Instructors

Kris Blanchard | Institut de la vision, France

As an engineer in molecular biotechnology/neuroscientist, I am very interested in both developing and using new tools and/or processes that can help to solve the biggest problems that we face towards a deeper understanding of the nervous system. I am particularly interested in doing scientific research in the topics of synaptic physiology, human-like brain organoids, optogenetics and the development of an all-optical system for the interrogation of the nervous system. From the beginning of my interest in scientific research I have been performing electrophysiological recordings, and I consider myself an electrophysiologist. I am always improving my technical skills and trying to perform changeling experiments. After years of practicing I have reached the ability to easily get connected pairs of MLIs of the rat cerebellum. I can also patch very small structures like a presynaptic terminal in the axon of MLIs and perform calcium imaging measurements simultaneously. Because I have received a strong background during my undergraduate and doctoral formation, I possess theoretical and experimental experience in Molecular biology, Cellular biology, Biochemistry, Physics, Programming and Data Analysis.

Selected publications:

- *Kris Blanchard, Javier Zorrilla de San Martín, Alain Marty, Isabel Llano, and Federico F. Trigo. (2019). Differentially poised vesicles underlie fast and slow components of release at single synapses. J Gen Physiol. 2020 May 4; 152(5): e201912523. 2. Claudia Acevedo, Kris*
- *Blanchard, Juan Bacigalupo, Cecilia Vergara. (2019). Possible ATP trafficking by ATP-shuttles in the olfactory cilia and glucose transfer across the olfactory mucosa. FEBS Lett. 2019 Mar;593(6):601-610.*

Alexander Dieter | ZMNH, Germany

My name is Alexander Dieter, and I have graduated in 2019 in the lab of Prof. Tobias Moser in Göttingen, Germany, working on optogenetic methods for hearing restoration. Since then I switched fields and am now a Postdoc in the lab of Prof. Simon Wiegert in Hamburg, Germany. Here, my interest is to learn more about learning: Which internal and external factors are contributing to a successful learning process and finally lead to memory formation? I am combining optogenetic, physiological and behavioral approaches to hopefully get one step closer to the answer.

Selected publications:

- *Wrobel C* and Dieter A*, Huet A, Keppeler A, Duque-Afonso C, Vogl C, Hoch G, Jeschke M, Moser T: Optogenetic Stimulation of Cochlear Neurons Activates the Auditory Pathway and Restores Auditory-Driven Behavior in Deaf Adult Gerbils; Science Translational Medicine, 2018, *: equal contribution*
- *Dieter A, Duque-Afonso CJ, Rankovic V, Jeschke M, Moser T: Near physiological spectral selectivity of cochlear optogenetics; Nature Communications, 2019*
- *Dieter A*, Klein E*, Keppeler D, Jablonski L, Harczos T, Hoch G, Rankovic V, Paul O, Jeschke M, Ruther P, Moser T: µLED-based optical cochlear implants for spectrally selective activation of the auditory nerve; EMBO Molecular Medicine, 2020*
- *Keppeler A, Schwaerzle M, Harczos T, Jablonski L, Dieter A, Wolf B, Ayub S, Vogl C, Wrobel C, Hoch G, Abdellatif K, Jeschke M, Rankovic V, Paul O, Ruther P, Moser T: Multichannel optogenetic stimulation of the auditory pathway using microfabricated LED cochlear implants; Science Translational Medicine, 2020*
- *Moser T, Dieter A: Towards optogenetic approaches for hearing restoration; Biochemical and Biophysical Research Communications, 2020*
- *Dieter A, Keppeler D, Moser T: Towards the Optical Cochlear Implant: Optogenetic Approaches for Hearing Restoration; EMBO Molecular Medicine, 2020*
- *Jablonski L, Harczos T, Wolf B, Hoch G, Dieter A, Hessler R, Ayub S, Ruther P Moser, T: Hearing restoration by a low-weight power-efficient multichannel optogenetic cochlear implant system; bioRxiv, 2020 (preprint)*
- *Vierock J, Rodriguez-Rozada S, Pieper F, Dieter A, Bergs A, Zeitzschel N, Ahlbeck J, Sauter K, Gottschalk A, Engel A, Hegemann P, Wiegert S: BiPOLES: a tool for bidirectional dual-color optogenetic control of neurons; bioRxiv, 2020 (preprint)*

Lief Fenno | Stanford University, USA

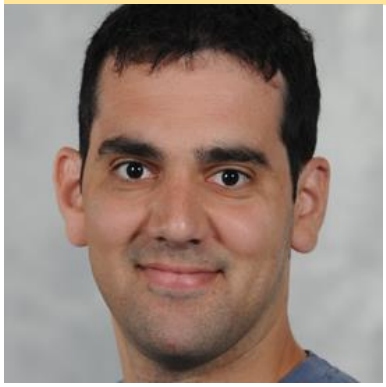
Dr. Fenno is a psychiatrist and Instructor at Stanford University School of Medicine. Leveraging his strengths in neuroscience research and bioengineering, his goal is to design, construct, validate, and apply novel molecular and viral tools to understand the brain in health and disease for the benefit of diverse patient populations. His clinical interests include the treatment of substance use disorders and co-occurring mood disorders. His specific research interests include the development and application of novel optogenetic tools that combine genetically encoded molecules and light to modulate neurons. Dr. Fenno directs a team focused on expanding the use of novel, intersectional viral targeting approaches, with the objective of precisely establishing links between neuron circuitry and behavior. He has patented advances for optically controlled CNS dysfunction and social dysfunction. Dr. Fenno has co-written articles on optogenetic tools and other topics in the journals Annual Review of Neuroscience, Neurobiology of Mental Illness, Molecular Psychiatry, Current Protocols in Neuroscience, Nature, and Cell. He is also the co-author of articles on neural mechanisms of autism spectrum disorder, which have appeared in Science Translational Medicine and Nature. Dr. Fenno has delivered presentations worldwide at events including the meeting of the National Science Foundation NeuroNex Program of Next Generation Networks for Neuroscience. He also has been an invited speaker at the Robarts Research Institute, a Canada-based facility accelerating medical discovery of treatments for

some of the most debilitating diseases of our time, and the Gordon Research Conference on Molecular Pharmacology, an international forum for the presentation of pre-publication frontier research. For his scholarship and teaching achievements, Dr. Fenno has won numerous honors. They include the Laughlin Fellowship from the American College of Psychiatrists, which honors individuals deemed likely to make a significant contribution to the field of psychiatry, and the Humanism and Excellence in Teaching Award from the Arnold P. Gold Foundation, which honors exceptional teaching skills and commitment to the compassionate treatment of patients and families, students, and colleagues. Dr. Fenno is a member of the Society for Neuroscience, The American Medical Association, and the American Society of Addiction Medicine.

Selected publications:

- *Temporally precise in vivo control of intracellular signalling Airan, R. D., Thompson, K. R., Fenno, L. E., Bernstein, H., & Deisseroth, K. (2009). Temporally precise in vivo control of intracellular signalling. NATURE, 458(7241), 1025–29.*
- *Global and local fMRI signals driven by neurons defined optogenetically by type and wiring Lee, J. H., Durand, R., Gradinaru, V., Zhang, F., Goshen, I., Kim, D.-S., … Deisseroth, K. (2010). Global and local fMRI signals driven by neurons defined optogenetically by type and wiring. NATURE, 465(7299), 788–92.*
- *Amygdala circuitry mediating reversible and bidirectional control of anxiety Tye, K. M., Prakash, R., Kim, S.-Y., Fenno, L. E., Grosenick, L., Zarabi, H., … Deisseroth, K. (2011). Amygdala circuitry mediating reversible and bidirectional control of anxiety. NATURE, 471(7338), 358–62.*
- *The Development and Application of Optogenetics Fenno, L., Yizhar, O., & Deisseroth, K. (2011). The Development and Application of Optogenetics. ANNUAL REVIEW OF NEUROSCIENCE, VOL 34, 34, 389–412.*
- *Optogenetics in Neural Systems Yizhar, O., Fenno, L. E., Davidson, T. J., Mogri, M., & Deisseroth, K. (2011). Optogenetics in Neural Systems. NEURON, 71(1), 9–34.*

Nitzan Geva | Weizmann Institute of science, Israel



PhD student at Yaniv Ziv's lab at the Weizmann Institute, where I also competed my MsC. In my studies I examine the factors that effect the dynamics of hippocampal population activity. Specifically, I use chronic calcium microscopy to investigate the interactions of time and experience on hippocampal activity dynamics. I am a father of 2 (+ a dog), live in Rehovot, and grow some vegetables in by balcony.

Nikolas Karalis | Friedrich Miescher Institute of Basel, Switzerland

Nikolas Karalis studies for his B.Sc./M.Sc. in Applied Mathematics and Physics at the National Technical University of Athens (NTUA). He joined the Neurasmus Joint Master in Neuroscience and moved to Charité, Berlin and University of Bordeaux II, to study Medical Neuroscience and Neuropsychopharmacology. There he worked in the lab of Dr. Cyril Herry, where he focused on the neuronal circuits of fear learning and expression, identifying novel mechanisms underlying the interaction between the prefrontal cortex and amygdala during fear. Following his graduation, he pursued the doctoral degree at the Ludwig-Maximilians University Munich, under the supervision of Dr. Anton Sirota, studying the oscillatory architecture of memory circuits. In this work, he identified and characterized the entrainment of the limbic brain regions by breathing, revealing a fundamental mechanism that serves as an oscillatory scaffold underlying the organization of brain activity and enabling the segregation and integration of information flow across neuronal networks. Since 2018 he is an EMBO research fellow in the group of Dr. Andreas Lüthi at the Friedrich Miescher Institute for Biomedical Research in Basel, where he is currently focusing on unraveling the functional logic of the neuromodulatory innervation of amygdala circuits. In his work, he is employing large-scale in vivo electrophysiological recordings and high-dimensional data analysis, paired with fiber photometry recordings and closed-loop optogenetic manipulations in freely behaving and head-fixed mice.

Selected publications:

- *Re-thinking the etiological framework of neurodegeneration. Castillo X, Castro-Obregón S, Gutierrez Becker B, Gutiérrez-Ospina G, Karalis N, Khalil A, López-Noguerola J, Lozano Rodríguez L, Martinez-Martinez E, Perez-Cruz C, Perez-Velazquez J, Pina AL, Rubio K, Salazar García H, Syeda T, Vanoye Carlo A, Villringer A, Winek K, Zille M. Published in : Front. Neurosci., 2019*
- *Breathing coordinates limbic network dynamics underlying memory consolidation. Karalis N, Sirota A. Preprint : bioRxiv, 2018*
- *IgSF9b regulates anxiety behaviors through effects on centromedial amygdala inhibitory synapses. Babaev O, Cruces-Solis H, Chatain C, Hammer M, Wenger S, Ali H, Karalis N, Hoz L, Schlüter O, Yanagawa Y, Ehrenreich H, Taschenberger H, Brose N, Krueger-Burg D. Published in : Nature Communications, 2018*
- *Prefrontal-periaqueductal gray-projecting neurons mediate context fear discrimination. Rozeske R, Jercog D, Karalis N, Chaudun F, Khoder S, Girard D, Winke N, Herry C. Published in : Neuron, 2018*
- *Prefrontal neuronal assemblies temporally control fear behaviour. Dejean C *, Courtin J *, Karalis N *, Chaudun F, Wurtz H, Bienvenu T & Herry C. Published in : Nature, 2016*

Marie Labouesse | ETH Zurich, Switzerland

Marie Labouesse is a postdoctoral researcher at Columbia University in the Department of Psychiatry since 2016. She did her PhD (2012-2016) at ETH Zurich (Switzerland) with Urs Meyer and Wolfgang Langhans investigating brain-metabolism interactions during early postnatal development. A large part of her work focused on the postnatal development of the prefrontal cortex and the influence of environmental factors such as unhealthy nutrition. She collaborated with Pascale Chavis (INMED, Marseille) and found that the reelin protein drives the emergence of cognitive and synaptic deficits in mice fed high fat diets during adolescence. She received the 2016 ETH Medal for Best Doctoral Thesis. She also worked on an independent study with Ulrike Weber-Stadlbauer (University of Zurich) showing that dopamine 2 receptors in the developing striatum promote obesity via altered thermogenic function. In 2016, Marie Labouesse switched gears and joined the lab of Christoph Kellendonk at Columbia University (USA) to work on brain circuits governing motor and reward function in the basal ganglia using advanced in vivo imaging methods, optogenetics and chemogenetics in freely moving animals. She worked in collaboration with Veronica Alvarez (NIH) and local Columbia collaborators looking at the effects of dopamine 2 receptors in driving addictive and reward behavior in the striatum and thalamus. In her main project, she used circuit neuroscience tools to identify a novel striatopallidal subcircuit that drives motor coordination in mice in collaboration with Savio Chan (Northwestern) and Michael Michaelides (NIH). At Columbia she was also the co-founder of the Outreach & Communications committee for postdocs. Throughout her career, Marie supervised 15 students and received fellowship funding from numerous sources including EMBO (2014), the Miller Foundation (2015), the Philippe Foundation (2017, 2018) and the Swiss National Science Foundation (SNSF) (2016, 2018, 2020). She is joining the laboratory of Tommaso Patriarchi at the University of Zurich in November 2020 as a SNSF-funded senior scientist to develop novel tools for in vivo neuromodulator imaging and gain expertise in molecular engineering.

Selected publications:

- *Labouesse MA, Sartori A, Weinmann O, Simpson EH, Kellendonk C, Weber-Stadlbauer U. Striatal dopamine 2 receptor upregulation during development predisposes to diet-induced obesity by reducing energy output in mice. Proceedings of the National Academy of Sciences. 2018; 115:10493-10498.*
- *Labouesse MA, Lassalle O, Richetto J, Iafrati J, Weber-Stadlbauer U, Notter T, Pujadas L, Gschwind T, Soriano E, Reichelt A, Labouesse C, Langhans W, Chavis P†, Meyer U†. Hypervulnerability of the adolescent prefrontal cortex to nutritional stress via reelin deficiency. Molecular Psychiatry. 2017; 22:961–971. †shared seniority.*
- *Weber-Stadlbauer U, Richetto J, Labouesse MA, Bohacek J, Mansuy I, Meyer U*. Transgenerational transmission and modification of pathological traits induced by prenatal immune activation. Molecular Psychiatry. 2017; 22:102–112.*
- *Labouesse MA, Dong E, Grayson D, Guidotti A, Meyer U. Maternal immune activation induces GAD1 and GAD2 promoter remodeling in the offspring prefrontal cortex. Epigenetics. 2015; 12:1142-1154.*

Mathias Mahn | Friedrich Miescher Institute of Basel, Switzerland

I like tinkering with proteins, light, and electronics to get a better grasp of the interactions between brain areas. Currently, I embark on my postdoctoral research in the lab of Andreas Lüthi at the Friedrich Miescher Institute in Basel, where I am looking into the influence of amygdala activity on cortical processing. Before that, I spent most of my days designing or characterizing light-gated proteins for neuronal inhibition in Ofer Yizhar's lab at the Weizmann Institute in Rehovot.

Selected Publications:

- *High-efficiency optogenetic silencing with soma-targeted anion-conducting channelrhodopsins. Mahn M, et al. (2018) Nat Commun. 2018 Oct 8;9(1):4125. - Two-Photon Bidirectional Control and Imaging of Neuronal Excitability with High Spatial Resolution In Vivo. Forli A, et al. (2018) Cell Rep. Mar 13;22(11):3087-3098.*
- *Silencing Neurons: Tools, Applications, and Experimental Constraints. Wiegert JS, et al. (2017) 10.1016/j.neuron.2017.06.050. Review.*
- *Biophysical constraints of optogenetic inhibition at presynaptic terminals. Mahn M, et al. (2016). Nat Neurosci. Apr;19(4):554-6.*

Vasyl Mykytiuk | Max Plank Institute, Germany

Vasyl is a PhD student at the Neuronal Circuits and Behavior research group, led by Prof. Tatiana Korotkova at the Max Planck Institute for Metabolism Research, Cologne, Germany. Vasyl received Master's degree in Neuroscience from the International Max Planck Research School in Neuroscience and the University of Goettingen, Germany. Vasyl's research interest is the organization of instinctive motivations and actions in the brain. He utilizes electrophysiology, combined with optogenetics in vivo in freely moving animals for his PhD project.

Selected publications:

- *Cruces-Solis H., Babaev O., Ali H., Piletti Chatain C., Mykytiuk V., Balekoglu N., Wenger S., Krueger-Burg D. Altered theta / beta frequency synchrony links abnormal anxiety-related behavior to synaptic inhibition in Neuroligin-2 knockout mice (BioRxiv [Preprint], 2019, https://doi.org/10.1101/726190);*
- *Jais A., Paeger L., Sotelo-Hitschfeld T., Bremser S., Prinzensteiner M., Klemm P., Mykytiuk V., Widdershooven P.J., Vesting A.J., Grzelka K., Minère M., Cremer A.L., Xu J., Korotkova T., Lowell B., Zeilhofer H.U., Backes H., Fenselau H., Wunderlich F.T., Kloppenburg P. and Brüning J. PNOCARC neurons promote hyperphagia and obesity upon high-fat-feeding. Neuron, 2020.*

Praneeth Namburi | Institut Magendie, France

I am currently a postdoctoral fellow at MIT working on biomechanics of efficient movement. I received my PhD in experimental neuroscience in the laboratory of Dr. Kay Tye in 2016. During my PhD, I worked on neural circuits and mechanisms for differentiating positive and negative associations. Specifically, I worked on projection-target defined neural populations in the basolateral amygdala, and studied these populations at the molecular, synaptic and circuit levels. I used several techniques, including patch-clamp electrophysiology, in vivo electrophysiology combined with optogenetic identification, optogenetic modulation of neural circuits, and photometry.

Selected publications:

- *Divergent routing of positive and negative information from the amygdala during memory retrieval. Beyeler A*, Namburi P*, Glober GF, Simonnet C, Calhoon GG, Conyers GF, Luck R, Wildes CP, Tye KM. Neuron. 2016 Apr 20;90(2):348-61. doi: 10.1016/j.neuron.2016.03.004.*
- *Architectural representation of valence in the limbic system. Namburi P, Al-Hasani R, Calhoon GG, Bruchas MR, Tye KM. Neuropsychopharmacology. 2016 Jun;41(7):1697-715. doi: 10.1038/npp.2015.358. Review.*
- *A circuit mechanism for differentiating positive and negative associations. Namburi P*, Beyeler A*, Yorozu S, Calhoon GG, Halbert SA, Wichmann R, Holden SS, Mertens KL, Anahtar M, Felix-Ortiz AC, Wickersham I, Gray JM, Tye KM. Nature. 2015 Apr 30;520(7549):675-8. doi: 10.1038/nature14366.*

Mauro Pulin | ZMNH, Germany

I obtained my Master Degree in Neuroscience from the University of Trieste, Italy in 2015. In my master's thesis I investigated the viability of primary neuronal cell cultures with different two-dimensional nanocomposite polymer substrates by performing immunofluorescence labeling and single-cell patch clamp recordings. In 2016 I moved to Hamburg, Germany to start my undergraduate studies in the Institute for Synaptic Physiology at the Center for Molecular Neurobiology Hamburg. The following year, I joined the newly established research group "Synaptic Wiring and Information Processing" led by Prof. Simon Wiegert. My PhD project aims at investigating the molecular and physiological mechanisms underlining rewiring of a defined synaptic circuit triggered by neuronal activity, focusing on dendritic spines in organotypic hippocampal slice preparations. My goal is to understand whether chronically perturbing the activity at identified synapses has an impact on their lifetime. In my work I combine optogenetic stimulation of Schaffer collateral synapses with 2-photon imaging of postsynaptic spine calcium transients, patch-clamp electrophysiology and chemogenetic (DREADD) silencing to chronically dampen synaptic transmission selectively in the pathway under scrutiny. After optogenetic

identification and functional characterization of individual synapses, I use chronic 2-photon imaging to measure the structural dynamics of silenced spines for seven days.

Selected publication:

- *Wiegert, J.S., Pulin, M., Gee, C.E., Oertner , T. G. (2018). The fate of hippocampal synapses depends on the sequence of plasticity-inducing events. eLife e39151*

Robson Scheffer Teixeira | Max Plank Institute, Germany

My name is Robson Scheffer Teixeira and I am currently working as a postdoc at Korotkova Lab as a data analyst of calcium imaging signals. My past experience, however, was mostly focused on behavioral electrophysiology of rodents. Specifically, I have a huge interest in analyzing continuous (local field potentials) and discrete (spike) signals from freely moving animals. I would say that my scientific signature is the study of cross-frequency coupling between oscillations. Over the years, instead of strictly focusing on "new scientific discoveries", I have also developed serious concerns about scientific reproducibility, analyses flaws, misleading scientific communication (statistical and word usage) and psychological biases. I believe that a large part of these interests were built up during the unfolding of two of my publications about possible analyses artifacts: spike-leaked high-frequency oscillations and spurious occurrence of phase-phase coupling. That is why I am now a big advocate of publishing negative results as well as doing transparent, slow and open science.

Selected publications:

- *Scheffer-Teixeira R, Belchior H, Caixeta FV, Souza BC, Ribeiro S, Tort AB (2012) Theta phase modulates multiple layer-specific oscillations in the CA1 region. Cereb Cortex 22:2404–2414.*
- *Scheffer-Teixeira R, Belchior H, Leão RN, Ribeiro S, Tort ABL (2013) On High-Frequency Field Oscillations (>100 Hz) and the Spectral Leakage of Spiking Activity. J Neurosci 33:1535–1539.*
- *Scheffer-Teixeira R, Tort AB (2016) On cross-frequency phase-phase coupling between theta and gamma oscillations in the hippocampus. eLife 5:e20515.*

Tristan Schuman | Mount Sinai Institute, New York, USA

My career goal is to improve the treatment of patients with epilepsy. To accomplish this, my lab at the Icahn School of Medicine at Mount Sinai focuses on understanding the circuit deficits that lead to seizures and cognitive deficits in epilepsy. Since many theories of epilepsy center on interneuron dysfunction, my postdoctoral work examined how interneuron populations are altered in chronically epileptic mice. Using in vivo electrophysiology in mice running through virtual reality, I found profound synchronization deficits in the interneurons of the dentate gyrus in epileptic mice. My lab is now examining the specific circuit mechanisms that lead to seizures and cognitive deficits and testing the broad hypothesis that synchronization deficits contribute to chronic epilepsy. Our goal is to identify new mechanisms underlying seizures and cognitive deficits so that future

treatments can be optimized to treat the underlying neural dysfunction of patients with epilepsy. In order to achieve these goals I have developed expertise in behavioral analysis, molecular and cellular imaging techniques, and electrophysiology. Early in my research career, I was interested in behavioral methods of understanding the brain which led me to work with Dr. Stephan Anagnostaras, an expert in the behavioral analysis of learning and memory. In my early graduate career, I focused entirely on behavioral techniques, and after a few years I had direct experience with over 15 distinct behavioral assays, providing a great foundation of animal behavior that will continue to guide my research throughout my career. While behavioral analysis is a cornerstone of neuroscience, a multi-level approach is critical to truly understanding how the brain works. Thus, I decided to complement my behavioral foundation with molecular and cellular techniques. To accomplish this, I worked with Dr. Mark Mayford to examine the cellular basis of addiction-related memories using a novel transgenic mouse that labels active cells at two different time points. Using this model, I was able to localize a population of cells in the dorsal striatum that are responsible for eliciting conditioned place preference to cocaine. As a postdoctoral scholar, I expanded my repertoire of molecular and cellular techniques to analyze the brain. I used in vivo electrophysiology to examine how interneurons regulate the flow of spatial information in the hippocampus and how this system is disrupted in epilepsy. I am currently preparing a manuscript for submission that characterizes the deficit in spatial coding and desynchronization of hippocampal circuits in epileptic mice. My lab focuses on leveraging technical advances with translation-focused epilepsy research. During my postdoc, I developed skills to record large ensembles of cells during behavior with both electrophysiology and calcium imaging. I have been heavily involved in developing an open-source head-mounted miniature microscope for calcium imaging in freely behaving mice and intend to continue to develop new technology to share with the scientific community. There are currently very few investigators studying epilepsy in awake, behaving mice and no published work stimulating interneurons during specific phases of network activity in vivo. Therefore, my technical and translational interests have created a defined path to distinguish myself within the epilepsy research community and make an impact on the future treatment of patients with epilepsy.

Selected publications:

- *Shuman T, Amendolara B, Golshani P. Theta Rhythmopathy as a Cause of Cognitive Disability in TLE. Epilepsy Curr. 2017 Mar-Apr;17(2):107-111. doi: 10.5698/1535-7511.17.2.107. PubMed PMID: 28491003; PubMed Central PMCID: PMC5416857.*
- *Lazaro MT, Taxidis J, Shuman T, Bachmutsky I, Ikrar T, Santos R, Marcello GM, Mylavarapu A, Chandra S, Foreman A, Goli R, Tran D, Sharma N, Azhdam M, Dong H, Choe KY, Peñagarikano O, Masmanidis SC, Rácz B, Xu X, Geschwind DH, Golshani P. Reduced Prefrontal Synaptic Connectivity and Disturbed Oscillatory Population Dynamics in the CNTNAP2 Model of Autism. Cell Rep. 2019 May 28;27(9):2567-2578.e6. doi: 10.1016/j.celrep.2019.05.006. PubMed PMID: 31141683; PubMed Central PMCID: PMC6553483.*
- *Pennington ZT, Dong Z, Feng Y, Vetere LM, Page-Harley L, Shuman T, Cai DJ. ezTrack: An open-source video analysis pipeline for the investigation of animal behavior. Sci Rep. 2019 Dec 27;9(1):19979. doi: 10.1038/s41598-019-56408-9. PubMed PMID: 31882950; PubMed Central PMCID: PMC6934800.*
- *Shuman T, Aharoni D, Cai DJ, Lee CR, Chavlis S, Page-Harley L, Vetere LM, Feng Y, Yang CY, Mollinedo-Gajate I, Chen L, Pennington ZT, Taxidis J, Flores SE, Cheng K, Javaherian M, Kaba CC, Rao N, La-Vu M, Pandi I, Shtrahman M, Bakhurin KI, Masmanidis SC, Khakh BS, Poirazi P, Silva AJ,*

Golshani P. Breakdown of spatial coding and interneuron synchronization in epileptic mice. Nat Neurosci. 2020 Feb;23(2):229-238. doi: 10.1038/s41593-019-0559-0. Epub 2020 Jan 6. PubMed PMID: 31907437; PubMed Central PMCID: PMC7259114.

- *Chen L, Cummings KA, Mau W, Zaki Y, Dong Z, Rabinowitz S, Clem RL, Shuman T, Cai DJ. The role of intrinsic excitability in the evolution of memory: Significance in memory allocation, consolidation, and updating. Neurobiol Learn Mem. 2020 Sep;173:107266. doi: 10.1016/j.nlm.2020.107266. Epub 2020 Jun 5. PubMed PMID: 32512183; PubMed Central PMCID: PMC7429265.*

Guilherme Silva | Harvard University, USA

Broadly speaking, I study the problem of information content and translation in the central nervous system. Much of my work focuses on studying synapses and their integration in dendrites, and particularly how the biophysics of rodent models translates into relevant insights on how the human brain works. Here are some questions which currently interest me. A crucial question in modern neuroscience is how some neurons are "selected" to fire action potentials or to stay in a state of high excitability and and how clusters of neurons or motifs are "allocated" to represent percepts while the majority of surrounding cells are silent or resting on a state of low conductance. In this context, dendrites are critical in receiving chemical and electrical stimuli that are ultimately translated into synaptic weights, which leads me into: dendritic excitability and integration. Neuronal microcircuits are elementary functional units of the brain. Microcircuits comprise inhibitory and excitatory cells, dynamically interconnected to process varying inputs and provide outputs that eventually lead to behavior. Neurons, the fundamental building block, are multicompartmental units and dendritic electrogenesis, or dendritic initiation of cell depolarizing events, is a fundamental aspect of dendritic computation. I am interested in the kinds of computation that may be implemented in a multicompartmental system with structural analogues of segregated dendrites, which differs from many current implementations of artificial neural networks lacking the dynamism for generalizability of computation that their biological counterparts exhibit.

Selected publications:

- *Human cortical pyramidal neurons: from spines to spikes via models. G Eyal, MB Verhoog, G Testa-Silva, Y Deitcher, R Benavides-Piccione, ... Frontiers in cellular neuroscience 12, 181 (2018)*
- *Lateral inhibition by Martinotti interneurons is facilitated by cholinergic inputs in human and mouse neocortex. J Obermayer, TS Heistek, A Kerkhofs, NA Goriounova, T Kroon, ... Nature communications 9 (1), 1-14 (2018)*
- *The human cerebellum has almost 80% of the surface area of the neocortex. MI Sereno, J Diedrichsen, M Tachrount, G Testa-Silva, H d'Arceuil, ... Proceedings of the National Academy of Sciences 117 (32), 19538-19543 (2020)*

Dimitri Tanese | Institut de la vision, France

Dimitrii Tanese is a researcher at the Vision Institute in Paris, in the team directed by Valentina Emiliani. His research focuses on the development of optical approaches for optogenetic control and fast functional recording of neuronal activity, at the level of subcellular structures up to large neuronal ensembles.

Selected publications:

- *Shemesh, O. A., et al. (2017) Temporally precise single-cell-resolution optogenetics. Nature Neuroscience, 20(12), 1796–1806.*
- *Tanese, D. et al. (2017). Imaging membrane potential changes from dendritic spines using computer-generated holography. Neurophotonics, 4(3), 031211.*
- *Hernandez, O., et al. (2016). Three-dimensional spatiotemporal focusing of holographic patterns. Nature Communications, 7, 11928.*

Meytar Zemer | Weizmann Institute of science, Israel

I'm a PhD student in the lab of Yaniv Ziv. I am interested in neuronal mechanism underlying long-term memory. As a case study for episodic experience, I aim to study the neural code for social identity and its long-term stability through the investigation of a group of mice. I'm combining novel optical imaging techniques for time-lapse Ca2+ imaging in hundreds of cells in the hippocampus with experimental design in semi-natural environments. Furthermore, a major part of my work is developing and implementing adequate data analysis tools to apply to the vast data collected in my experiments.