Director's Report

National Advisory Council
for Biomedical Imaging and Bioengineering

January 23, 2019

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 Planning*

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	Engineered Biology	Sensing Health and Disease	Imaging Health and Disease	Advanced Therapies/Cures	Technology Development Pipeline	Biomedical Imaging & Bioengineering Workforce
Christine Cooper	Paula Hammond	Samuel Achilefu	Richard Buxton	Kate Egan	Andrea Belz	Gilda Barbino
Qi Duan	Joshua Leonard	Nancy Allbritton	Shawn Chen	Ranu Jung	Richard Leapman	Rashid Bashir
Maryellen Giger	Jessica Meade	Zane Arp	Vincent Ho	Brian Pogue	Jack Linehad	Zeynep Erim
Jay Humphrey	Robert Nerem	Tatjana Atanasijevic	Elizabeth Jones	Marjolein van der Meulen	Raymond MacDougall	Ilana Goldberg
Lydia Kavraki	David Rampulla	David Grainger	Randy King	Michael Wolfson	Ed Margerrison	Raphael Lee
Kyle Myers	Gordana Vunjak-Novakovic	Amy Herr	Richard Leapman		Todd Merchak	Carolyn Meltzer
Grace Peng	Ron Weiss	Thomas Johnson	Guoying Liu		Sohi Rastegar	Julia Ringel
Behrouz Shabestari		Tiffani Lash	Cynthia McCullough		Greg Sorensen	
Hari Shroff			Kathy Nightingale			
Andrew Weitz			Bruce Rosen			
			Daniel Sodickson			
			Patricia Wiley			
			George Zubal			

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: 19th 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.

Sanjiv Gambhir, Ph.D.
Former NIBIB Council Member

Thank you!

- *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

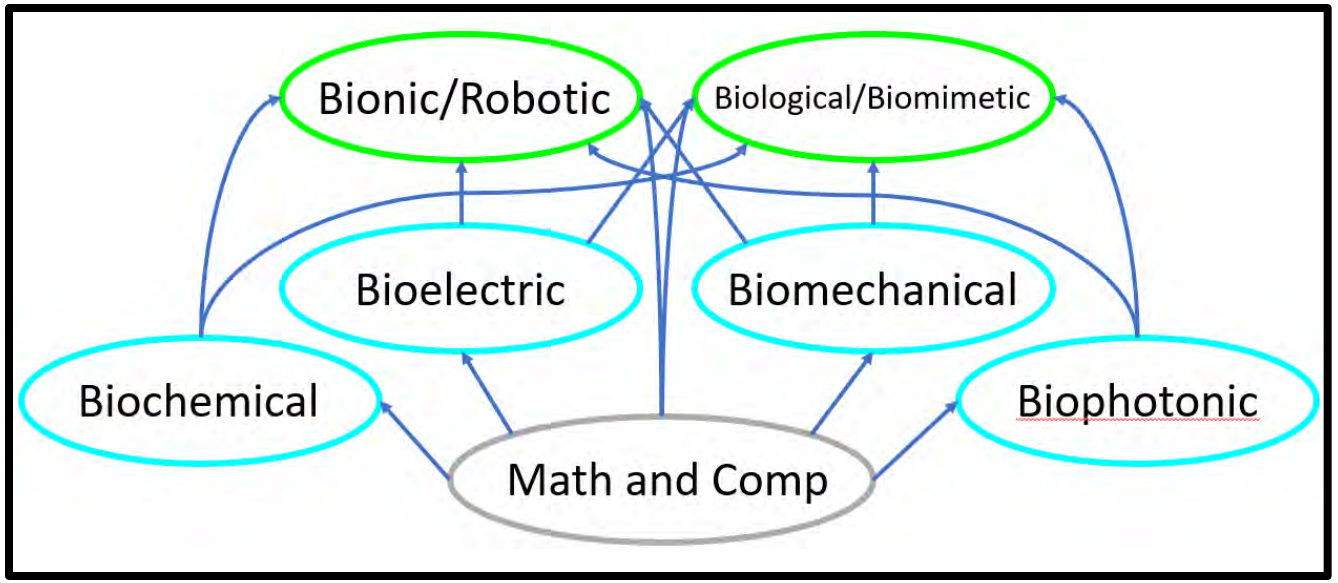
P41 Concept Clearance

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!

Šeila Selimović, Ph.D.

Program Director (DDST)

DDST Program Change

- 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!

Moria Bittmann, Ph.D.

DDST Program Director

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

NIBIB Intramural Research Program Review

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

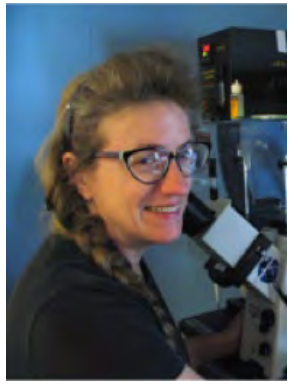
Leon Axel (Chair)
NYU Langone

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

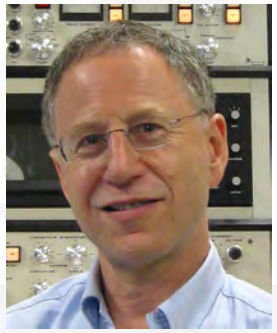
Peter Lollar III
Emory

Ammasi Periasamy
Virginia

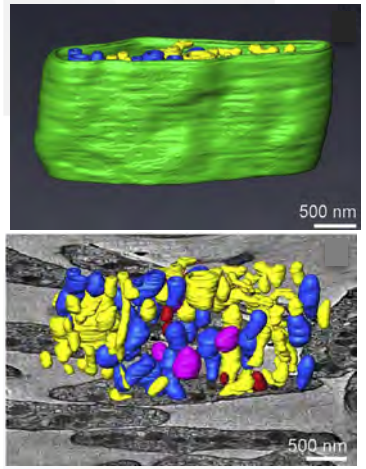
NIBIB Intramural Research Program Review

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

Cellular Structure / Electron Microscopy

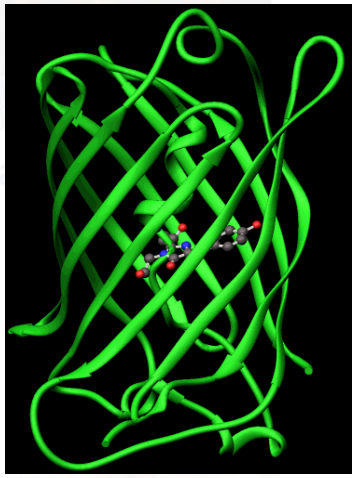


Richard Leapman



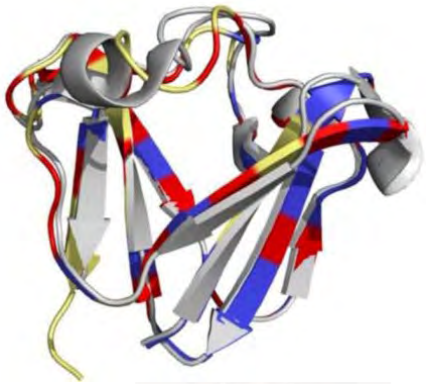
Biophotonics

George Patterson



Dynamics of Macromolecular Assembly

Peter Schuck



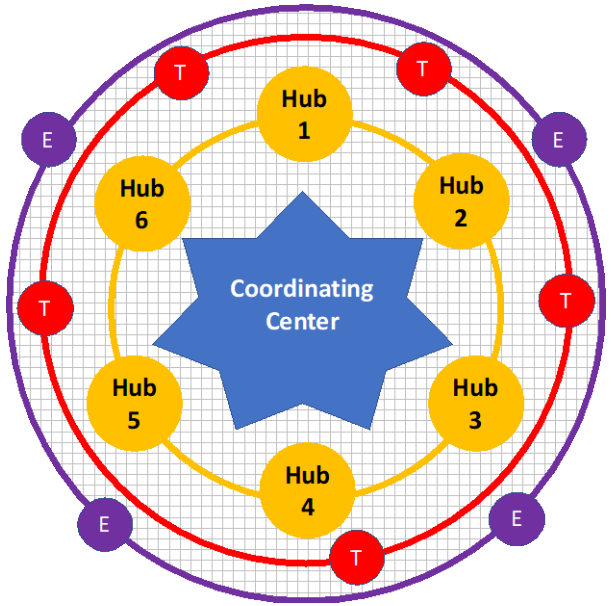
More in May 2020

Harnessing Data Science for Health Discovery and Innovation in Africa

https://commonfund.nih.gov/africadata

DS-I Africa

NIH National Institutes of Health
Office of Strategic Coordination - The Common Fund



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

Behrouz Shabestari

Jill Heemskerk

Taylor Gililand, NIH OD

NHLBI NEWS | News Release

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

BILL & MELINDA GATES foundation

NIH TECH ACCELERATOR CHALLENGE FOR GLOBAL HEALTH

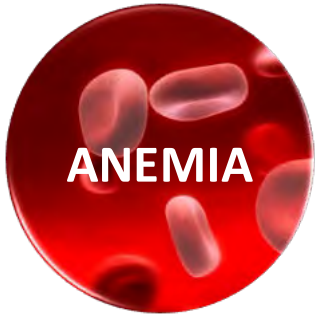
$1,000,000 Challenge:

NIBIB, OD, NIAID, NIDDK, FIC

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



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

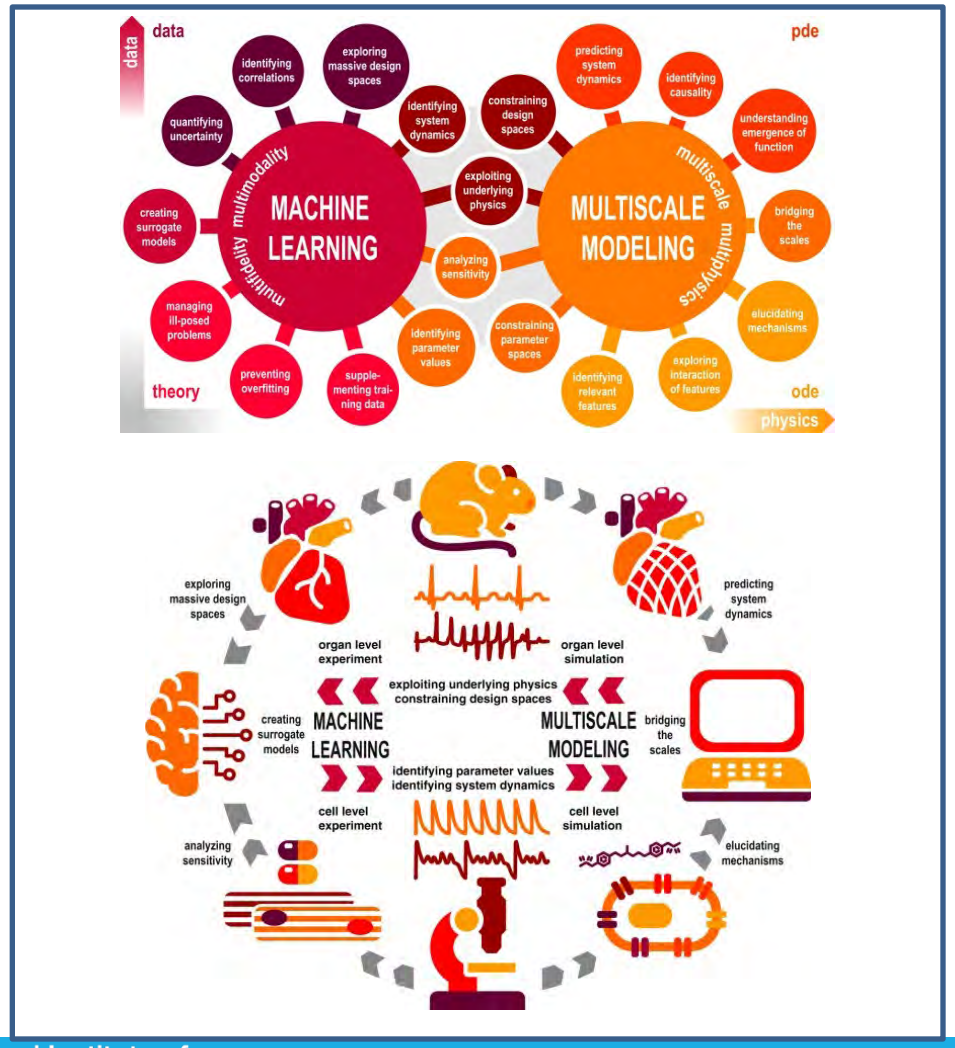
- Apply to Human Safety
- Apply to Digital Twins

Grace Peng

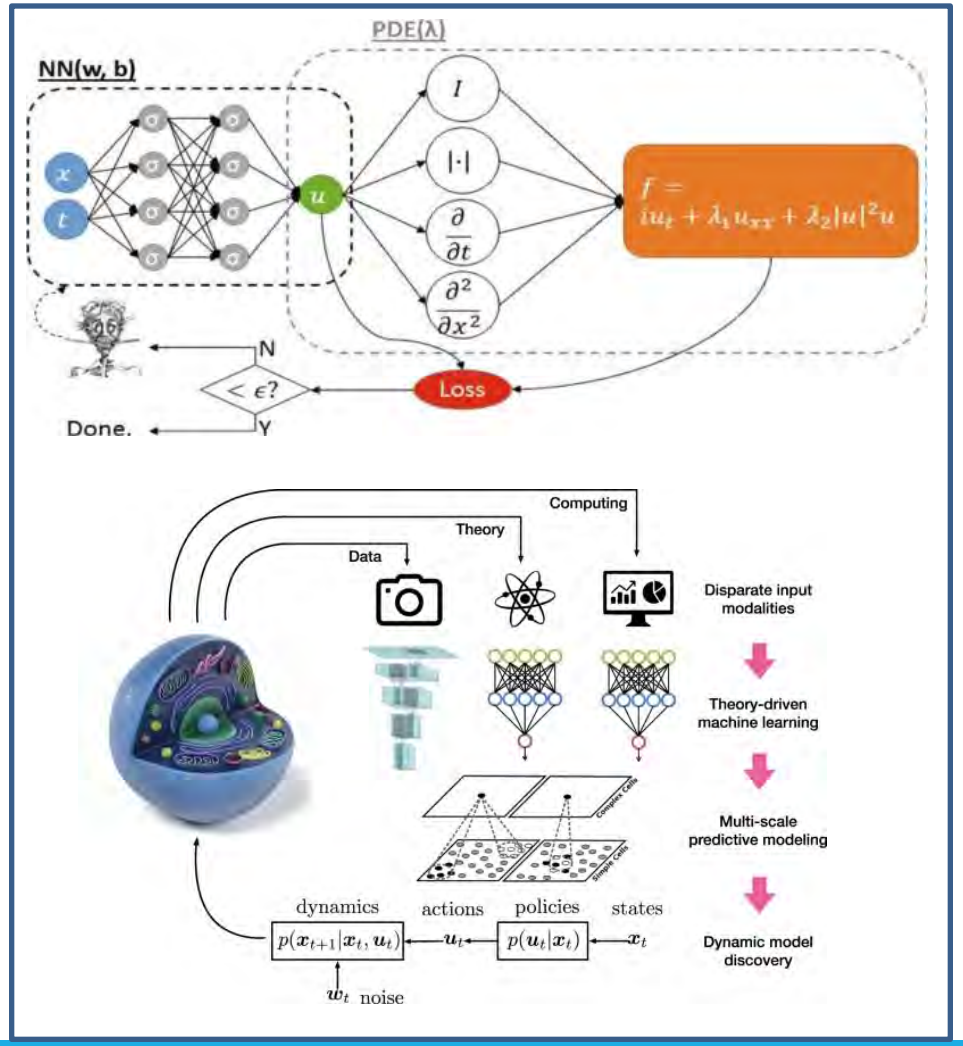
- Spread the word!
- Will be videocast
- **REGISTER!** Search: IMAG wiki

Integrating machine learning and multiscale modeling-perspectives, challenges, and opportunities in the biological, biomedical, and behavioral sciences. Alber M, Buganza Tepole A, Cannon WR, De S, Dura-Bernal S, Garikipati K, Karniadakis G, Lytton WW, Perdikaris P, Petzold L, Kuhl E. NPJ Digit Med. 2019 Nov 25.

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 Valantine**, Chief Officer for Scientific Workforce Diversity at the NIH
- Meeting implementation will be a mindfulness exercise for nurturing diversity

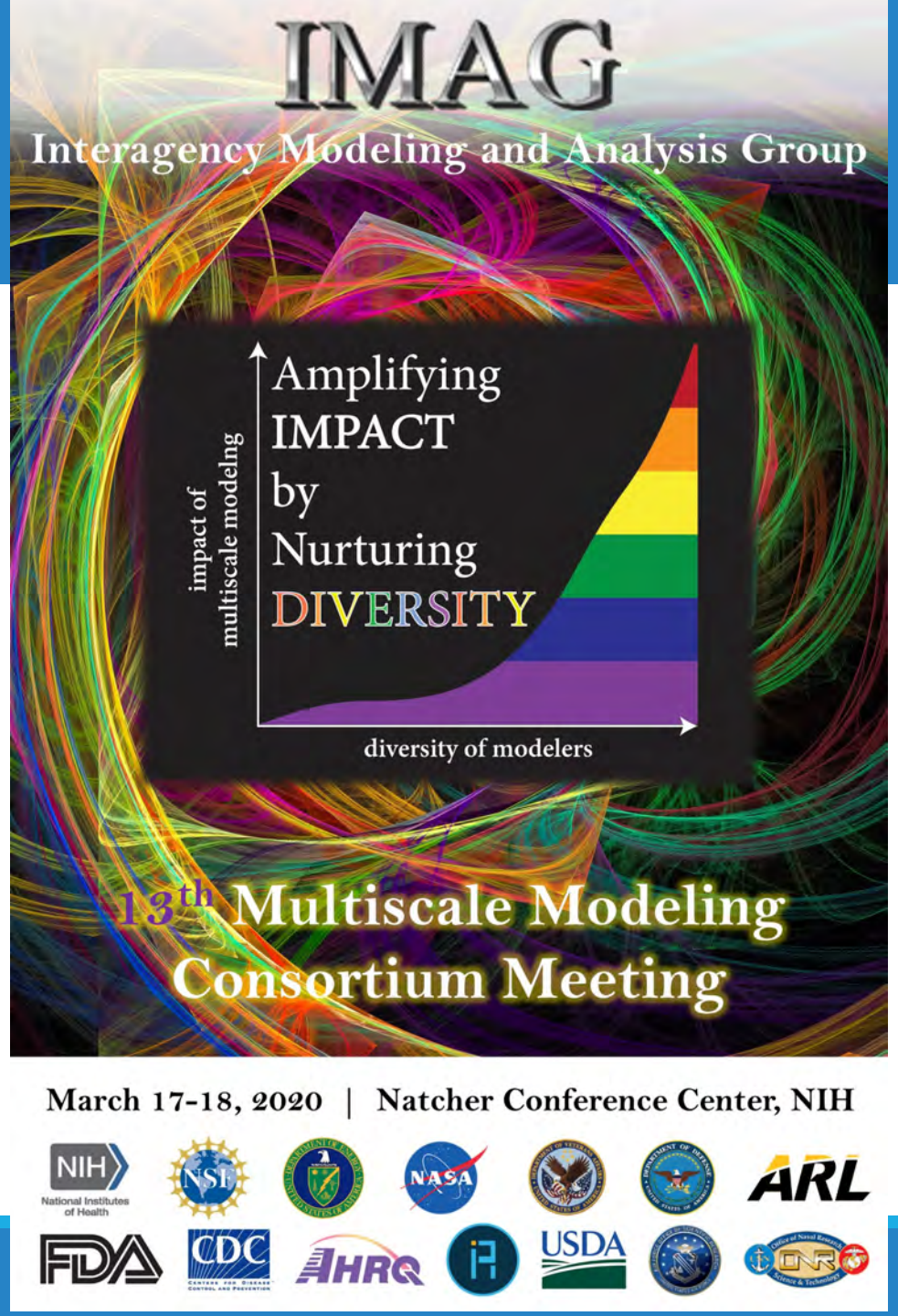
Registration Opening this week!

Browser Search: IMAG wiki

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

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



NIBIB *TRAILBLAZER* (R21) AWARD

National Institute of Biomedical Imaging and Bioengineering

Randy King, Ph.D.
Program Director

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

National Institute of Biomedical Imaging and Bioengineering

Randy King, Ph.D.
Program Director

2015 -- 2019
R21 awards ESI/NI: (16)*18%* → (41) *63%*
Payline: *<12%* → *19%*

R21 Trailblazer FOA(PAR-20-084)

- **Re-issued January 8, 2020**

Specifically for New/Early Stage Investigators

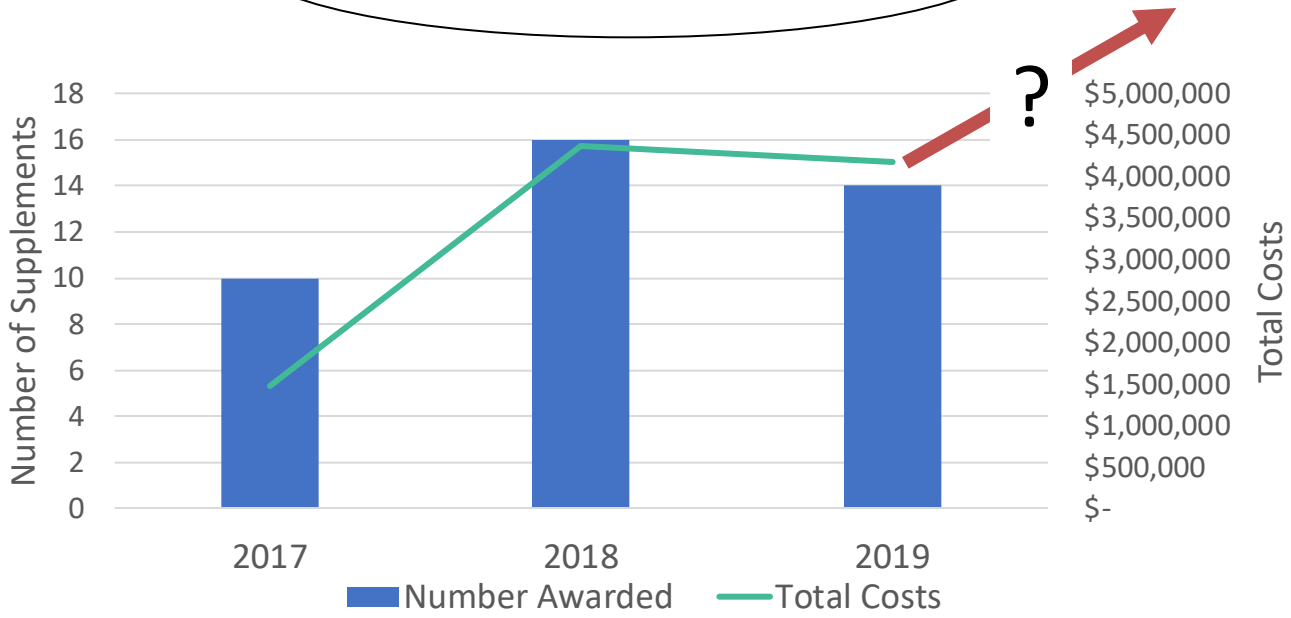
- Three years / $400,000 direct costs
- **Limited** preliminary data is allowed, but must be limited to one-half page which may include one figure
- High-risk/High-reward projects Similar to Exploratory R21 mechanism, but for New Investigators

Encourages:

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

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

DEBUT Design by Biomedical Undergraduate Teams Challenge

2019: *$80,000 in Prizes*

2019 Steven H. Krosnick 1st Prize w/ Krosnick Family

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

Total of **250** students engaged

Zeynep Erim. Ph.D.

2020: *$100,000 in Prizes*

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

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:

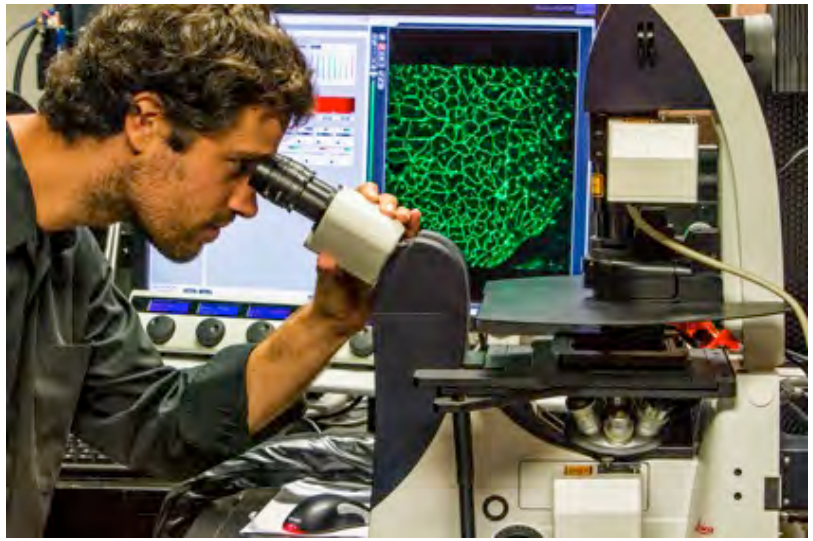
- Modeling and Simulation Technologies
- Pediatric Technologies
- Point-of-Care Ultrasound Technologies
- Clinical Decision Support Technologies

Todd Merchak

Ilana Goldberg

Dream

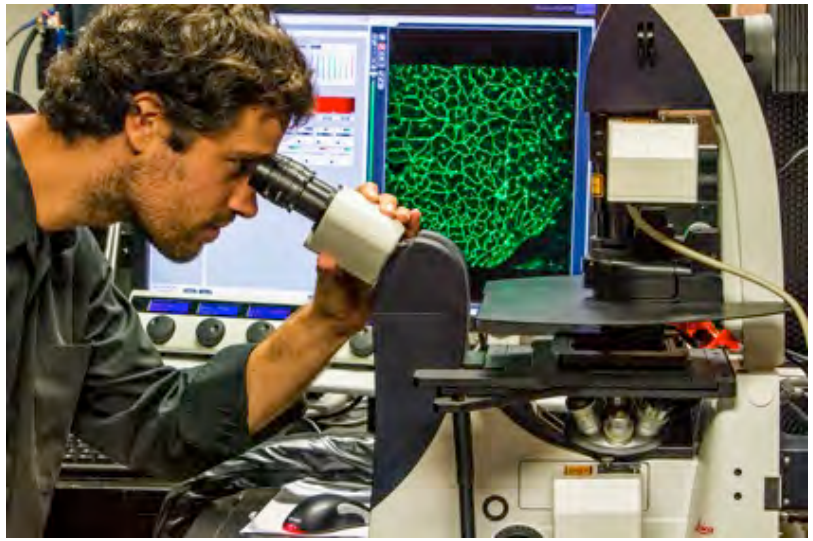
Basic Science and Technology Development

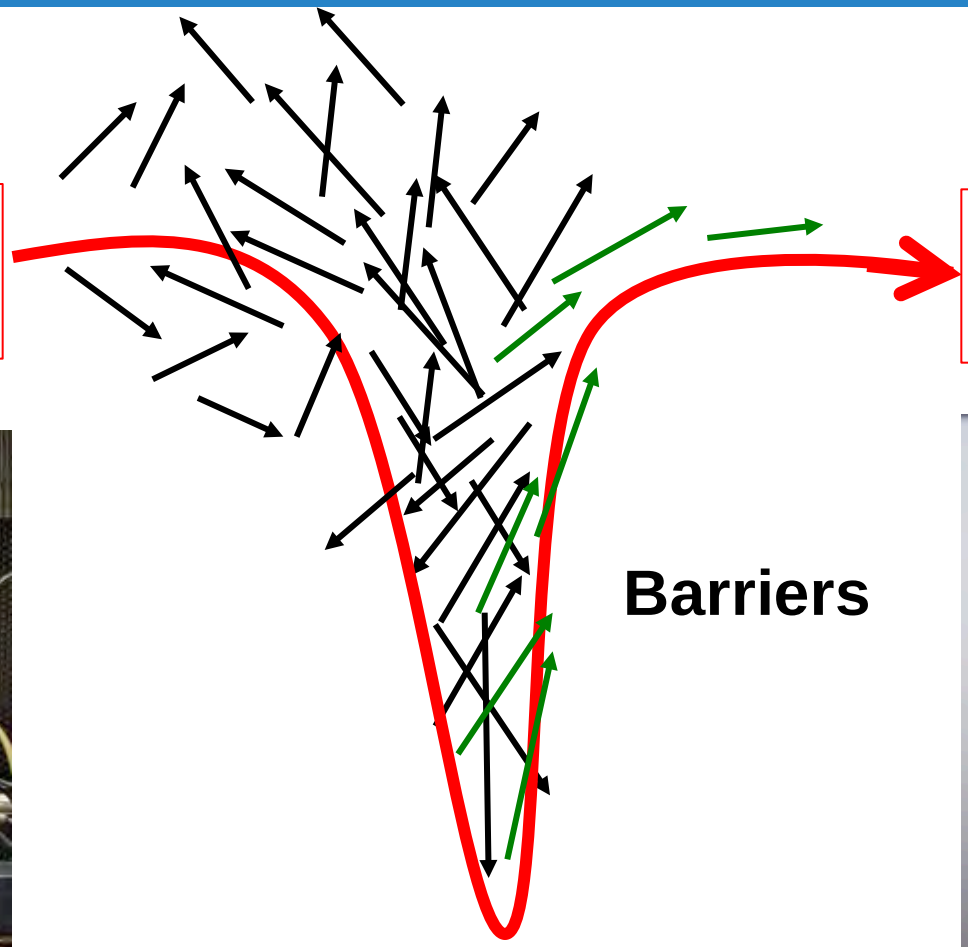


Clinical Diagnostics and Therapeutics

Reality

Basic Science and Technology Development



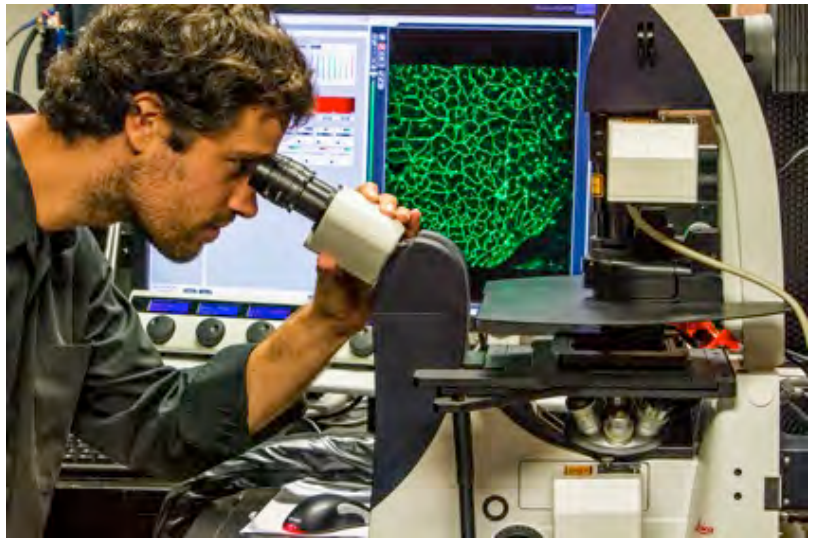


Barriers

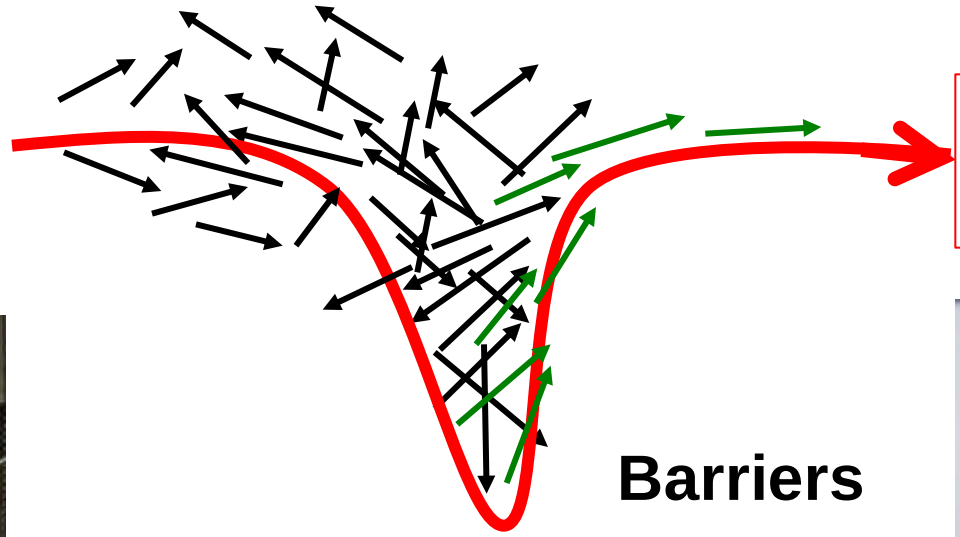
Clinical Diagnostics and Therapeutics

Shift Equilibrium *to Right*

Basic Science and Technology Development



Increase activity



Barriers

Reduce Barriers

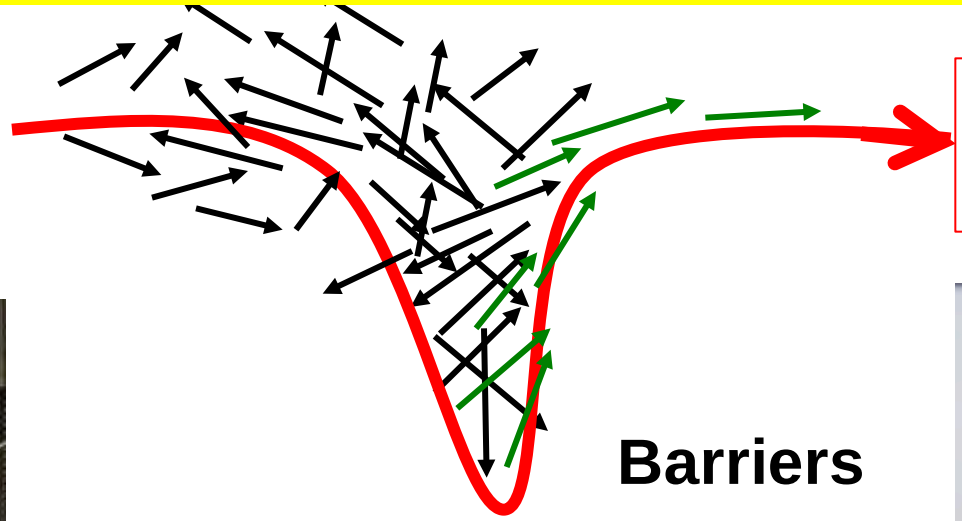
Clinical Diagnostics and Therapeutics

Accelerate Translation, Validation, Commercialization

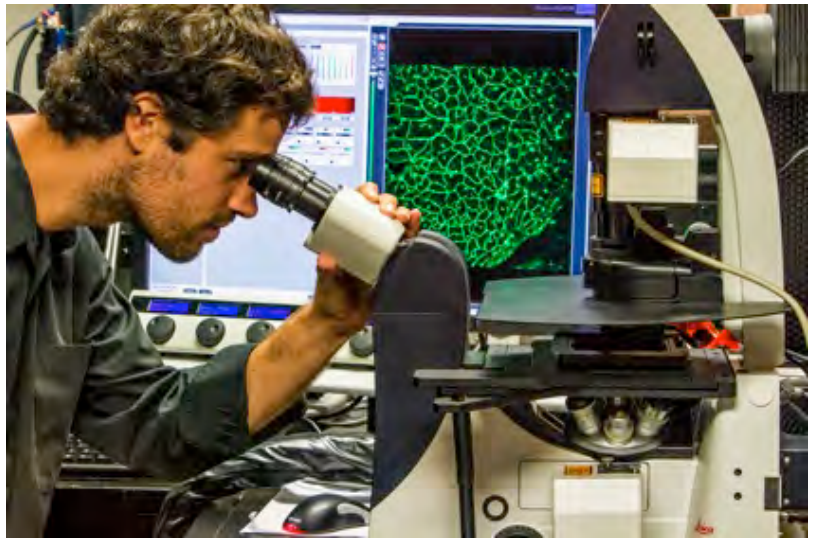
Shift Equilibrium *to Right*

NIH - NSF - FDA - NIST Partnerships?

Basic Science and Technology Development



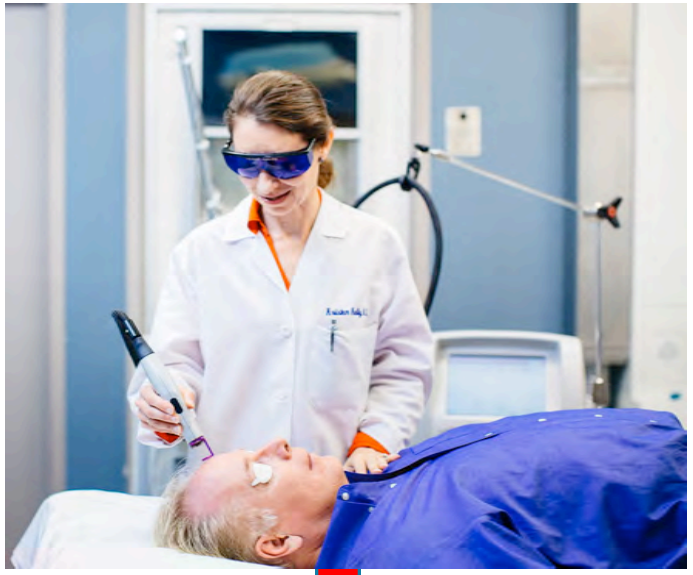
Clinical Diagnostics and Therapeutics



Barriers

Reduce Barriers

NSF IUCRC

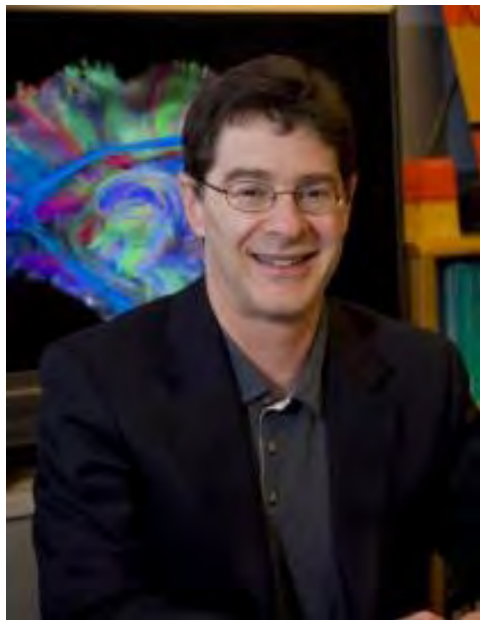


Accelerate Translation, Validation, Commercialization

NSF ERC

Increase activity

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