Neurophotonics: Illuminating How the Brain Works





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Neurophotonics Center

Build and sustain a community of developers, early adopters, and users







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Illuminating How the Brain Works

Neurophotonics:



David Boas

Biomedical Engineering







Irving J. Bigio **Biomedical Engineering**







Alberto Cruz-Martin Biology











Michael Hasselmo Neuroscience



Swathi Kiran Speech, Language &



Sam Ling Psychological & Brain Sciences



Jerome Mertz **Biomedical Engineering**



Siddharth

Ramachandran

Engineering

Kamal Sen

Darren Roblyer Biomedical Engineering Electrical & Computer



Barbara Shinn-Cunningham **Biomedical Engineering**



Biology



Helen B. Tager-Flusberg Psychological & Brain Sciences



Lei Tian Electrical & Computer Engineering







John A. White **Biomedical Engineering**



Medicine

Allison Dennis Biomedical Engineering



Biomedical Engineering Electrical & Computer Engineering



Bob Stern Medicine



Tyrone Porter Nanomedicine and Medical Acoustics











Melissa Kibbe Physiology & Biophysics Psychological & Brain Sciences



Jeff Gavornik, Meryem Yucel, Steve Ramirez

Neurophotonics: Illuminating How the Brain Works

- Seeing More with Microscopy | Mertz
- In vivo Imaging of the Diseased Nervous System | Cruz-Martín
- Dissecting Long-Range Cortical Networks During Behavior | Chen
- Novel Laser Sources for Nerve Stimulation | Sander
- Neural Circuits for Social Behavior | Davison
- Conversing with the Nervous System: Tools and Findings | White
- Worms Under Duress: Imaging Small Neuronal Circuits in C. elegans | Gabel
- Multi-dimensional Neuroretinal Optical Imaging for Humans & Small Animals | Yi
- Artificially Activating Memories to Prevent the Return of Fear | Ramirez
- Investigating the Neural Basis of Learned Temporal Relationships | Gavornik
- Birefringence Imaging of Neuronal Activity and Myelin Degeneration | Bigio
- fNIRS at BU | Yücel
- Optics & Photonics for BRAIN Science: BRAIN Initiative Funding Priorities | Tally





Seeing More with Microscopy

Jerome Mertz

Professor Biomedical Engineering, ENG



Seeing more with microscopy: be adaptive!

Two-photon microscopy





In vivo Imaging of the Diseased Nervous System

Alberto Cruz-Martín

Assistant Professor Biology, CAS; and Pharmacology & Experimental Therapeutics, MED



Cruz-Martín Lab: In Vivo Imaging of the Diseased Nervous System

1. Understand how the brain wires itself during cortical development







3. Selective manipulation of neural circuits

Expression of schizophrenia-associated genes in specific neural networks



2. Why do we do this?

Complex behavior in primates



Artificial Intelligence



Mental Illness



4. Interrogating neural networks in freely moving behaving mice





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Dissecting Long-Range Cortical Networks During Behavior

Jerry Chen Assistant Professor Biology, CAS



Understanding the Circuits and Computations of the Neocortex: Towards a Complete Functional, Anatomical, and Molecular Readout





Novel Laser Sources for Nerve Stimulation

Michelle Sander

Assistant Professor Electrical & Computer Engineering and Materials Science & Engineering Division, ENG







Neural Circuits for Social Behavior

Ian Davison

Assistant Professor Biology, CAS



Optical approaches for probing social learning and behavioral flexibility





Conversing with the Nervous System: Tools and Findings

John A. White

Professor and Chair Biomedical Engineering, ENG; Graduate Program in Neuroscience; Pharmacology & Experimental Therapeutics, MED



Conversing with the Nervous System: Tools and Findings





Worms Under Duress: Imaging Small Neuronal Circuits in C. elegans

Christopher V. Gabel

Associate Professor Physiology & Biophysics and Pharmacology & Experimental Therapeutics, MED; Photonics Center



Worms under duress: imaging small neuronal circuits in *C. elegans*



Multi-dimensional Neuroretinal Optical Imaging for Humans and Small Animals

Ji Yi

Assistant Professor Medicine, MED; Biomedical Engineering, ENG







Artificially Activating Memories to Prevent the Return of Fear Steve Ramirez

Assistant Professor Psychological & Brain Sciences, CAS









Investigating the Neural Basis of Learned Temporal Relationships

Jeff Gavornik

Assistant Professor Biology, CAS







Birefringence Imaging of Neuronal Activity and Myelin Degeneration

Irving J. Bigio

Professor Biomedical Engineering and Electrical & Computer Engineering, ENG; Physics, CAS; and Medicine, MED



Anisotropic structures are birefringent – can be imaged with polarized microscopy Myelin is highly birefringent: uniaxial in radial direction









fNIRS at BU

Meryem Ayşe Yücel

Research Assistant Professor Neurophotonics Center and Biomedical Engineering, ENG



fNIRS at BU



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