



# New Tools, New Hope: The Modern Face of Psychiatry

#### November 9, 2018 Weill Cornell Medicine | New York City





Sanford I. "Sandy" Weill and Joan Weill

# Welcome to the symposium!

It is with great pleasure that we invite you to the 2018 UCSF Weill Institute for Neurosciences Symposium, hosted by Weill Cornell Medicine. Bringing together neuroscientists from Weill Cornell Medicine and the University of California, San Francisco, this symposium will examine the current landscape of psychiatry-related neuroscience research, highlighting recent advances and discussing key challenges facing the field.

#### Schedule of Events

- 9:00AM Welcome & Opening Remarks Dean Augustine M.K. Choi, MD; Sandy & Joan Weill
- 9:10AM Current State of Psychiatry Francis Lee, MD, PhD & Matthew State, MD, PhD
- 9:20AM Neuronal Cell Biology

**Timothy Ryan, PhD** Metabolic Vulnerability of Your Brain's Communication System

Mark von Zastrow, MD, PhD The Cellular Landscape of Neuromodulation: New Therapeutic Opportunities

10:05AM Neuronal Circuits

Vikaas Sohal, MD, PhD Rhythms in the Human Brain That Encode Real-Time Changes in Mood

**Conor Liston, MD, PhD** Sustained Rescue of Prefrontal Circuit Dysfunction by Antidepressant-Induced Synapse Formation

10:50AM Break

11:00AM **Neuronal Circuits** (continued)

Lisa Gunaydin, PhD Fronto-Striatal Control of Approach-Avoidance Behavior

Joshua Levitz, PhD Optical Interrogation of Synaptic G Protein-Coupled Receptors

Mazen Kheirbek, PhD Hippocampal Circuits Supporting Emotional Behavior

#### 12:30PM Lunch Break (lunch provided)

#### 1:30PM Autism Spectrum Disorders

Rebecca Jones, PhD, MPhil The Social Brain in Autism

**So Hyun "Sophy" Kim, PhD** Charting the Symptom and Developmental Trajectories of Autism in Early Childhood: Clinical and Research Implications

Stephan Sanders, BMBS, PhD Genomic Insights into Autism Spectrum Disorder

Jeremy Willsey, PhD The Psychiatric Cell Map Initiative: Identifying Convergent Functional Pathways in Neuropsychiatric Disorders

**Eirene Markenscoff-Papadimitriou, PhD** Chromatin Regulation in Cortical Development and Autism Spectrum Disorder

Helen Willsey, PhD Identifying Phenotypic Convergence Among Autism Risk Genes Using CRISPR in Frogs

3:45PM Closing Remarks Costantino ladecola, MD & Stephen Hauser, MD

4:00PM Reception

### Meet the Moderators



#### Francis Lee, MD, PhD

Francis Lee, MD, PhD, is the Mortimer D. Sackler MD Professor, Chair of the Department of Psychiatry at Weill Cornell Medicine and Psychiatrist-in-Chief at NewYork-Presbyterian/Weill Cornell Medical Center. His research has focused on connecting molecular neuroscience with psychiatry through mechanistic

studies of how growth and plasticity factors, such as BDNF and endocannabinoids, contribute to the pathophysiology and treatment of anxiety disorders. He and his collaborators at the Sackler Institute for Developmental Psychobiology have pioneered vertically integrated research strategies to perform parallel genetic mouse model studies with human behavioral and neuroimaging studies to identify how individual variation contributes to risk and resilience for mental illness. He has received numerous honors including the Presidential Early Career Award for Scientists and Engineers, the Burroughs Wellcome Clinical Scientist Award, the Siegel Family Award for Outstanding Medical Research, and election to the National Academy of Medicine.



#### Matthew State, MD, PhD

Matthew State MD, PhD, is the Oberndorf Family Distinguished Professor of Psychiatry, Chair of the Department of Psychiatry, President of the Langley Porter Psychiatric Institute, and member of the UCSF Weill Institute for Neurosciences at the University of California, San Francisco. He is a board certified child

and adolescent psychiatrist and human geneticist. Over the past 15 years, his laboratory has played a leading role in elaborating the contribution of rare and de novo mutations to the etiology of autism spectrum and Tourette disorders. He has been the recipient of numerous awards, including the Tarjan Award from the American Academy of Child and Adolescent Psychiatry, the Ruane Prize from the Brain and Behavior Research Foundation and the Sarnat International Prize in Mental Health from the US National Academy of Medicine. He and was elected to membership in the National Academy of Medicine (NAM) in 2013.



### Timothy Ryan, PhD

Timothy Ryan, PhD, is a Rockefeller/Sloan-Kettering/Cornell Tri-Institutional Professor and an HHMI Senior Fellow at the Janelia Research Campus. He is an internationally acclaimed neuroscientist focused on the molecular basis of synaptic function. Dr. Ryan's recent research focuses on understanding the molecular basis for the brain's metabolic vulnerability by deciphering the energetic costs to sustain synaptic transmission and the biochemical pathways used to regulate this process.

Dr. Ryan received a bachelor's degree in physics in 1981 from McGill University in Montreal, Canada and a doctorate in physics in 1989 from Cornell University. He completed postdoctoral training at Stanford University Medical School in Palo Alto, California. In 1997, he joined the faculty of Weill Cornell Medicine and became a tenured Tri-institutional Professor of Biochemistry in 2005.

Dr. Ryan has published more than 100 studies in leading scientific journals, such as Nature, Cell, Science, Neuron, Nature Neuroscience, eLife and PNAS (Proceedings of the National Academy of Sciences of the United States of America). Dr. Ryan was an Alfred P. Sloan Fellow in Neuroscience, was twice awarded the McKnight Endowment for Neuroscience Technological Innovation in Neuroscience Award, the Siegel Family Award for Outstanding Medical Research and The Javits Neuroscience Investigator award from the National Institute of Neurological Disorders and Stroke. Dr. Ryan is a member of the editorial Boards of the Journal of Biological Chemistry and The Journal of General Physiology and currently serves as the chair of the Board of Scientific Counselors for NINDS. Dr. Ryan is a frequent peer reviewer for leading scientific journals, has given over 200 invited lectures world-wide and serves on the scientific advisory boards at several institutes and research consortia.



#### Mark von Zastrow, MD, PhD

Mark von Zastrow, MD, PhD, is a physician–scientist with primary professional commitment to laboratory research into the cellular basis of neural signaling, brain disease, neuropsychiatric drug action and addiction. His lab focuses on the interface between molecular pharmacology, membrane cell biology and cellular signaling.

Dr. von Zastrow received a bachelor's degree in biochemistry from Cornell University in 1980. He received a PhD in cell biology, as well as an MD from Yale University in 1987. Dr. von Zastrow completed his residency in Psychiatry at Stanford University Medical Center as well as his postdoctoral research in the Pritzker Laboratory followed by the Department of Molecular & Cellular Physiology and Howard Hughes Medical Institute at Stanford University School of Medicine. Dr. von Zastrow joined UCSF in 1994 in the Departments of Psychiatry and Cellular & Molecular Pharmacology (joint), and became the Friends of Langley Porter Endowed Chair for Psychiatric Research in 2005.

Dr. von Zastrow has received top prizes at every stage of his academic training, including the NARSAD Young Investigator Award and NIH Scientific Development Award in 1994, as well the Presidential Early Career Award for Scientists and Engineers (PECASE) and Killam Award/Syntex prize for Outstanding Discovery in Molecular Pharmacology in 1999. In 2011, Dr. von Zastrow was elected as a member to the National Academy of Medicine (formerly IOM). More recently, Dr. von Zastrow received the Royer Award for Academic Excellence in Neurology and Psychiatry (2014) and the Weill Investigator Award in Neuroscience (2017).



### Vikaas Sohal, MD, PhD

Vikaas Sohal, MD, PhD, is a psychiatrist and neuroscientist. His laboratory combines new experimental technologies with mathematical and computational approaches, in order to understand how brain circuits generate complex patterns of activity, such as brain rhythms. These patterns of brain activity are believed to play key roles in normal cognition, but go awry in disorders such as schizophrenia, autism, and epilepsy. The goal of his research is to identify new ways of treating these disorders by restoring normal patterns of circuit activity.

Dr. Sohal received his undergraduate degree in applied mathematics summa cum laude from Harvard University in 1997. He then received a master's degree in mathematics with distinction from the University of Cambridge in 1998, before completing his MD/PhD degrees at Stanford University in 2005. He stayed at Stanford for a psychiatry residency and postdoctoral training before joining the UCSF faculty in 2010. He is currently co-director of the Sloan-Swartz Center for Theoretical Neurobiology at UCSF, and also holds leadership positions in the Neuroscience Graduate Program and Department of Psychiatry.

Dr. Sohal has published more than 50 papers in journals including Nature, Cell, Neuron and Nature Neuroscience. One of his papers has been cited more than 1,500 times, and was selected as one of the 40 most seminal papers in modern neuroscience by Trends in Neuroscience. He has won the NIH Director's New Innovator Award, Krieg Cortical Explorer award, Alfred P. Sloan Research Fellowship, and received an Honorable Mention for the Frank and Brennie Morgan prize in mathematical research.



### Conor Liston, MD, PhD

Conor Liston, MD, PhD, is an Assistant Professor of Neuroscience and Psychiatry in the Feil Family Brain and Mind Research Institute and the Department of Psychiatry at Weill Cornell Medicine. The long-term goal of his research program is to define mechanisms by which prefrontal cortical brain circuits support learning, memory, and motivation, and to understand how these functions are disrupted in depression, addictions, and other stress-related psychiatric disorders. His lab integrates optogenetic tools and genetically encoded calcium indicators with two-photon imaging and functional MRI, and they are actively developing new methods for quantifying prefrontal cortical microcircuit dynamics in genetically defined neuronal subtypes. They are also developing novel neuroimaging tools for informing psychiatric diagnosis in human populations and predicting treatment response to transcranial magnetic stimulation (TMS) and other neurostimulatory antidepressant interventions.

Dr. Liston graduated summa cum laude from Harvard College in 1998, and received doctorate and medical degrees from The Rockefeller University and Weill Cornell Medicine in 2007 and 2008, respectively, where he was supported by a Paul and Daisy Soros Fellowship for New Americans. He subsequently completed his residency in psychiatry at NewYork–Presbyterian Hospital and postdoctoral training at Stanford University. He returned to Weill Cornell Medicine as an Assistant Professor in 2014. His research has been recognized with awards from the Klingenstein-Simons Foundation Fund, the Rita Allen Foundation, the Dana Foundation, the Doris Duke Charitable Foundation, and the One Mind Institute. Dr. Liston is also a clinically active psychiatrist specializing in the management of treatment-resistant mood disorders.



## Lisa Gunaydin, PhD

Lisa Gunaydin, PhD, is an Assistant Professor in the Department of Psychiatry and Institute for Neurodegenerative Diseases at UCSF. Dr. Gunaydin's laboratory studies how the prefrontal cortex regulates subcortical brain areas involved in emotional behavior. Her research is focused on understanding neural circuit mechanisms underlying avoidance behaviors and how they go awry in anxiety disorders, with the goal of eventually leading to novel and more targeted treatment approaches.

Dr. Gunaydin received a bachelor's degree in biology from Swarthmore College and her doctorate in neuroscience from Stanford University, where she developed and applied a variety of novel optogenetic techniques to dissect neural circuitry underlying complex mammalian behaviors. She completed postdoctoral training at the Gladstone Institute of Neurological Disease and joined UCSF as a faculty member in May 2016. She is a member of the UCSF Weill Institute for Neurosciences, Neuroscience Graduate Program, and Kavli Institute for Fundamental Neuroscience.

Dr. Gunaydin has published her work in prestigious journals such as Cell, Nature, and Nature Neuroscience. In 2017 she was named a Chan Zuckerberg Biohub Investigator and recipient of the UCSF Weill Neurosciences Innovation Award. In 2018 Dr. Gunaydin received the Excellence in Didactic Teaching Award from the UCSF Psychiatry Residency Program.



### Joshua Levitz, PhD

Joshua Levitz, PhD, is an Assistant Professor in the Department of Biochemistry at Weill Cornell Medicine. Dr. Levitz's research focuses on deciphering the biophysical and neurophysiological mechanisms of G protein-coupled receptors and their associated signaling proteins.

Dr. Levitz received dual Bachelor of Science degrees in biology and physics from American University in 2009 and a PhD in biophysics from the University of California, Berkeley in 2014. He completed postdoctoral training at the University of California, Berkeley and joined Weill Cornell Medicine as a faculty member in 2016. Dr. Levitz has published more than 20 studies in leading scientific journals, such as Nature, Nature Neuroscience, Neuron, Cell, JACS and PNAS. Dr. Levitz was the recipient of the Nemko Prize in Cellular and Molecular Neuroscience from the Society for Neuroscience in 2015.



### Mazen Kheirbek, PhD

Mazen Kheirbek, PhD, is an Assistant Professor in the Department of Psychiatry at the University of California, San Francisco and a member of the UCSF Weill Institute for Neurosciences, Neuroscience Graduate Program, Kavli Institute for Fundamental Neuroscience, and Center for Integrative Neuroscience at UCSF. The primary focus of his laboratory is to understand the circuits that generate emotional behavior, with a particular interest in those circuits that are disrupted in mood and anxiety disorders. For this, his group employs a number of techniques to dissect these circuits in mouse models, including electrophysiology, viral tracing, high resolution functional imaging, and optogenetic manipulation in vivo. Dr. Kheirbek's research has focused on how the hippocampus encodes emotionally relevant information. His work has provided insight into how the dentate gyrus (and adult neurogenesis in this structure) discriminates between similar experiences, and how the ventral hippocampus and its projection targets modulate mood and anxiety-related behavior.

Dr. Kheirbek received his undergraduate degree from Washington University in St. Louis, his PhD in neurobiology from the University of Chicago, and did his postdoctoral study at Columbia University. In 2016, he moved to UCSF as an Assistant Professor in the Department of Psychiatry. Dr. Kheirbek has received a number of awards for his research, including the Ginsberg Memorial Prize for his graduate work, the Freedman Prize Honorable Mention from the Brain and Behavior Research Foundation, a Weill Scholar Award, and a Rising Star Award from the One Mind Institute.



#### Rebecca Jones, PhD, MPhil

Rebecca Jones, PhD, MPhil, a neuroscientist known for her groundbreaking interdisciplinary autism research, is an Assistant Professor at the Center for Autism and the Developing Brain and the Sackler Institute for Developmental Psychobiology at Weill Cornell Medicine. Dr. Jones' research focuses on the development of the social brain. She uses computational, behavioral, and neuroimaging methods as well as mobile technologies to discover how social behavior develops and can be disrupted in those with autism, with the goal of informing how to target interventions for clinical disorders of social behavior.

Dr. Jones received a bachelor's degree in psychology from Princeton University in 2005, her MPhil in psychiatry from the University of Cambridge in 2006, and her PhD in neuroscience from Weill Cornell Graduate School of Medical Sciences in 2011. She completed a postdoctoral fellowship at the Center for Autism and the Developing Brain. Rebecca joined the Department of Psychiatry faculty in 2015.

Even as an early-career investigator, Dr. Jones has published more than two dozen papers in high impact journals. She has received numerous awards including the Gates Cambridge Scholarship, the Rising Star Award from the Association for Psychological Science, and the Women in Technology Award from the Westchester County Association for her innovative research using mobile technologies. She received the Christine Mirzayan Science and Technology Fellowship at the National Academies of Science, and has received funding from the Department of Defense, Autism Speaks, the Simons Foundation, and the Leon Levy Foundation.



## So Hyun "Sophy" Kim, PhD

So Hyun "Sophy" Kim, PhD, is an Assistant Professor at the Center for Autism and the Developing Brain at Weill Cornell Medicine. Dr. Kim is a clinical researcher with an extensive background in identification of early behavioral phenotypes and examining developmental trajectories of children with autism spectrum disorder (ASD). Dr. Kim has developed a new language assessment tool, the Observation of Spontaneous Expressive Language (OSEL), which is now undergoing a national norm based on a partnership with the publisher, WPS. She has also led the development of the new treatment outcome measure for ASD, the Brief Observation of Social Communication Change (BOSCC) in collaboration with Dr. Catherine Lord. Currently, she is a PI of a NIMH funded project designed to examine the mechanisms of early, parent-mediated interventions for toddlers with ASD (1R01MH114925-01). Most recently, Dr. Kim has led efforts to examine school readiness in kindergarteners with ASD while integrating behavioral and electrophysiological (ERP/EEG) methods, with a particular focus on executive function.

Dr. Kim received a bachelor's degree in psychology in 2007 from Ewha University in Seoul, South Korea and a PhD in clinical psychology in 2012 from University of Michigan. She completed postdoctoral training at Yale University Child Study Center in 2014 and remained as an Associate Research Scientist before she joined the Center for Autism and the Developing Brain at Weill Cornell Medicine as an assistant professor in May 2016.

Dr. Kim has published her studies in leading psychology, psychiatry, and pediatric journals, such as Journal of the American Academy of Child and Adolescent Psychiatry, Journal of Child Psychology and Psychiatry, and Journal of Pediatrics. Her recent manuscript has been featured as one of the Top Ten Autism Studies of 2017 by Autism Speaks. Dr. Kim is also the recipient of the Kellen Junior Faculty Fellowship at Weill Cornell Medicine. Dr. Kim is also a licensed clinical psychologist and a certified trainer of gold standard diagnostic and treatment outcome instruments for ASD, such as ADOS, ADI-R, and BOSCC.



#### Stephan Sanders, BMBS, PhD

Stephan Sanders, BMBS, PhD, is a geneticist, bioinformatician and pediatrician known for his work on the genetics of childhood developmental disorders, especially autism spectrum disorder (ASD). He is an Assistant Professor in the Department of Psychiatry at UCSF and the director of the Psychiatry Department Bioinformatics Core. Dr. Sanders' research focuses on identifying genetic variants that cause ASD, using these variants to identify specific genes and genetic loci and investigating the mechanisms by which these genes and loci lead to ASD with the view to developing therapeutic interventions.

Dr. Sanders received a Bachelor of Medical Science degree in 2003 and a Bachelor of Medicine and Bachelor of Surgery (BMBS, equivalent of an MD in the United States) in 2005 from Nottingham University in the United Kingdom (UK). After working as a pediatrician in the UK, he began his postdoctoral training at Yale University School of Medicine in 2008, under the supervision of Dr. Matthew State, and completed a doctorate in genetics in 2014, with the same supervisor. He joined the UCSF Department of Psychiatry as an assistant professor-in-residence in 2015.

Dr. Sanders has published more than 80 studies in leading scientific journals, including Nature, Science, Cell, Nature Genetics, Neuron and Nature Neuroscience. Several of these studies have been recognized as being the most impactful papers in ASD research by Autism Speaks and the Simons Foundation Autism Research Initiative. He has received the Howard Hughes Medical Institute International Student Research Fellowship and the NARSAD Young Investigator Award, along with being the inaugural recipient of the UCSF Weill Neurosciences Innovation Award. Dr. Sanders is a member of the Journal of Neurodevelopmental Disorders Editorial Board and is an ad-hoc reviewer of 18 peer-reviewed journals. Dr. Sanders also serves on the review panels for government and private grant agencies, including the National Institutes of Health.



## Jeremy Willsey, PhD

Jeremy Willsey, PhD, is an Assistant Professor in the Institute for Neurodegenerative Diseases and the Department of Psychiatry at the UCSF Weill Institute for Neurosciences. Dr. Willsey is a co-director of the Psychiatric Cell Map Initiative at UCSF (PCMI). He is also a PI and member of the executive steering committee of the TIC Genetics consortium, as well as a PI and member of the PsychENCODE consortium. Dr. Willsey's research aims to elucidate the biology underlying neurodevelopmental and neurodegenerative disorders, with the goal of a clinically actionable understanding. His group focuses on two areas. First, gene discovery, as genes are the puzzle pieces needed to advance our understanding. Second, systems biological approaches that assemble these puzzle pieces into testable hypotheses.

Dr. Willsey received a bachelor's degree in molecular biology and biochemistry in 2010 from Simon Fraser University in British Columbia, Canada, where he received the Dean's Medal. He next received a PhD in genetics in 2014 from Yale University, securing a prestigious pre-doctoral fellowship from the Canadian Institutes of Health Research (CIHR) and the Carolyn Slayman Prize. He completed postdoctoral training at UCSF, receiving a fellowship from the CIHR as the top ranked applicant. Dr. Willsey joined UCSF in 2016 as an assistant professor-in-residence.

Dr. Willsey has published more than 30 peer-reviewed articles in leading scientific journals, including Nature, Cell, Science, Nature Genetics, and Neuron. His pioneering work integrating autism genetics with a map of gene expression from the developing human brain resulted in a paradigm shift in the field and was recognized as one of the top ten advances in autism research by Autism Speaks and as a Notable Paper by the Simons Foundation. Additionally, his work characterizing the contribution of rare genetic variants to Tourette disorder was hailed as one of Neuron's top papers for 2016-2017.



#### Eirene Markenscoff-Papadimitriou, PhD

Eirene Markenscoff-Papadimitriou, PhD, is a postdoctoral scholar in the Department of Psychiatry at the University of California, San Francisco. Dr. Markenscoff-Papadimitriou's research focuses on elucidating the function of chromatin-modifying genes implicated in autism spectrum disorder (ASD).

Dr. Markenscoff-Papadimitriou received a bachelor's degree from Harvard University and a PhD in neuroscience from UCSF. In her doctoral studies on neuronal development she discovered a novel mode of enhancer gene regulation in the mouse olfactory system. As a postdoctoral scholar in the laboratory of Dr. Matthew State, she is studying the function of high confidence ASD genes Pogz and Kmt2c using mouse models. To pinpoint the cell types and gene networks impacted in ASD, she has generated an atlas of the chromatin landscape in the developing mouse and human brain, working collaboratively with the laboratory of Dr. John Rubenstein.



### Helen Willsey, PhD

Helen Willsey, PhD, is a developmental neuroscientist working to understand the molecular mechanisms underlying autism spectrum disorders as a postdoctoral fellow in the laboratory of Dr. Matthew State, at the UCSF Weill Institute for Neurosciences. Dr. Willsey has developed a Xenopus frog model system to understand how autism risk genes function during brain development, and a method to find small molecules that counter these effects. This novel approach provides a path forward for understanding disorders like autism and identifying potential therapeutics in a high-throughput manner.

Dr. Willsey received a bachelor's degree in biology with a concentration in cell and molecular biology and a minor in chemistry from Duke University in 2009. She received a PhD in genetics from Yale University in 2015. Dr. Willsey completed postdoctoral training in frog methods at the University of California, Berkeley and brought this innovative and powerful model system to UCSF in 2016.

Dr. Willsey has received top prizes at every stage of her academic training, including the Edward C. Horn Memorial prize from Duke University in 2009 and the Carolyn Slayman Prize in Genetics from Yale University in 2015. Her new, innovative work modeling the function of autism risk genes has won recognition in the form of 1st place poster prizes at both the 2016 International Xenopus Conference and the 2016 University of California, Berkeley Genetics, Genomics, and Development Division retreat.