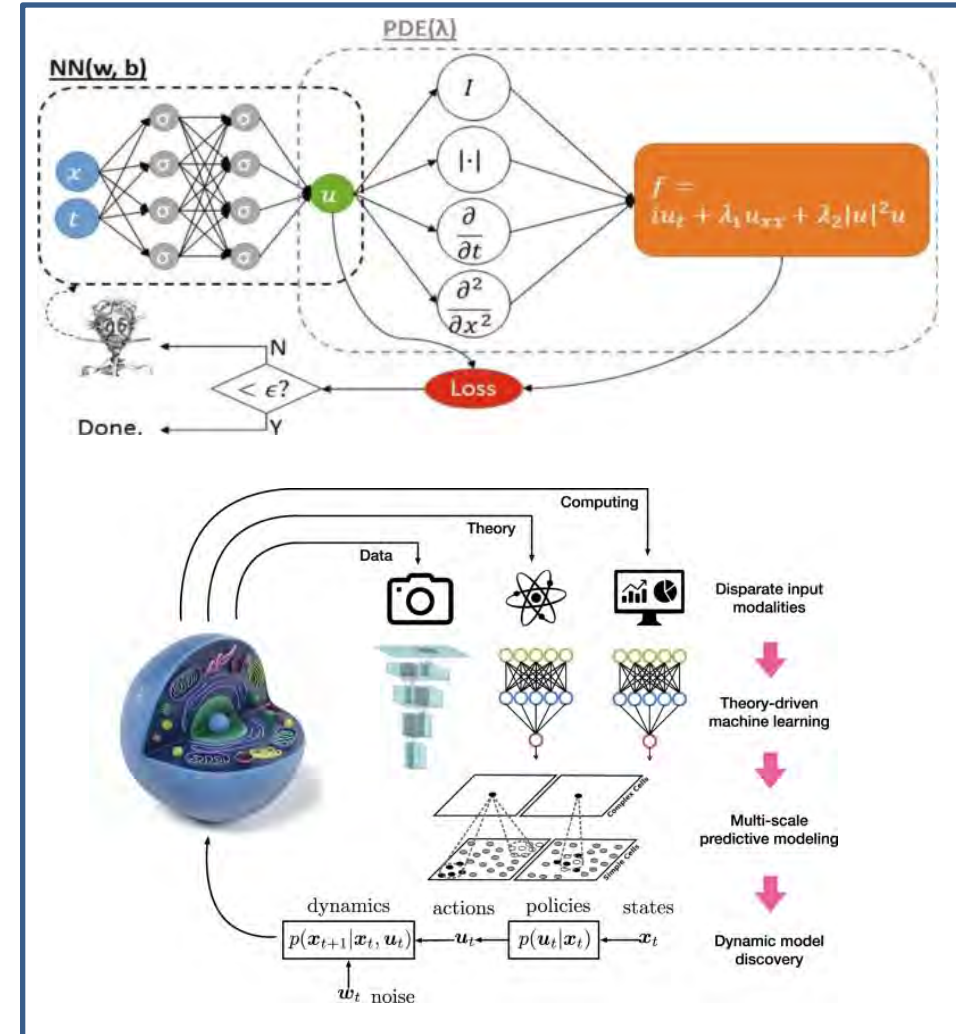




## Conceptual Framework



## Technical Approaches



# Upcoming Meeting:

IMAG-AND: March 17-18, 2020

at the NIH Conference Center & Remote Access

- ❖ Key venue for the **mechanistic multiscale modeling** (MSM) community
- ❖ Keynote address: **Dr. Hannah Valentine**, Chief Officer for Scientific Workforce Diversity at the NIH
- ❖ Meeting implementation will be a mindfulness exercise for nurturing diversity

## Sessions:

- Diverse Contexts for MSM
- Diverse Approaches for MSM
- Diverse Credibility Assessments for MSM
- Diverse Funding for MSM
- Diverse Pedagogy for MSM
- Diverse Impacts of MSM
- Implicit Bias and Stereotype Threat training

Registration  
Opening this week!

Browser Search:  
IMAG wiki

Co-chairs: Dr. Silvia Blemker and Dr. Shayn Peirce-Cottler

IMAG  
Interagency Modeling and Analysis Group

Amplifying  
IMPACT  
by  
Nurturing  
DIVERSITY

impact of  
multiscale modeling

diversity of modelers

13<sup>th</sup> Multiscale Modeling  
Consortium Meeting

March 17-18, 2020 | Natcher Conference Center, NIH







# NIBIB TRAILBLAZER (R21) AWARD



National Institute of Biomedical Imaging and Bioengineering

## R21 Trailblazer FOA(PAR-20-084)

- Re-issued January 8, 2020

## Specifically for New/Early Stage Investigators

- Three years / \$400,000 direct costs
- **Limited** preliminary data is allowed, but must be limited to one-half page which may include one figure
- High-risk/High-reward projects Similar to Exploratory R21 mechanism, but for New Investigators

## Encourages:

- Early stage developmental ideas that promise transformation
- Underrepresented groups strongly encouraged



# NIBIB TRAILBLAZER (R21) AWARD



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2015 -- 2019

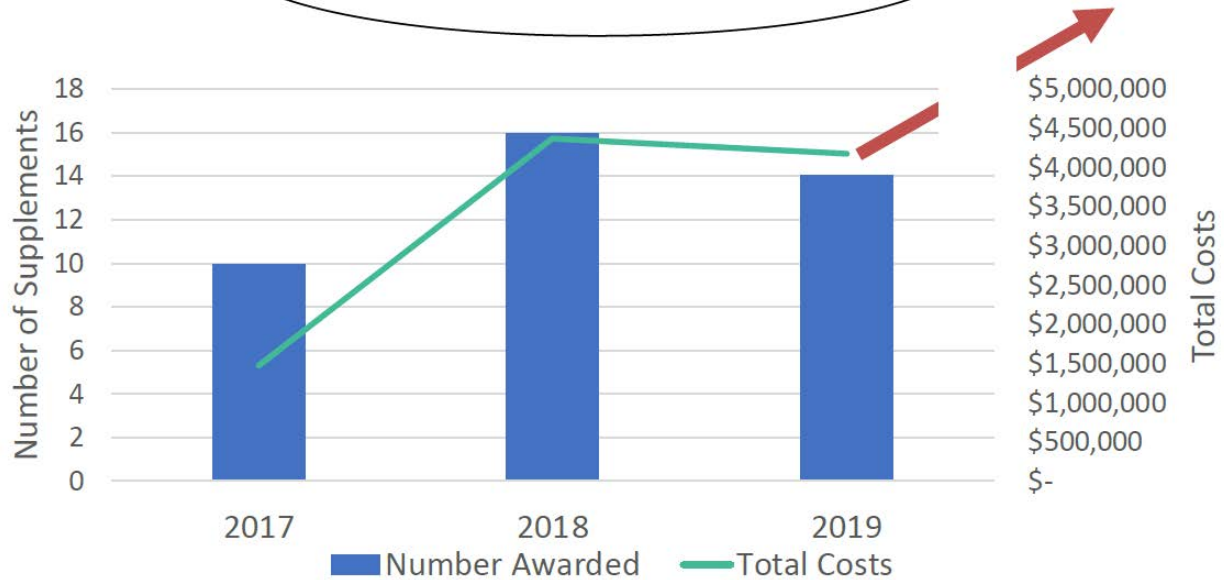
R21 awards ESI/NI: (16)18% → (41) 63%

Payline: <12% → 19%



# Alzheimer's Supplements

NOT-AG-20-008



Randy King, Ph.D.  
Program Director



NIA has released a Notice of Special Interest to fund Alzheimer's-focused supplements for projects that are not focused on Alzheimer's disease.



NIBIB participated in the pilot program in 2017 and helped start this partnership by funding the first round of supplements.



The partnership has expanded to involve 21 Institutes and Centers in 2020.



Supplements allow PIs to investigate the applications of technologies to Alzheimer's and Related Dementias.



**Applications due March 7, 2020**

**2019: \$80,000 in Prizes**



**Zeynep Erim, Ph.D.**

**2020: \$100,000 in Prizes**

- Application Deadline: **June 1**
- Winners Announced: August 25
- Awards: October 15, 2020 BMES SD



**2019 Steven H. Krosnick 1<sup>st</sup> Prize w/ Krosnick Family**

Powered by Bing © GeoNames, MSFT, Navteq

**52 applications from 32 universities in 18 states**

**Total of 250 students engaged**



**NEW PRIZE**  
**\$15,000 NIMHD prize**  
**Low resource settings**

# Funding Opportunities: NOSIs

## **NOT-EB-19-020**

### **Maximizing Opportunities for Scientific and Academic Independent Careers (MOSAIC)**

Postdoctoral Career Transition Award to Promote Diversity (K99/R00)

Early career, independent investigators from diverse backgrounds conducting research



Zeynep Erim

## **NOT-EB-19-022**

### **Technological Innovations for Advancing Clinical SPECT Imaging**

New SPECT imaging technologies and SPECT analogues of PET brain radiopharmaceuticals.



George Zubal

## **NOT-EB-19-023**

Highlights interest in receiving SBIR and STTR grant applications focused in the following areas:

- Modeling and Simulation Technologies
- Pediatric Technologies
- Point-of-Care Ultrasound Technologies
- Clinical Decision Support Technologies



Todd Merchak



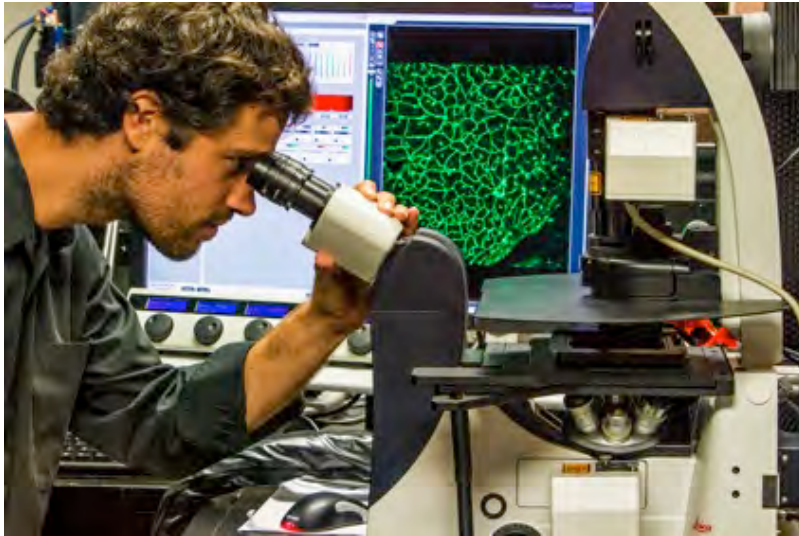
Ilana Goldberg

# Dream

**Basic Science and  
Technology Development**



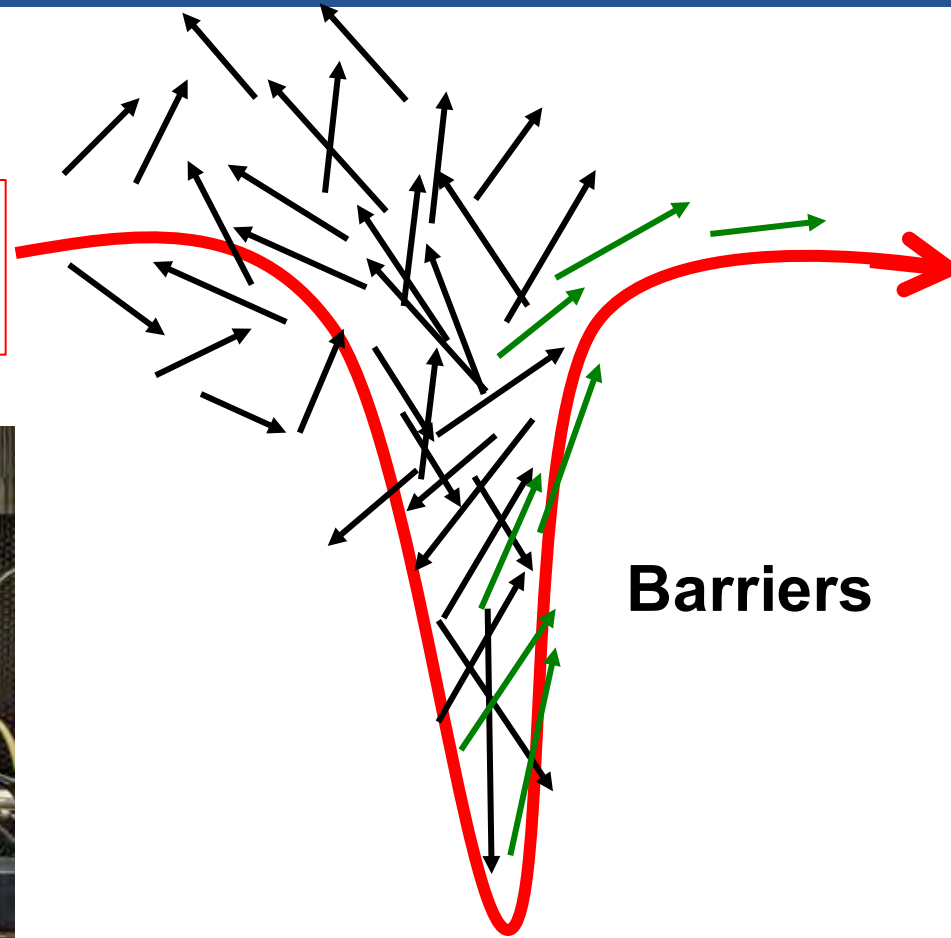
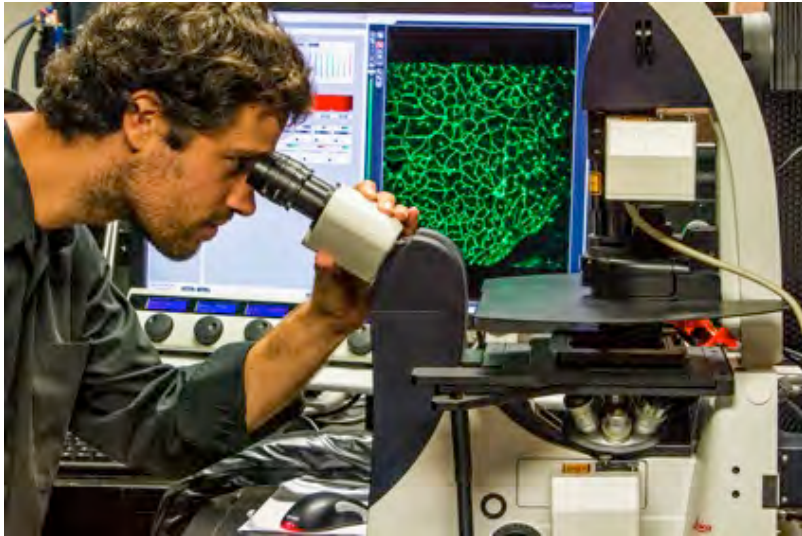
**Clinical Diagnostics  
and Therapeutics**





# Reality

**Basic Science and  
Technology Development**

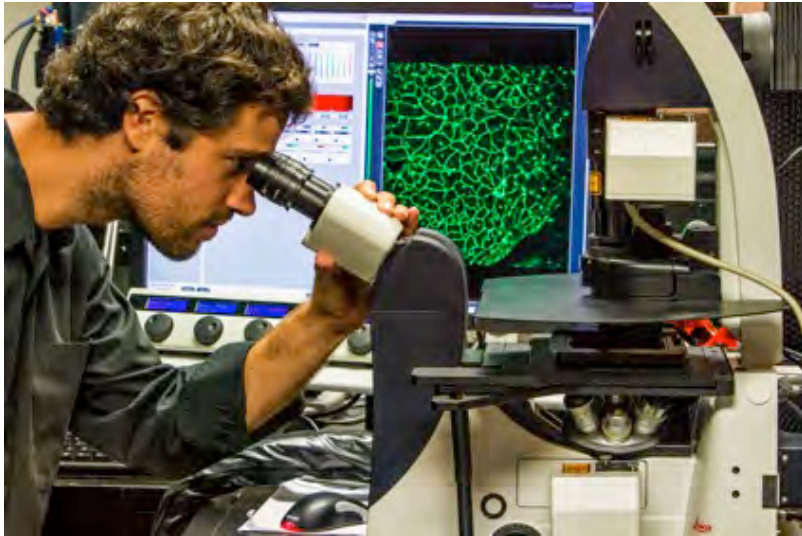



**Clinical Diagnostics  
and Therapeutics**

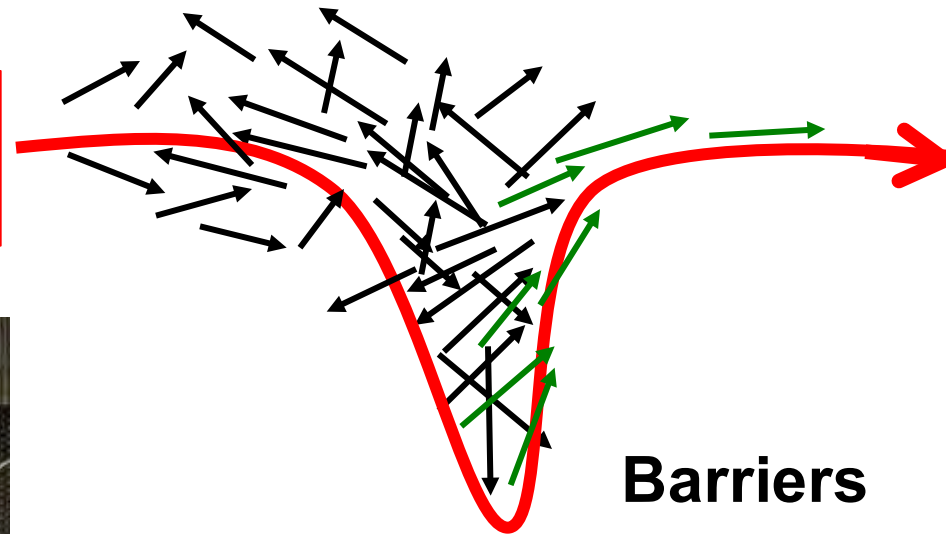


# Shift Equilibrium *to Right*

**Basic Science and  
Technology Development**



 Increase activity



**Clinical Diagnostics  
and Therapeutics**



**Barriers**

Reduce  
Barriers

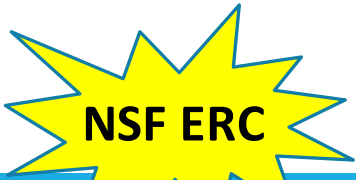
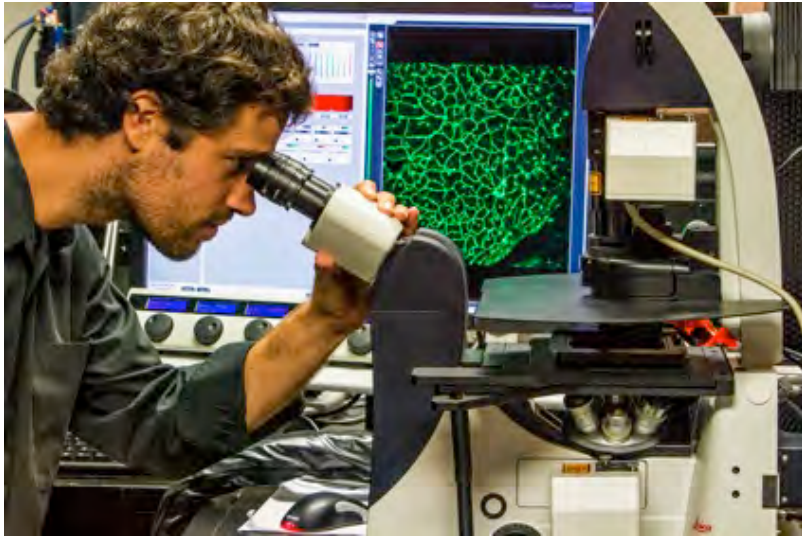
Accelerate Translation,  
Validation, Commercialization



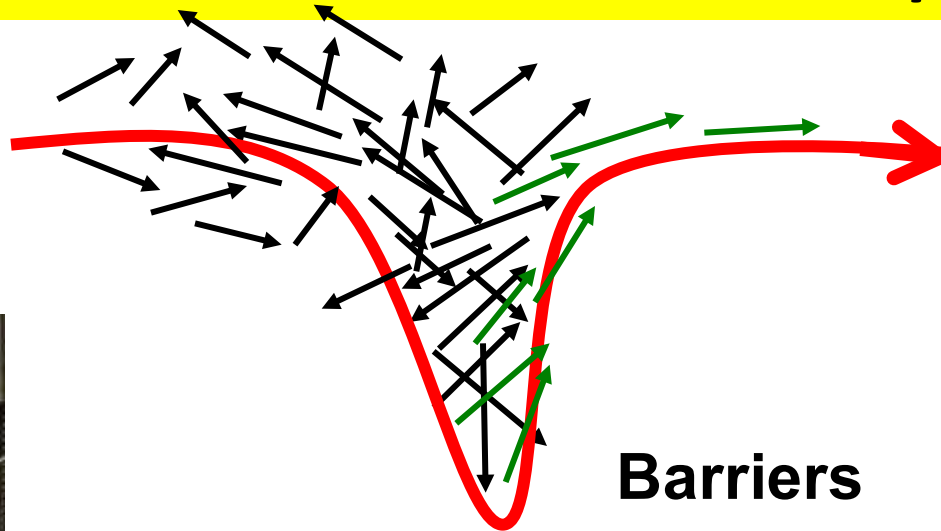
# Shift Equilibrium *to Right*

**NIH - NSF - FDA - NIST Partnerships?**

**Basic Science and  
Technology Development**



Increase activity



**Clinical Diagnostics  
and Therapeutics**



**Barriers**



Reduce  
Barriers

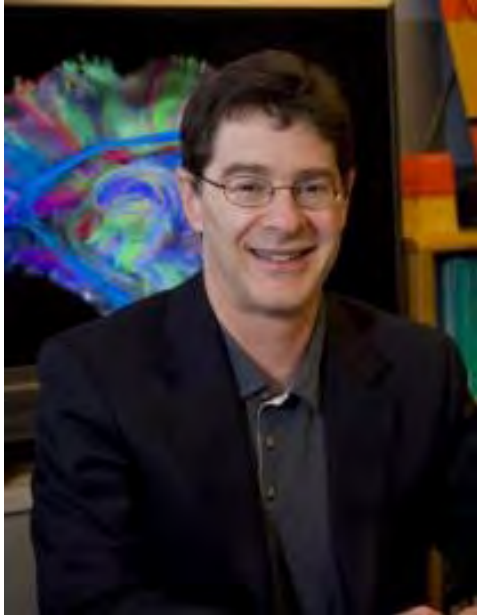


Accelerate Translation,  
Validation, Commercialization





# BRAIN Update



Bruce Rosen, MD, Ph.D.

*Professor, Health Sciences and Technology, Harvard Medical School  
Laurence Lamson Robbins Professor of Radiology, Harvard Medical School  
Director, Athinoula Martinos Center for Biomedical Imaging, MGH  
Director, NIBIB P41 Center Functional Neuroimaging Technologies  
NIBIB BRAIN representative*

