



2017



SYMPOSIUM ON THE BRAIN INITIATIVE

Mission Statement:

The Mayo Symposium highlights the dual promise of the BRAIN Initiative to drive public/private collaboration to develop tools that revolutionize our basic understanding of the brain and to quickly translate this foundational understanding into transformed clinical practice and robust economic growth in the high-tech medical industry.

Meeting Organizers



Kendall H. Lee, M.D., Ph.D., is the director of the Neural Engineering Laboratory at the Mayo Clinic in Rochester, as well as the program director for the Medical Scientist Training Program at the Mayo Clinic School of Medicine. He is a full professor in the departments of Neurologic Surgery, Physiology and Biomedical Engineering, and Physical Medicine and Rehabilitation. His research

interests include developing neuromodulation techniques and devices for the treatment of Parkinson's disease, tremor, depression, obsessive-compulsive disorder, epilepsy, and spinal cord injury. His lab is currently working on a chronically implantable closed-loop smart deep brain stimulation system using electrochemical and electrophysiological feedback to change stimulation parameters in real time.

Dr. Lee received his M.Phil., M.D., and Ph.D. degrees from Yale University. He is a permanent member of the NIH BNVT study section and serves on the editorial board for several journals. Dr. Lee holds the rank of Commander in the U.S. Navy Reserve and has deployed as a neurosurgeon in support of Operation Enduring Freedom.



Kevin Bennet, Ph.D., M.B.A., is the chair of the Division of Engineering at Mayo Clinic and the co-director of the Neural Engineering Laboratory. His division provides engineering design and production support for all Mayo Clinic departments and is a major part of the Neural Engineering Laboratory's team science efforts. His division provides engineering design and production support for all Mayo

Clinic departments and is a major part of the Neural Engineering Laboratory's team science efforts, with whom they have jointly developed three generations of neuromodulation recording and stimulation devices.

Dr. Bennet received his Ph.D. from Deakin University and his M.B.A. from the Harvard Graduate School of Business Administration. He holds the rank of assistant professor in the Department of Neurosurgery.



Sam Rudolph is the research program coordinator for the Mayo Neural Engineering Laboratory. He provides project, operations, communications, and administrative management to the NEL. He is a U.S. Army veteran and earned a B.A. in Mass Communications from Winona State University.



Keynote Speaker



Michael Hawrylycz, Ph.D., has been responsible for data annotation, mapping, and analysis at the Allen Institute for Brain Science since the Institute's founding in 2003. He received his Ph.D. from MIT in applied mathematics and has worked in a variety of areas applying data analysis and image processing to the life sciences, including the Human Genome Project at Los Alamos National Laboratory and the NHGRI ENCODE project. Most recently, Dr. Hawrylycz is forming a team to enhance translational applications of Allen Institute resources.

Mayo Clinic Leadership



Fredric Meyer, M.D., F.A.A.N.S., is the Juanita Kious Waugh Executive Dean for Education, Mayo Clinic College of Medicine and Science, and also the Dean of the Mayo Clinic School of Medicine. He also serves as the enterprise chair of the Department of Neurologic Surgery and holds the Alfred Uihlein Family Professorship in Neurologic Surgery.

Dr. Meyer received his M.D. from Boston University and completed his residency at Mayo Clinic, where he has been on staff since 1988. He has authored over 350 scientific articles, book chapters, and editorials and published four books on operative neurosurgery. Dr. Meyer is a past president of the American Academy of Neurological Surgery and is currently the executive director of the American Board of Neurological Surgery.

Dr. Meyer's research primarily involves clinical investigation of surgical techniques and outcomes for brain tumor, epilepsy, pituitary, and neurovascular operations. He has been funded by the National Institute of Neurological Disorders and Stroke, the National Institute on Aging, the National Cancer Institute, and the Robert N. Brewer Foundation, among others.



MARCH 31, 2017

5:30 p.m.	Reception Foundation House
6:30 p.m.	Dinner
8:30 p.m.	Adjourn

APRIL 1, 2017

7:00 a.m.	Continental Breakfast/Poster Setup Landow Atrium
8:00 a.m.	Welcome Drs. Kendall Lee and Kevin Bennet Geffen Auditorium
8:10 a.m.	Mayo Welcome Dr. Fred Meyer

KEYNOTE SESSION

8:20 a.m.	Data, Tools, and Resources from the Allen Institute for Brain Science: From Basic Science through Translational Application – Dr. Michael Hawrylycz (Allen Institute for Brain Science)
9:05 a.m.	Keynote Q&A
9:15 a.m.	Break/Poster Session

CONCURRENT TRACKS

9:45 a.m.	Genetics and Cell Typing Tools and Projects Dr. Allan Bieber, moderator Geffen Auditorium	Multiphoton Microscopy Dr. Kendall Lee, moderator Judd Hall
9:50 a.m.	Intrabody-Dependent Activation of Cell-Specific Gene in CNS Dr. Seth Blackshaw (Johns Hopkins University)	Non-Degenerate Multiphoton Microscopy for Deep Brain Imaging Dr. Christopher Ferri (UCSD)
10:10 a.m.	Identifying Design Principles of Neural Cells Dr. Amina Qutub (Rice University)	Molecular Engineering of the Next Generation of Fluorescent Reporters of Neural Activity Dr. Robert Campbell (University of Alberta)
10:30 a.m.	Towards Quantitative Cell Type-Based Mapping of the Whole Mouse Brain Dr. Pavel Osten (Cold Spring Harbor Laboratory)	Wide-Field Single-Photon Imaging for the Interrogation of Brain Connectivity Dr. Howard Gritton (Boston University)
10:50 a.m.	Panel Question	Panel Question
11:00 a.m.	PANEL: BUSINESS Dr. Kevin Bennet, moderator Geffen Auditorium	
11:05 a.m.	Bridging the Development Gap Between Technology Disclosure and Commercialization Tim Argo (Mayo Clinic Ventures)	
11:15 a.m.	Protecting IP for Medical Research Devices Patricia Bianco (U.S. Patent and Trademark Office)	
11:30 a.m.	Transitioning from Academic Lab to Startup Company Dr. Pushkar Joshi (Inscopix)	
11:45 a.m.	Licensing Your Technology – Earl Slee (Medtronic)	
12:00 p.m.	Commercializing Big Data and Service Analytics – Mark Sexton (Optum)	
12:15 p.m.	Panel Question	



12:30 p.m.	Lunch/Poster Session Landow Atrium	
CONCURRENT TRACKS		
1:30 p.m.	Brain Imaging Dr. Paul Min, moderator Geffen Auditorium	Sensors and Optogenetics Dr. Charles D. Blaha, moderator Judd Hall
1:35 p.m.	Individual Variability in Human Brain Connectivity Modeled Using Multi-Scale Dynamics Under Energy Constraints Dr. Lilianne Mujica-Parodi (Stony Brook)	Controlling Neuronal Activity by Biological Light Dr. Ute Hochgeschwender (Central Michigan University)
1:50 p.m.	Imaging Brain Function in Real-World Environments and Populations with Portable MRI Dr. J. Thomas Vaughan (University of Minnesota)	Integrated Measurement of Dopamine Release and Large-Scale Ensemble Activity in Behaving Animals Dr. Stephen Cowen (University of Arizona)
2:05 p.m.	Building and Sharing Next-Generation Open-Source, Wireless, Multichannel Miniaturized Microscopes for Imaging Activity in Freely Behaving Mice Dr. Peyman Golshani (UCLA)	Carbon Thread Arrays for High-Resolution Multimodal Analysis of Microcircuits Dr. Cynthia Chestek (University of Michigan)
2:20 p.m.	Dissecting the Mechanisms of Ultrasonic Neuromodulation Dr. Tomokazu Sato (Caltech)	Micro-Coil Implants for Cortical Activation Dr. Shelley Fried (Massachusetts General Hospital)
2:35 p.m.	Sub-Micrometer X-Ray Tomography for Neuroanatomy Dr. Eva Dyer (Northwestern)	Modular Systems for Measuring and Manipulating Brain Activity Dr. Supin Chen (Lawrence Livermore National Laboratory)
2:50 p.m.	Panel Question	Panel Question
3:00 p.m.	Break/Poster Session	
3:30 p.m.	PANEL: MAYO NEUROSCIENCE Dr. Greg Worrell, moderator Geffen Auditorium	
3:35 p.m.	Mayo Systems Electrophysiology Laboratory Dr. Greg Worrell	
3:50 p.m.	Three-Dimensional Mitochondrial Morphology in the Brain Dr. Eugenia Trushina	
4:05 p.m.	Computational Models for Controlling in Vivo Stimulation-Evoked Neurochemical Activity – Dr. Luis Lujan	
4:20 p.m.	Ultrasound Microvessel Imaging for Evaluation of Neural Activity – Dr. Shigao Chen	
4:35 p.m.	Panel Question	
5:00 p.m.	Conclusion – Drs. Kendall Lee and Kevin Bennet Geffen Auditorium	
5:10 p.m.	Dinner/Poster Session Landow Atrium	
6:30 p.m.	Adjourn	



APRIL 2, 2017

Program
Agenda

8:00 a.m.	Welcome Drs. Kendall Lee and Kevin Bennet Geffen Auditorium
8:00 a.m.	PANEL: NEW BRAIN AWARDS AND TRANSLATIONAL SCIENCE APPLICATIONS Kendall Lee, M.D., Ph.D., moderator Geffen Auditorium
8:05a.m.	Magnetic Neural Excitation Dr. Dekel Rosenfeld (MIT) / Anikeeva Lab
8:20 a.m.	Closing the Loop on Tremor: A Responsive Deep Brain Stimulator for the Treatment of Essential Tremor Dr. Aysegul Gunduz (University of Florida)
8:35 a.m.	Acoustoelectric Brain Imaging of Deep Dipole Sources in a Human Head Phantom Dr. Russell Witte (University of Arizona)
8:50 a.m.	Clinical Testing of an Intracortical Visual Prosthesis System Dr. Philip Troyk (Illinois Institute of Technology)
9:05 a.m.	Manifold-Valued Statistical Models for Longitudinal Morphometric Analysis in Preclinical Alzheimer's Disease Vamsi Ithapu (University of Wisconsin)
9:20 a.m.	Panel Question
9:30 a.m.	PANEL: BRAIN BEYOND THE BRAIN Dr. Kip Ludwig, moderator Geffen Auditorium
9:35 a.m.	NINDS – Dr. Nick Langhals (NIH)
9:50 a.m.	SPARC – Dr. Gene Civillico (NIH)
10:15 a.m.	HAPTIX/ElectRx – Dr. Doug Weber (DARPA)
10:35 a.m.	The FDA and the BRAIN Initiative – Dr. Kristen A. Bowsher (FDA)
10:55 a.m.	Panel Question
11:20 a.m.	PANEL: COMMUNICATING NEUROSCIENCE Dr. Greg Gage, moderator Geffen Auditorium
	Backyard Brains Dr. Greg Gage
11:30 a.m.	Making the Case to the Public Dr. Norbert Myslinski (University of Maryland)
11:40 a.m.	Research Neuroscientists as Science Communicators: Challenges and Opportunities Dr. Eric Chudler (University of Washington)
11:50 a.m.	Talking with Legislators and Government Agencies Dr. Paul Radensky (McDermott+ Consulting)
12:00 p.m.	Communicating Research Value to Private Donors and Foundations Alaine Westra (Mayo Clinic Department of Development)
12:10 p.m.	Panel Question
12:30 p.m.	Conclusion Drs. Kendall Lee and Kevin Bennet



Panelists & Moderators



Allan Bieber, Ph.D., is the Associate Director of Education for the Neural Engineering Laboratory. He holds the rank of associate professor in the departments of Neurologic Surgery and Neurology and previously served as the director of the Neurobiology of Disease Graduate Program in the Mayo Clinic Graduate School of Biomedical Sciences.

Dr. Bieber has been a researcher and teacher at Mayo Clinic since 1997. His early research focused on the genetic basis for disease progression in multiple sclerosis. Currently he and his team in the Neural Engineering Laboratory are working to understand the biological basis for the therapeutic effect of deep brain stimulation in movement disorders.



Seth Blackshaw, Ph.D., is a professor of neuroscience, neurology, and ophthalmology at the Johns Hopkins University School of Medicine. He also serves as an investigator for both the Center for Human Systems Biology and the Institute for Cell Engineering at Johns Hopkins.

Dr. Blackshaw's research examines the molecular basis for neuronal and glial cell fate specification and survival. He focuses on characterizing the network of genes that control specification of different cell types within the retina and hypothalamus with the goal of learning how individual cell types are specified, understanding how those cells contribute to the regulation of behavior, and ultimately learning how they can be replaced in neurodegenerative disease.

Dr. Blackshaw received his B.A. in biology and M.S. in biochemistry from the University of Chicago. He completed his Ph.D. in neuroscience at Johns Hopkins and a postdoctoral fellowship in genetics at Harvard Medical School.



Amina Qutub, Ph.D., is an assistant professor in the Department of Bioengineering at Rice University. She received her B.S. in chemical engineering from Rice University and her Ph.D. in bioengineering from the University of California at Berkeley and San Francisco. She then completed postdoctoral training in biomedical engineering at the Johns Hopkins University School of Medicine.

Dr. Qutub's research interests are systems biology and neurovascular cell engineering. Her lab's research vision is to interpret human cellular communication in order to understand and improve health. Her team uses experimental computational methods to identify mechanisms by which neural stem cells form functional neuronal networks.

Dr. Qutub has more than 30 peer-reviewed publications, cofounded the data visualization startup company DiBS, and was scientific lead on the 2014-2015 DREAM Biomedical Big Data Algorithm Challenge. She has received funding under the NSF CAREER and Neural & Cognitive Systems programs.



Pavel Osten, M.D., Ph.D., is an associate professor at Cold Spring Harbor Laboratory. He obtained his M.D. from Charles University in Prague and his Ph.D. from the State University of New York in Brooklyn. He has trained at New York University and the Max Planck Institute.

At Cold Spring Harbor Laboratory, Dr. Osten has led a team of scientists in establishing serial two-photon tomography (STPT) as

Speaker Biographies



the first automated method for standardized and unbiased mapping of anatomy and activation in the whole mouse brain at cellular resolution. In ongoing work funded by the BRAIN Initiative, Dr. Osten and colleagues are applying their imaging and computational tools to build a comprehensive atlas of neuronal and glia cell type distribution and morphology across the entire mouse brain.

Dr. Osten has authored and co-authored over 60 papers, reviews, and book chapters. In addition to his academic work, Dr. Osten co-founded Certerra Inc., a biotech company that applies the imaging and computational methods for mapping mouse brain activation to screening drugs targeting the central nervous system.



Christopher Ferri, Ph.D., is a postdoctoral scholar in the Department of Neurosciences at the University of California at San Diego. He received his Ph.D. from the University of California at Merced.

His research interests include the design of novel multiphoton microscopy techniques for deep-tissue imaging and optical characterization of bio-imaging fluorophores.



Robert Campbell, Ph.D., is a professor in the Department of Chemistry at the University of Alberta. He earned his Ph.D. in chemistry at the University of British Columbia and completed postdoctoral research at the University of California at San Diego in the lab of Nobel winner Dr. Roger Tsien.

Dr. Campbell's research focuses on the development of optogenetic tools for cell biology applications.

His work has been recognized with numerous awards, including the Teva Canada Limited Biological and Medicinal Chemistry Lectureship Award, the Rutherford Memorial Medal in Chemistry from the Royal Society of Canada, and a Canada Research Chair from 2004 to 2014.



Howard Gritton, Ph.D., is a research associate in the Department of Bioengineering at Boston University, where he works with Dr. Xue Han's lab to investigate how cell populations organize as networks to encode sensory stimuli. His work has led to new insights into how cholinergic signaling in the hippocampus contributes to learning and how unique cell populations within the striatum influence one another to organize motor output.

Dr. Gritton earned his undergraduate degree in biology from the University of Utah and his Ph.D. in neuroscience from the University of Michigan in Ann Arbor.



Timothy Argo is the director of licensing for Mayo Clinic Ventures, the Mayo Clinic team responsible for commercializing Mayo-developed technologies. Prior to joining Mayo Clinic, Mr. Argo worked for the Kansas State University Research Foundation and in the pharmaceutical industry. His areas of expertise include cardiology, gastroenterology, and medical devices.

Mr. Argo received his B.S. in microbiology and his M.B.A. from Kansas State University.

Speaker Biographies





Patricia Bianco is a manager quality assurance specialist in Technology Center 3700 (Mechanical and Biomedical Technologies) at the United States Patent and Trademark Office, where she has worked since 1998.

Ms. Bianco examined applications in the fields of blood filtration and separation, cardiopulmonary bypass, and shunt devices and methods until 2006, when she became a supervisory patent examiner and supervised application examination for orthopedic devices, bandages, and miscellaneous surgical devices. She has participated in numerous patent examiner training programs in both her technical center and the USPTO as a whole. She earned her B.S. in biochemistry from Virginia Tech and is a recipient of the Department of Commerce Bronze Medal and Exceptional Career Award.



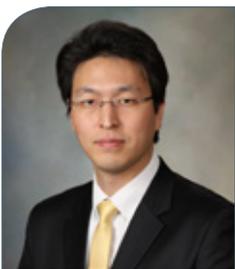
Pushkar Joshi, Ph.D., is the director of strategy and business development for Inscopix, Inc. Dr. Joshi leads the company's efforts to build relationships with key partners in academia, industry, and the philanthropic sector of the neuroscience ecosystem. In 2014, Dr. Joshi led Inscopix's alignment with the BRAIN Initiative through the establishment of the DECODE Grant Program.

A developmental neurobiologist by training, Dr. Joshi received his Ph.D. at the University of Rochester and completed postdoctoral research at Stanford University. He is an alumnus of the Christine Mirzayan Science and Technology Policy Program at the National Academy of Sciences and the Program in Innovation and Entrepreneurship at the Stanford Graduate School of Business.



Earl Slee is the vice president of strategy, technology, and business development for the Brain Therapies Business Unit in Medtronic. Mr. Slee has nearly 30 years of experience in the medical device space and is responsible for external technology and company acquisition and licensing at Medtronic. Prior to joining Medtronic, he held various engineering and management positions at Covidien, ev3, Micro Therapeutics Inc., Instromedix, Pfizer, Welch Allyn, and Hughes Aircraft.

Mr. Slee has 22 issued patents, including 17 for neurovascular inventions. He earned his B.S. in physics from the University of California at San Diego, an M.B.A. from Dartmouth College, and an M.S.E.E. from San Diego State University.



Paul Min, Ph.D., is a principal engineer in the Mayo Clinic Neural Engineering Laboratory. He holds the rank of assistant professor in the Department of Neurologic Surgery and the Department of Physiology and Biomedical Engineering. He received his Ph.D. in biomedical engineering from the University of California at Irvine and completed postdoctoral training at the Leibniz Institute for Neurobiology.

His research interests include neuroimaging, 7T MRI, high-resolution PET, and fMRI. He is currently investigating the mechanism of deep brain stimulation using fMRI and electrochemistry.



Lilianne Mujica-Parodi, Ph.D., is the director of the Laboratory for Computational Neurodiagnostics at Stony Brook University. She holds the rank of associate professor in Stony Brook University's Department of Biomedical Engineering with appointments in the departments of Neurobiology and Behavior, Neurology, Psychiatry, and Physics.



Dr. Mujica-Parodi's research focuses on the application of control systems engineering and dynamical systems to neuroimaging with neurodiagnostic applications to neurological and psychiatric disorders.

She received her B.A. from Georgetown University and, her Ph.D. from Columbia University, and completed postdoctoral training in clinical neuroscience, neuroimaging, and psychiatry at the Columbia University College of Physicians and Surgeons.



J. Thomas Vaughan, Ph.D., is a professor of biomedical engineering at Columbia University. Prior to joining Columbia University, Dr. Vaughan was a tenured professor at the University of Minnesota with appointments in the Departments of Radiology, Electrical Engineering, and Biomedical Engineering, where he administered the Engineering Core of the University of Minnesota Center for Magnetic Resonance Research.

Dr. Vaughan earned B.S. degrees in electrical engineering and biology at Auburn University and worked for NASA, Texas Instruments, and the University of Texas prior to earning his Ph.D. in biomedical engineering at the University of Alabama. After completion of his doctorate, he joined the Massachusetts General Hospital Nuclear Magnetic Resonance Center as the center's director of engineering. His work and research has focused on advanced human MRI technology, methodology, and applications.



Peyman Golshani, M.D., Ph.D., directs a laboratory in the Department of Neurology at the David Geffen School of Medicine at the University of California in Los Angeles. He holds the rank of associate professor in the Department of Neurology at UCLA.

His lab uses cutting-edge electrophysiological, imaging, and optogenetic techniques to study how specific cortical circuits orchestrate attention-based, working memory, and social behaviors, as well as how these circuits malfunction in models of autism and epilepsy. In collaboration with Dr. Alcino Silva, Dr. Baljit Khakh, and Dr. Dejan Markovic, the Golshani lab has built a new generation of open-source miniature microscopes currently used in more than 100 laboratories.

Dr. Golshani received his M.D. and Ph.D. degrees from the University of California at Irvine under Dr. Edward Jones. He completed his neurology residency at UCLA, where he also studied the role of DNA methylation enzymes in brain development and plasticity.

Tomokazu Sato, Ph.D., is a postdoctoral fellow in Prof. Doris Tsao's laboratory at Caltech, where he studies ultrasound neuromodulation from a basic research perspective. Dr. Sato has been studying ultrasonic neuromodulation since 2010 as a research scientist under Dr. William Tyler at Virginia Tech. In collaboration with Prof. Mikhail Shapiro at Caltech, Dr. Sato organized and helped lead efforts for research under the planning phase of the first round of BRAIN Initiative grants. The aim of this project was to understand the multiple mechanisms through which ultrasound can modulate neural activity.



Eva Dyer, Ph.D., is a research scientist at the Rehabilitation Institute of Chicago and in the Department of Physical Medicine and Rehabilitation at Northwestern University.

Her research interests lie at the intersection of machine learning, image analysis, and computational neuroanatomy.

Dr. Dyer completed her undergraduate studies at the University of Miami and her M.S. and Ph.D. at Rice University, all in electrical and computer engineering. She is the recipient of numerous awards, including an



NSF Graduate Research Fellowship, a National Library of Medicine Fellowship in Computational Biology and Medicine, and a Presidential Fellowship from the Rice University George R. Brown School of Engineering.



Charles (Chuck) Blaha, Ph.D., is the associate director of research for the Mayo Clinic Neural Engineering Laboratory and holds the rank of Professor of Neurosurgery.

Dr. Blaha's research interests span basic and clinical research to include the neurobiological bases of autism spectrum disorders and the neurophysiological mechanisms of deep brain stimulation in the treatment of neurological and psychiatric disorders. He has spent more than 30 years developing electrochemistry recording

procedures and sensors.

Prior to joining Mayo Clinic, Dr. Blaha was a distinguished professor in the Department of Psychology at the University of Memphis. He earned his Ph.D. in neurochemistry and neuropharmacology from the University of Oregon.

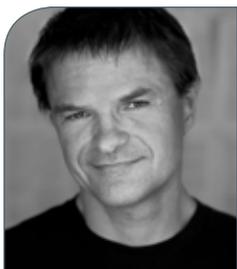


Ute Hochgeschwender, M.D., directs the Bioluminescent Optogenetics Lab at Central Michigan University, where she holds the rank of Associate Professor of Neuroscience and sits on the faculty of the CMU College of Medicine.

Dr. Hochgeschwender's research focuses on exploring the effects of optogenetically manipulated neural activity at the molecular, cellular, and behavioral levels through a wide range of approaches and technologies, including molecular engineering,

genetic engineering of model organisms, viral vector generation, in vitro multielectrode recordings, in vivo imaging, and behavioral analysis. Her team studies neuronal activity related to psychiatric disorders, neurodegenerative diseases, and injured circuits.

Prior to joining the CMU faculty, Dr. Hochgeschwender held faculty positions at Duke University, where she was the director of the Duke Neurotransgenic Laboratory, Mount Sinai Medical School, the National Institute of Mental Health, and the Oklahoma Medical Research Foundation. She received her M.D. from the Free University in Berlin and completed postdoctoral training in molecular and cellular immunology and molecular neuroscience.



Stephen Cowen, Ph.D., is a researcher in the Evelyn F. McKnight Brain Institute at the University of Arizona, where he holds the rank of assistant professor in the Department of Psychology.

His laboratory seeks to identify the role that neural circuits and neuromodulation play in regulating the coordination of interconnected neurons during learning and decision making by the experimental measurement of neuron activity and dopamine release in rodent models. Much of Dr. Cowen's research involves

the investigation of Parkinson's Disease, epilepsy, and age-associated memory impairment.

Through a collaboration with Dr. Michael Heien's lab, Dr. Cowen's team has developed new instrumentation for the simultaneous measurement of dopamine release and single-unit/local-field activity in awake and behaving rats with a goal of using this tool to investigate the relationship between dopamine release in neural coordination during learning and sleep.

Dr. Cowen earned his Ph.D. in psychology under Dr. Bruce McNaughton at the University of Arizona and completed his postdoctoral training at the Neurosciences Institute in San Diego.

Speaker Biographies





Cynthia (Cindy) Chestek, Ph.D., leads the Cortical Neural Prosthetics Laboratory at the University of Michigan at Ann Arbor, where her team seeks to develop clinically viable systems that allow paralyzed patients to control prosthetic limbs as well as their own limbs using functional electrical stimulation and assistive exoskeletons.

Her research interests include high-density interfaces to the nervous system for the control of multiple degree-of-freedom hand and finger movements.

Dr. Chestek received her B.S. and M.S. degrees in electrical engineering from Case Western Reserve University and her Ph.D. in electrical engineering from Stanford University, where she was also a research associate on the Braingate 2 clinical trial in the Stanford Department of Neurosurgery. She holds the rank of assistant professor of biomedical engineering at the University of Michigan, and is the author of 30 full-length peer-reviewed scientific articles.



Shelley Fried, Ph.D., is a principal investigator in the Department of Neurosurgery at Massachusetts General Hospital/Harvard Medical School and a research scientist at the Boston Retinal Implant Project at the Boston VA Medical Center.

His lab is developing novel stimulation strategies for use with retinal prostheses as well as next-generation CNS stimulator technologies. Most recently, his team developed an implantable magnetic micro-coil that can be safely implanted into the cortex and used to selectively target specific subpopulations of cortical neurons.

Dr. Fried received his Ph.D. in vision science from the University of California at Berkeley and completed postdoctoral training at both UC Berkeley and Massachusetts General Hospital. Prior to obtaining his Ph.D., he worked for 12 years in the medical device industry.



Supin Chen, Ph.D., is an engineer in the Center for Micro and Nanotechnology at the Lawrence Livermore National Laboratory. He has been a key contributor on NIH projects for in vivo neural recording and lab-on-a-chip radiotracer synthesizers.

His current work is the application of microfabrication to improve spatial resolution, incorporate new materials, and add fluidic and optical functionalities to flexible neural probes. Dr. Chen has also worked on developing processes to increase the lifetime and interconnect density of human-use neural implants.

Dr. Chen received his Ph.D. in bioengineering from the University of California at Los Angeles.



Greg Worrell, M.D., Ph.D., is the director of the Systems and Electrophysiology Laboratory in the Mayo Clinic Department of Neurology, where he is also vice chair of neurology research.

Dr. Worrell's clinical practice and research focus on the evaluation and care of patients with drug-resistant epilepsy using neurophysiology, computational neuroscience, and neuroengineering. He is currently seeking to integrate large-scale neurophysiology, computing, and imaging approaches for the discovery of epilepsy biomarkers. His team has ongoing clinical trials investigating brain mapping, therapeutic brain stimulation, and seizure forecasting.



Dr. Worrell earned his Ph.D. in physics from Case Western Reserve University and his M.D. from the University of Texas Medical Branch. He completed his residency in Neurology at the Mayo Clinic.



Eugenia (Jania) Trushina, Ph.D., is the director of the Mitochondrial Neurobiology and Therapeutic Lab in the Mayo Clinic Department of Neurology. She holds the rank of associate professor in the Department of Neurology and the Department of Molecular Pharmacology and Experimental Therapeutics.

Her laboratory's research studies the role of mitochondrial dynamics and function and cellular metabolism play in health and disease, specifically, in neurodegenerative processes related to Huntington's Disease, Alzheimer's Disease, Parkinson's Disease, chemotherapy-induced peripheral neuropathy, multiple sclerosis, and toxin-induced neurodegeneration.

Dr. Trushina's team has developed novel cellular and molecular techniques, including methods to monitor mitochondrial behavior in neurons and brain tissue from transgenic animals and in cerebrospinal fluid, plasma, fibroblasts, and small molecule mitochondria-targeting therapeutics, which are now in preclinical characterization.



J. Luis Luján, Ph.D., is an associate consultant in the Neural Engineering Laboratory at Mayo Clinic. He holds the rank of assistant professor in the Department of Neurologic Surgery and the Department of Physiology and Biomedical Engineering.

Dr. Luján's research studies novel, patient-specific neuromodulation techniques for restoring motor and psychiatric function following neural injury and disease through developing computational and mathematical techniques to analyze the effects of deep brain stimulation, improving the clinical outcomes of neuromodulation technology, and developing novel neuromodulation control paradigms based on machine learning techniques.

Dr. Luján received his B.S. in computer and systems engineering from the Universidad Autonoma de Chihuahua in Mexico and his M.S. and Ph.D. in biomedical engineering from Case Western Reserve University. He completed postdoctoral training at the Cleveland Clinic.



Shigao Chen, Ph.D., is an associate consultant in the Mayo Clinic Department of Radiology and Department of Physiology and Biomedical Engineering. He holds the rank of associate professor of biomedical engineering and directs the Ultrasound Research Lab.

His research program focuses on developing innovative ultrasound solutions to meet critical clinical needs and translating those technologies from bench to bedside. Technologies developed by Dr. Chen and his colleagues have been licensed to leading ultrasound companies, implemented on clinical ultrasound scanners, and used to benefit patients around the world.

Dr. Chen received his B.S. and M.S. in biomedical engineering and his B.B.A. from Tsinghua University in China and his Ph.D. in biomedical sciences from the Mayo Graduate School. He has served on multiple NIH study sections, journal review boards, and society committees.

Dekel Rosenfeld, Ph.D., is a postdoctoral associate in the Bioelectronics Group of





Prof. Polina Anikeeva at MIT's Department of Materials Science and Engineering and Research Laboratory of Electronics.

Dr. Rosenfeld's research focuses on deep-tissue neuromodulation using magnetic nanoparticles. She is working on developing a minimally invasive, injectable platform based on the application of alternating magnetic fields to magnetic nanoparticles with the goal of enabling multi-organ neuromodulation at micrometer precision without the need for implants.

Dr. Rosenfeld earned her Ph.D. in biomedical engineering from the Technion – Israel Institute of Technology, where she studied mechanical stimulation of cell behavior, including stem cell differentiation and 3D vessel networks.



Ayse Gunduz, Ph.D., is the director of the Brain Mapping Laboratory in the Department of Biomedical Engineering at the University of Florida, where she holds the rank of assistant professor.

Her research interests include neural interfacing, neural signal processing, neuromodulation, and neurological disorders, as well as cortical and deep brain stimulation in humans.

Dr. Gunduz earned her B.S., M.S., and Ph.D. degrees in electrical engineering from the Middle East Technical University in Ankara, Turkey; North Carolina State University, and the University of Florida, respectively. She completed postdoctoral training at the Albany Medical College Department of Neurology and in the Division of Translational Medicine at the Wadsworth Center of the New York State Department of Health.



Russell (Russ) Witte, Ph.D., leads the Experimental Ultrasound and Neural Imaging Laboratory at the University of Arizona Cancer Center, where he holds the rank of associate professor in medical imaging, biomedical engineering, and optical sciences.

His laboratory devises hybrid imaging and contrast mechanisms that combine light, ultrasound, and radiofrequencies to address clinical challenges for a wide variety of medical disorders, including epilepsy, arrhythmias, tendinopathy, and cancer.

Dr. Witte received his B.S. in physics from the University of Arizona and his Ph.D. in bioengineering from Arizona State University, where his doctoral thesis involved the use of chronic microelectrode arrays in the auditory cortex to study sensory coding and learning-induced plasticity in awake, behaving animals. Dr. Witte completed postdoctoral training at the University of Michigan. He recently started a medical device company, ElectroSonix, to facilitate the development and translation of his lab's technologies.



Phillip (Phil) Troyk, Ph.D., is a professor in the Department of Biomedical Engineering at the Illinois Institute of Technology, where he is also an associate dean of the Armour College of Engineering, as well as a faculty associate in the Department of Neurosurgery at the University of Chicago.

Dr. Troyk has broad research interests that include cortical and retinal visual prostheses, implantable EMG sensors, functional electrical stimulation systems, implantable neural prostheses, bioelectronic medicine, smart sensors, RFID, biotelemetry, application-specific integrated circuit design, and implantable electronics packaging.

Speaker Biographies



Dr. Troyk leads the BRAIN Initiative Intracortical Visual Prosthesis team, which is currently working toward a clinical trial of the ICVP system. He is also founder and CEO of SIgenics, Inc., a custom electronics company designing ASICs for commercial application and research neuroprosthetic systems. He received his B.S. in electrical engineering from the University of Illinois at Urbana-Champaign and his M.S. and Ph.D. in bioengineering from the University of Illinois at Chicago.



Vamsi Ithapu is a sixth-year graduate student in computer science at the University of Wisconsin in Madison. His primary interest is the application of machine learning to medical research, especially learning problems in the areas of computer vision, applied statistics, and deep learning.

In the labs of Prof. Vikas Singh and Prof. Sterling Johnson of the University of Wisconsin School of Medicine's Alzheimer's Disease Research Center, Mr. Ithapu has developed multiple algorithms as part of computational toolboxes for neuroimaging and prospective clinical trials.



Kip Ludwig, Ph.D., is the associate director of technology for the Mayo Clinic Neural Engineering Laboratory as well as the director of the Bioelectronic Medicine Lab under the NEL.

Prior to joining Mayo Clinic, Dr. Ludwig was the program director for neural engineering at the National Institute of Neurological Disorders and Stroke, where he served as a leader for multiple initiatives and programs, including the NINDS Translational Devices Program, an NIH BRAIN Project Team, and the trans-NIH planning team responsible for developing and initial execution of the SPARC program.

Dr. Ludwig earned his M.S. and Ph.D. in biomedical engineering from the University of Michigan.



Nicholas (Nick) Langhals, Ph.D., is the program director for neural engineering at the National Institute of Neurological Disorders and Stroke, where he is heavily involved in the BRAIN Initiative as well as the SPARC (Stimulating Peripheral Activity to Relieve Conditions) program.

Prior to joining the NIH, Dr. Langhals was the co-director of the Neuromuscular Lab and an assistant professor in plastic surgery and biomedical engineering at the University of Michigan, where his team developed a regenerative peripheral nerve interface to extract prosthetic control signals and restore lost sensation to amputees for control of upper and lower limb prostheses. Dr. Langhals has also worked as a senior research engineer for the Center for Neural Communication Technology and as a consultant for NeuroNexus Technologies, Biotectix, and Michigan State University. He co-founded Rhythm Solutions, a startup at the University of Michigan that develops and commercializes automated algorithms and technologies to diagnose and monitor atrial fibrillation.

Dr. Langhals received his B.S.E. from Arizona State University and his M.S.E. and Ph.D. in biomedical engineering from the University of Michigan at Ann Arbor.



Gene Civillico, Ph.D., is the program manager for the SPARC (Stimulating Peripheral Activity to Relieve Conditions) program of the NIH Common Fund. SPARC funds teams using the latest anatomical, physiological, and computational methods, including promising advances funded by the BRAIN Initiative, to advance understanding of the neural control of select organ function. The program's goal is to lay the mechanistic foundation for a new generation of therapeutic closed-loop neuromodulation devices and protocols.

Speaker Biographies



Dr. Civillico earned his Ph.D. in neuroscience from the University of Pennsylvania and completed postdoctoral training in cerebellar physiology and two-photon microscopy techniques at the Princeton Neuroscience Institute. He has conducted research or managed research portfolios at Otsuka Maryland and the FDA Center for Devices and Radiological Health.



Douglas (Doug) Weber, Ph.D., is a program manager in the Biological Technologies Office at the Defense Advanced Research Projects Agency, and an associate professor of bioengineering at the University of Pittsburgh.

Dr. Weber manages a DARPA research portfolio that blends fundamental neuroscience with advanced biotechnology development, including the HAPTIX, ElectRX, and TNT programs.

Dr. Weber received his B.S. in biomedical engineering from the Milwaukee School of Engineering and his M.S. and Ph.D. in bioengineering from Arizona State University. He completed postdoctoral work at the Centre for Neuroscience at the University of Alberta. He is a Senior Member of IEEE.



Kristen Bowsher, Ph.D., has worked as a scientific reviewer in the Office of Device Evaluation at the FDA Center for Devices and Radiological Health for over 20 years reviewing neurological and physical medicine devices.

Dr. Bowsher is an expert in neurostimulation and brain-to-computer interface devices and has been active in enhancing the transparency of the FDA review process for neurological devices and in helping medical device sponsors navigate the

regulatory landscape.

Prior to the FDA, she received her B.S. in electrical engineering from the University of Massachusetts and her M.S. and Ph.D. in biomedical engineering from the University of Virginia.



Greg Gage, Ph.D., is the co-founder and CEO of Backyard Brains, a company he started with his labmate Tim Marzullo while a graduate student in the University of Michigan Neural Engineering Lab. He is a published neuroscientist and engineer who develops tools, curriculum, and experiments that allow hands-on participation in neural discovery for the general public.

Dr. Gage is a senior fellow at TED and has been recognized at NIH with a director's innovation award and at the White House for his commitment to citizen science. He earned his B.S. in electrical and computer engineering from Michigan State University, his M.S. in electrical engineering from the University of South Carolina, and his Ph.D. in biomedical engineering from the University of Michigan.



Norbert Myslinski, Ph.D., is a neuroscientist at the University of Maryland and the founder of the International Brain Bee, a neuroscience competition for high school students with 200 chapters in 40 countries, and the International Youth Neuroscience Association.

Dr. Myslinski's interest is in neuroscience education both for professionals and non-professionals. He has created, directed, or taught 40 courses to 25,000 nursing, dental, graduate, undergraduate, high school, and elementary students, including students in prisons and special schools. His courses have also been delivered via virtual reality, long-distance education, and online learning.



Dr. Myslinski received his Ph.D. in neuropharmacology from the University of Illinois and completed postdoctoral training in neurochemistry at Tufts University. He also trained in sensory neurophysiology at Bristol University, in cognitive neuroscience at Harvard, and in journalism at Johns Hopkins University.



Eric Chudler, Ph.D., is a research neuroscientist and associate professor in the Department of Bioengineering at the University of Washington, where he is the executive and education director for the Center for Sensorimotor Neural Engineering. He holds faculty appointments in the UW Department of Anesthesiology and Pain Medicine and in the UW Graduate Program in Neuroscience.

In addition to his basic research, which focuses on how the brain processes information about pain and nociception, he works with other neuroscientists and classroom teachers to develop educational materials for teaching K-12 students about the brain.

Dr. Chudler has also worked at the NIH and in the Department of Neurosurgery at Massachusetts General Hospital. He received his Ph.D. from the University of Washington.



Paul Radensky, M.D., J.D., is a partner in the law firm of McDermott, Will & Emery and a principal of McDermott+Consulting. He is an expert on Medicare law and policy as well as a full range of legal, regulatory, and reimbursement issues in the pharmaceutical, biotechnology, medical device, and clinical laboratory development and marketing fields.

At McDermott+Consulting, Dr. Radensky helps his clients navigate the federal legislative and regulatory process related to Medicare coverage, coding, reimbursement, and compliance, as well as regulatory and promotional compliance matters with the FDA.

Dr. Radensky earned his M.D. from the University of Pennsylvania and his J.D. from Harvard Law School.



Alaine Westra is the director of benefactor engagement in the Mayo Clinic Department of Development. Prior to this role, she has worked at Mayo Clinic as a development administrator, communications consultant, and event manager.

Ms. Westra earned her B.A. from the University of Wisconsin at Eau Claire and her M.B.A. from Saint Mary's University. She sits on the board for the Children's Museum of Minnesota in Rochester, the Leadership Greater Rochester Executive Board, and the Civic League Day Nursery board of directors.

Speaker Biographies





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