

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

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



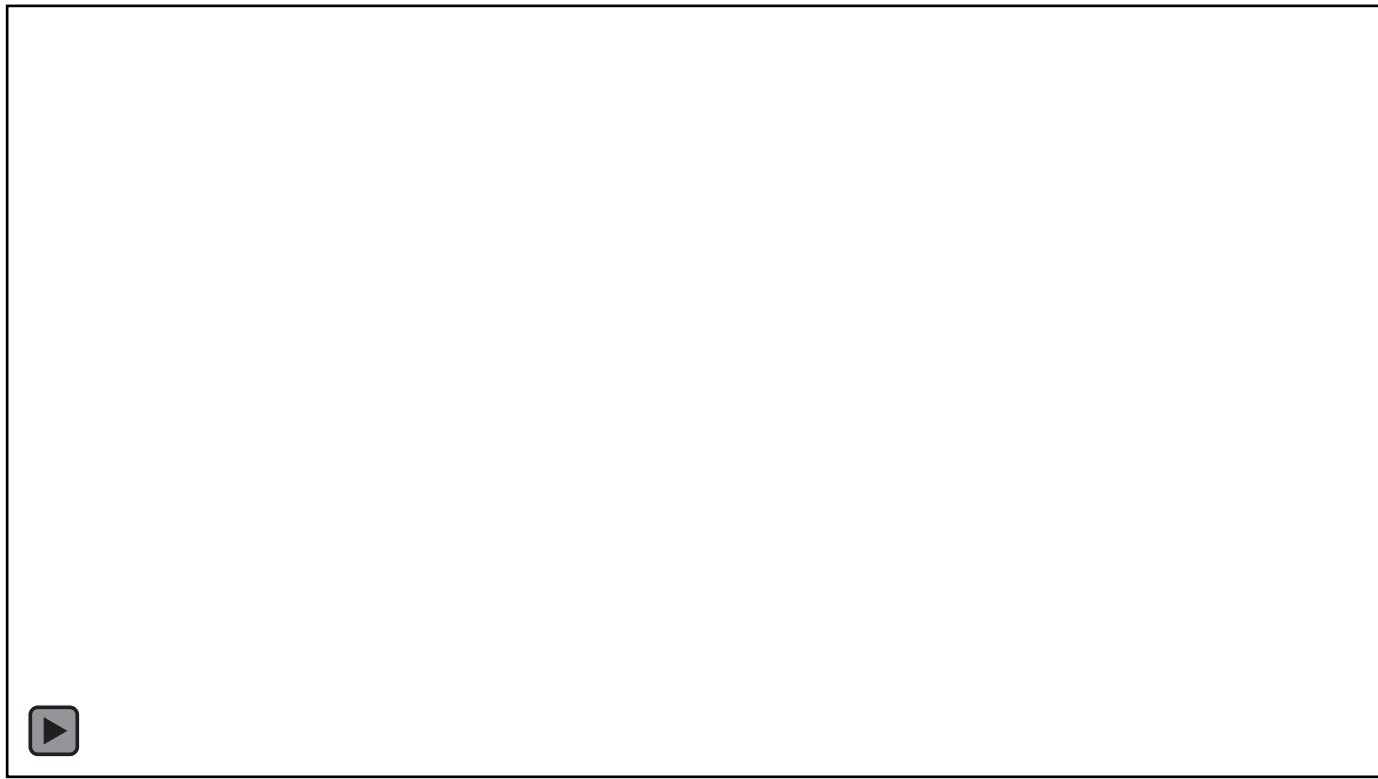
FY 2020 Appropriation* for NIH, enacted Dec 2019: total of \$41.45B reflects a \$2.5B or 6.4% increase to FY 2019 allocation of \$38.95B.

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: 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.

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



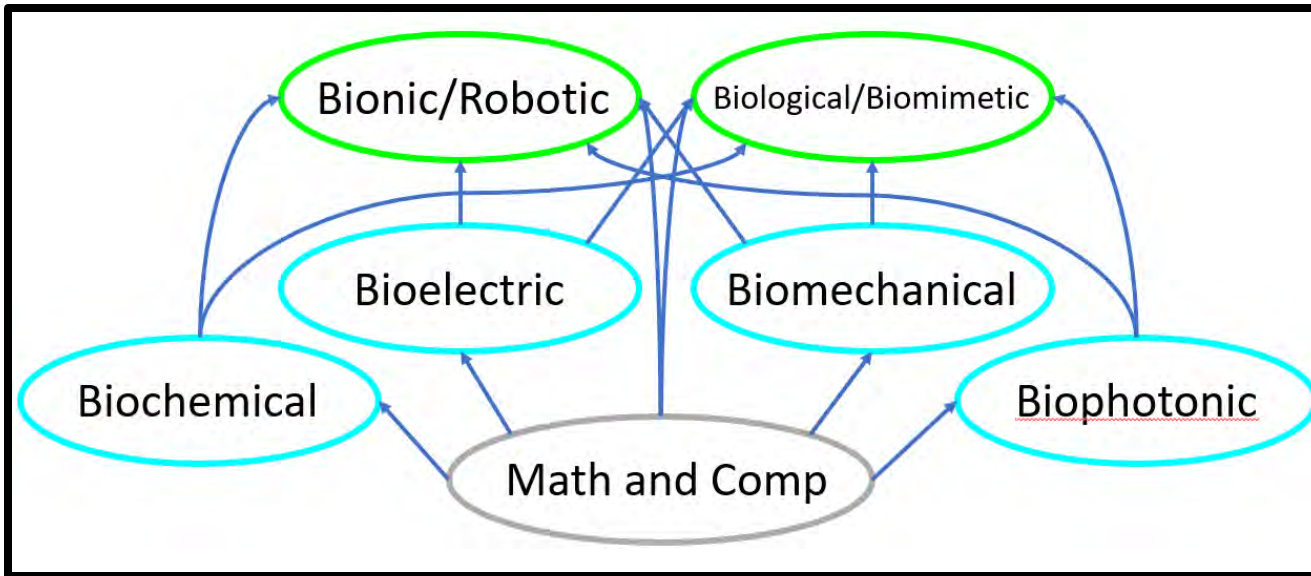
Behrouz Shabestari, Ph.D.
Director, NIBIB National
Technology Centers Program



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



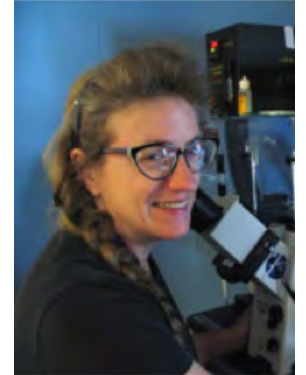
Tom Meade
Northwestern



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

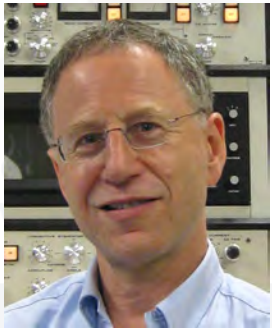


Ammasi Periasamy
Virginia

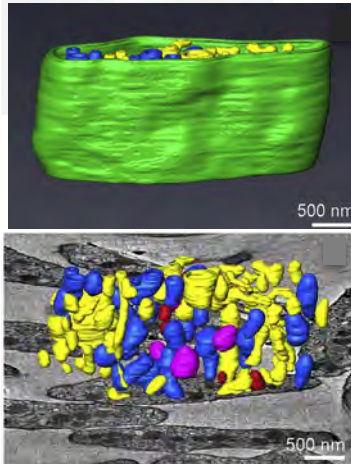
NIBIB Intramural Research Program Review

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

Cellular Structure / Electron Microscopy



Richard Leapman



Marcel Bruchez
Carnegie Mellon

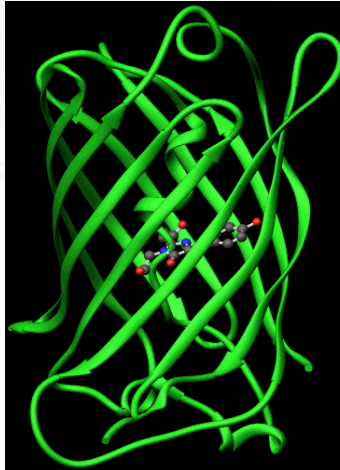
Wah Chiu
Stanford

Biophotonics



George Patterson

Vinayak Dravid
Northwestern



Michael Fried
Kentucky

Dynamics of Macromolecular Assembly



Peter Schuck

More in May 2020

Peter Lollar III
Emory



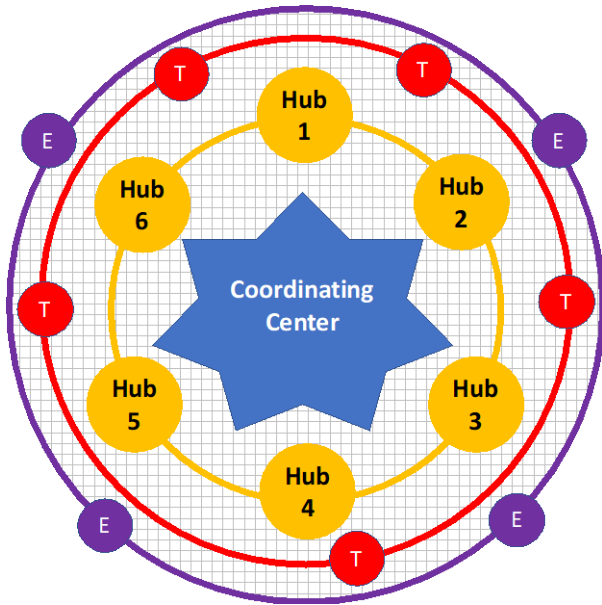
Ammasi Periasamy
Virginia

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



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



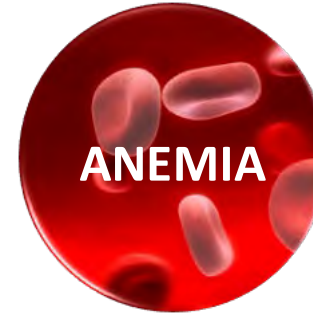
NIH TECH ACCELERATOR
CHALLENGE
FOR GLOBAL HEALTH



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

IMAG Interagency Modeling and Analysis Group

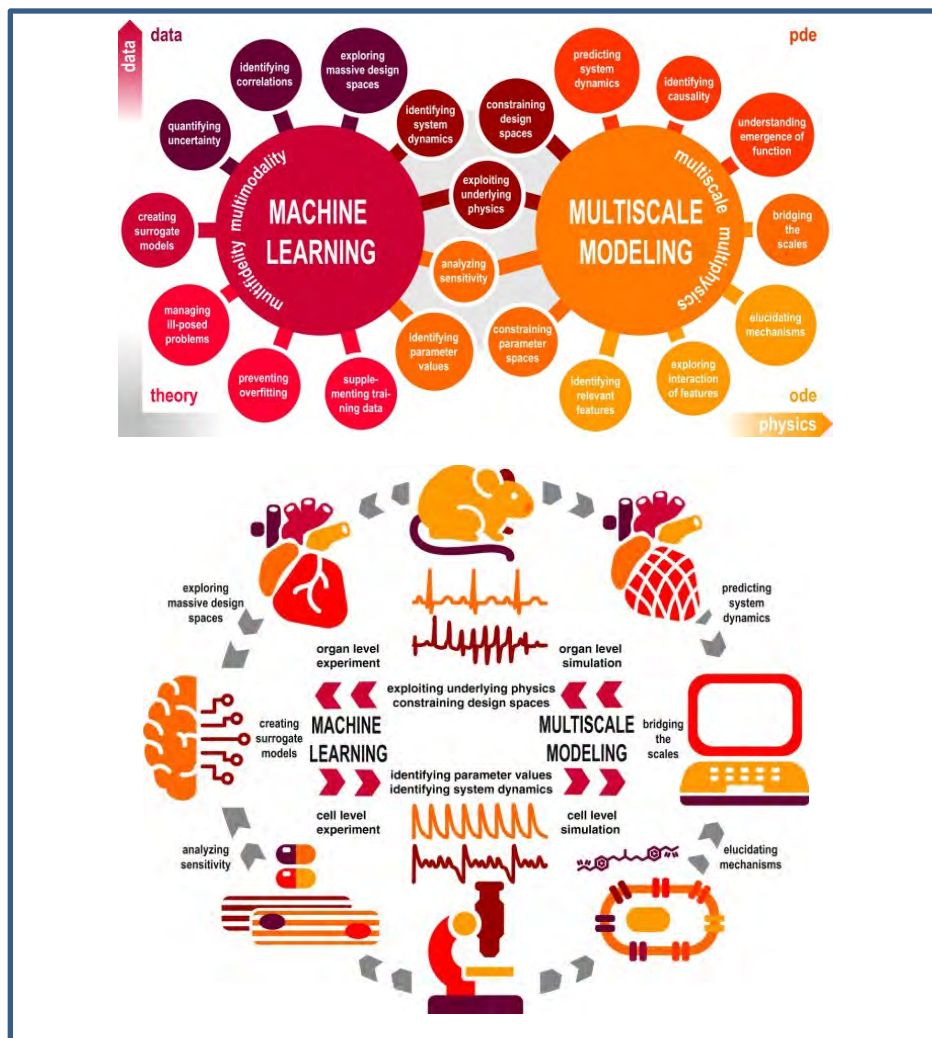
**INTEGRATING
MACHINE LEARNING WITH
MULTISCALE MODELING FOR
BIOMEDICAL, BIOLOGICAL AND
BEHAVIORAL SYSTEMS**

OCTOBER 24-25, 2019

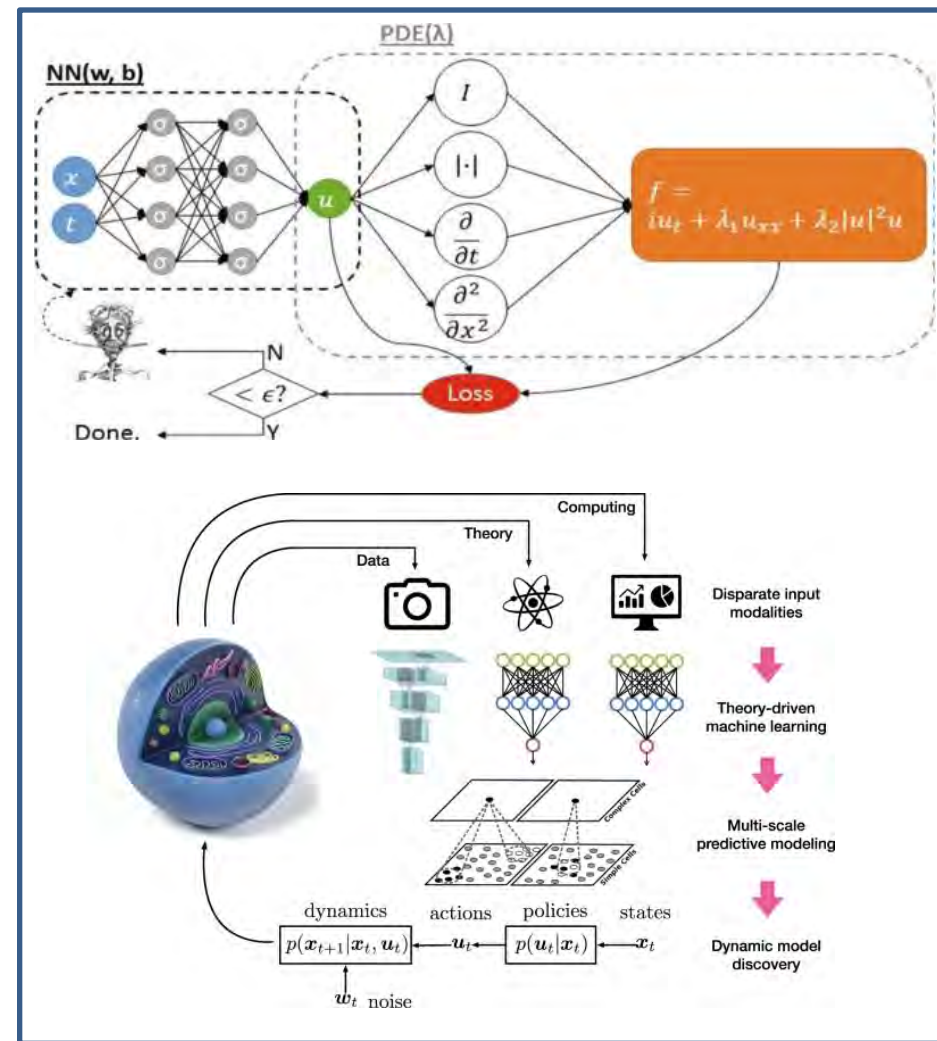
Rensselaer IQS NVIDIA

FDA CDC NIH NASA NOAA NSF USDA ARL HRQ

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

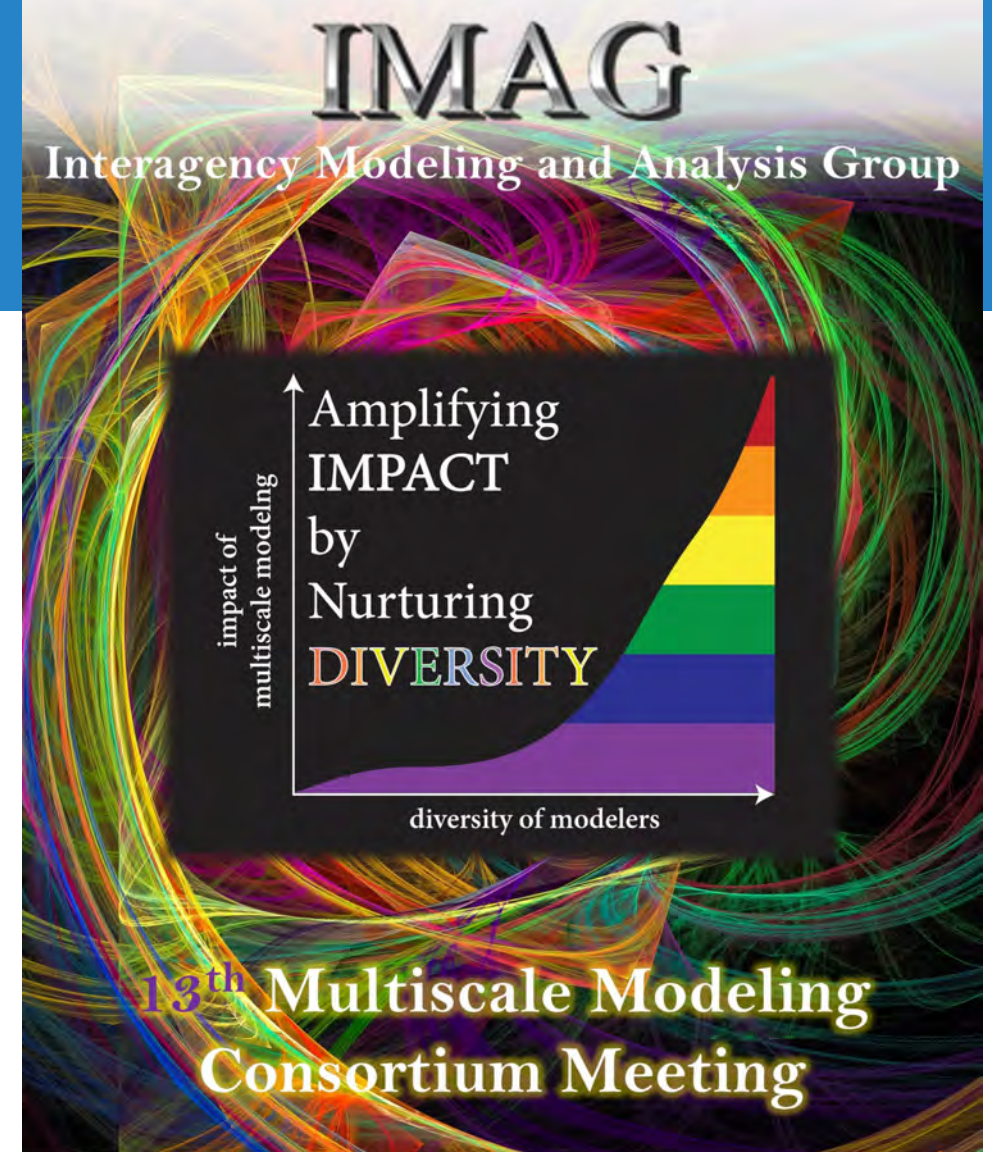
Sessions:

- 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



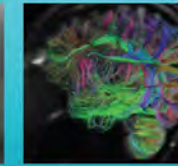
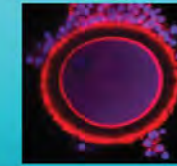
March 17-18, 2020 | Natcher Conference Center, NIH





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

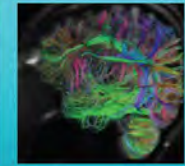
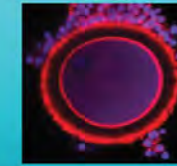
- Three years / \$400,000 direct costs
- **Limited** preliminary data is allowed, but must be limited to one-half page which may include one figure
- High-risk/High-reward projects Similar to Exploratory R21 mechanism, but for New Investigators

Encourages:

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



NIBIB TRAILBLAZER (R21) AWARD



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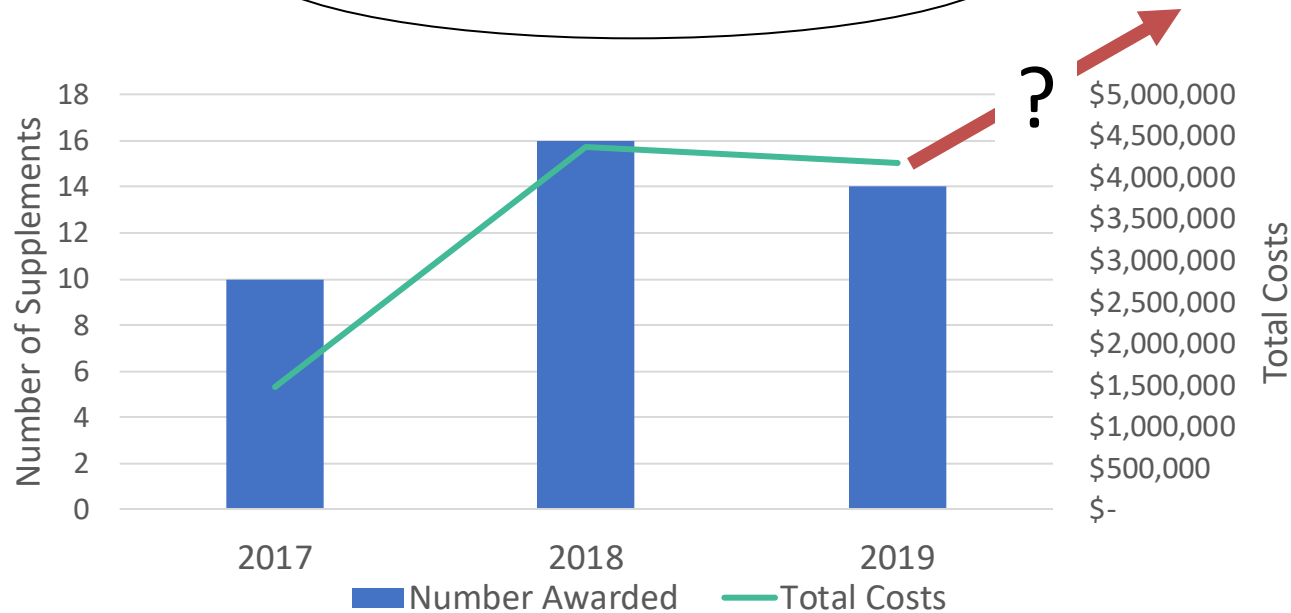
2015 -- 2019

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



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

Total of **250** students engaged



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 Zupal

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



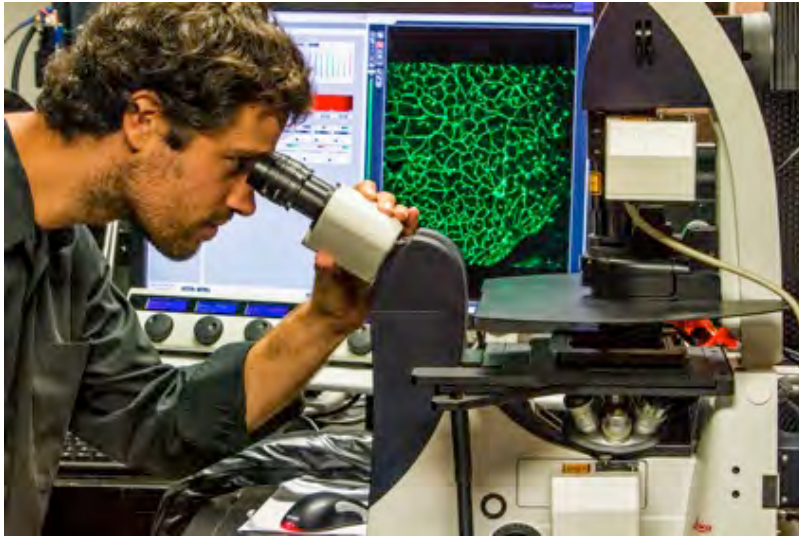
Todd Merchak



Ilana Goldberg

Dream

**Basic Science and
Technology Development**

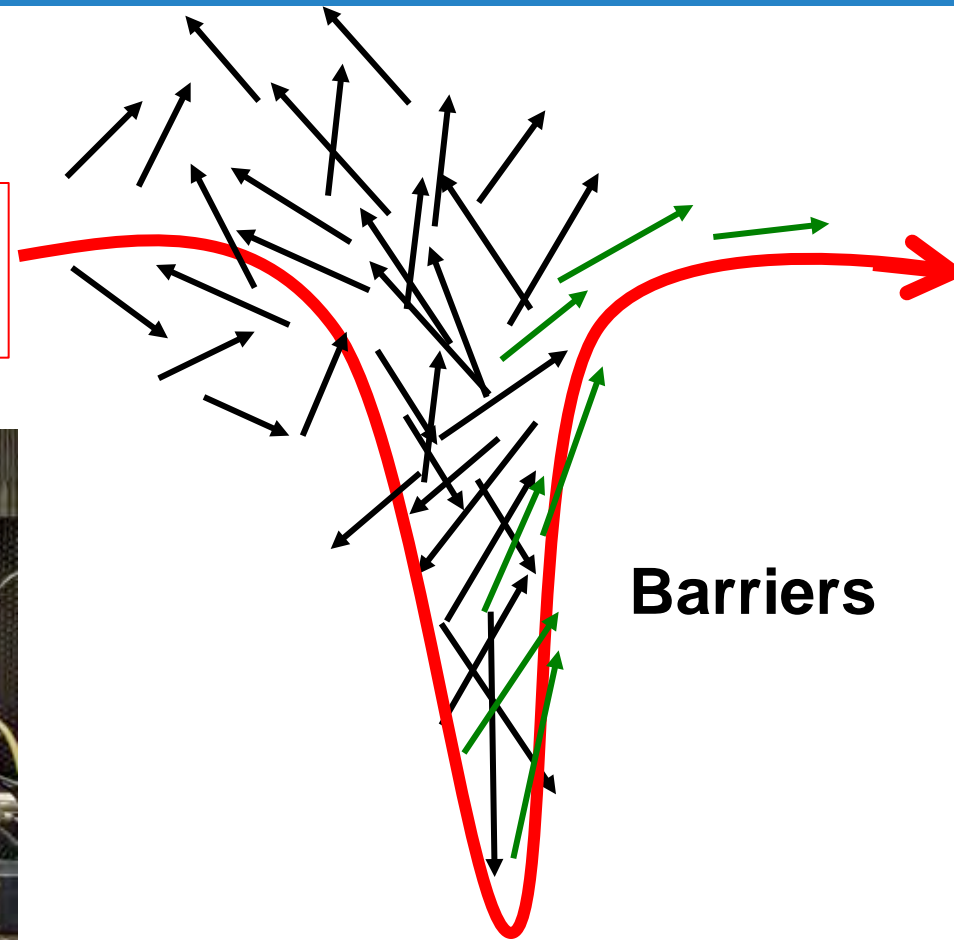
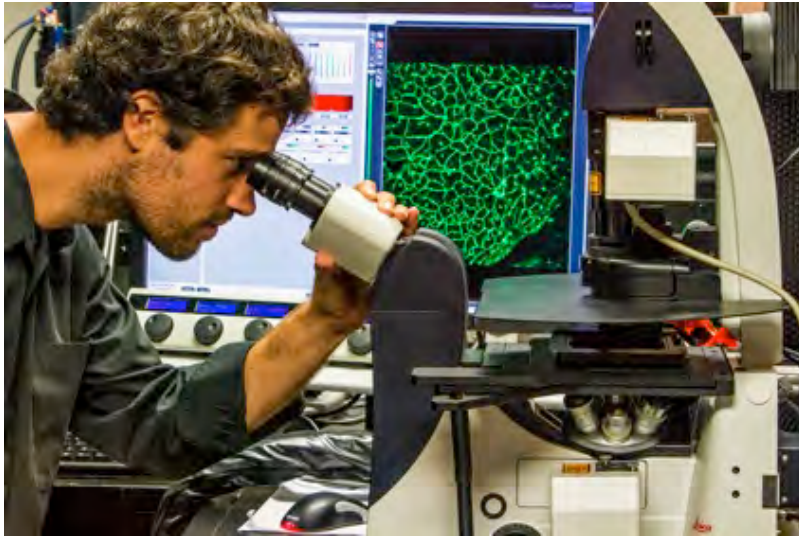


**Clinical Diagnostics
and Therapeutics**



Reality

**Basic Science and
Technology Development**

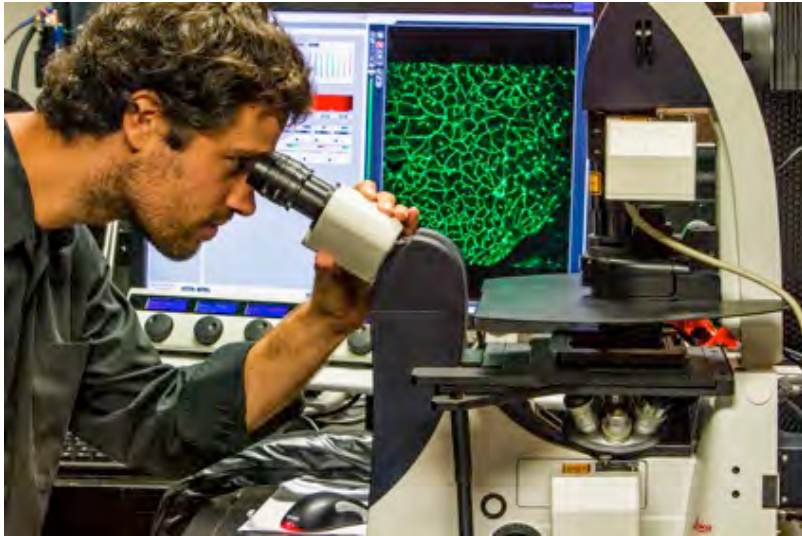


**Clinical Diagnostics
and Therapeutics**

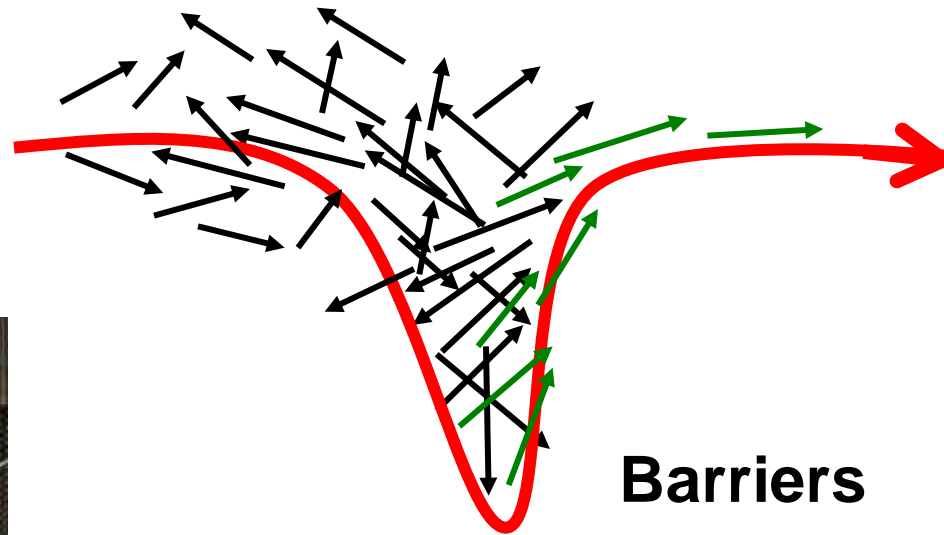


Shift Equilibrium *to Right*

**Basic Science and
Technology Development**



Increase activity



Reduce
Barriers



**Clinical Diagnostics
and Therapeutics**



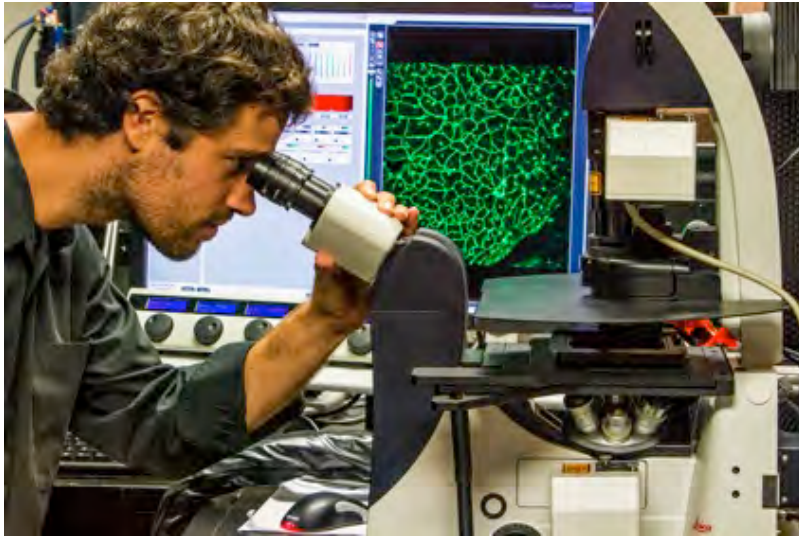
Accelerate Translation,
Validation, Commercialization



Shift Equilibrium *to Right*

NIH - NSF - FDA - NIST Partnerships?

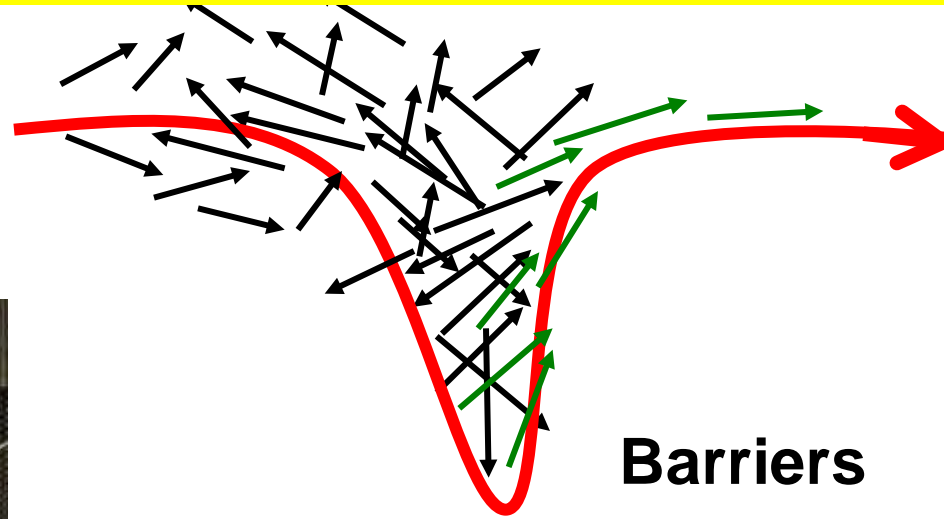
**Basic Science and
Technology Development**



NSF ERC



Increase activity



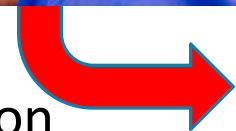
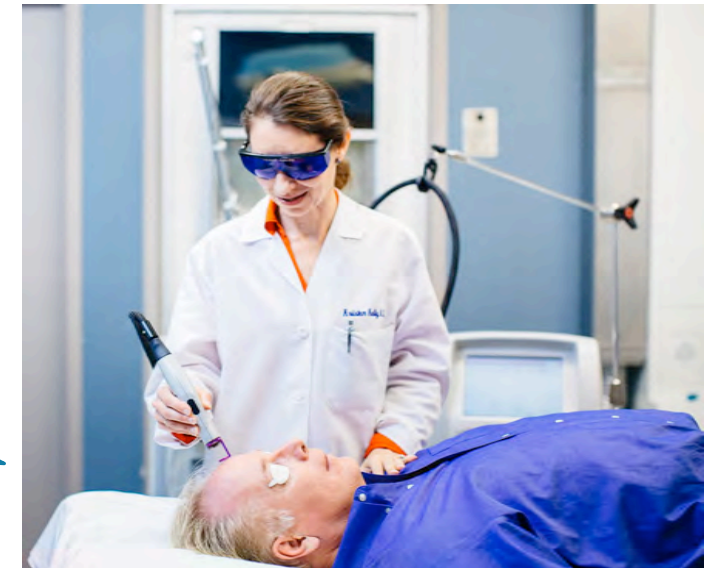
Barriers

Reduce
Barriers

NSF IUCRC

Accelerate Translation,
Validation, Commercialization

**Clinical Diagnostics
and Therapeutics**



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*

