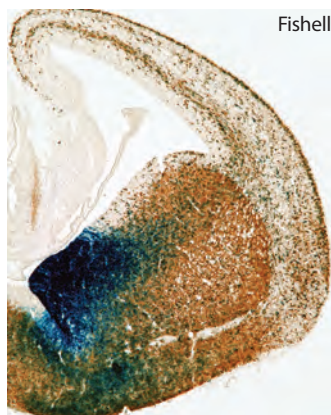# NYU NEUROSCIENCE

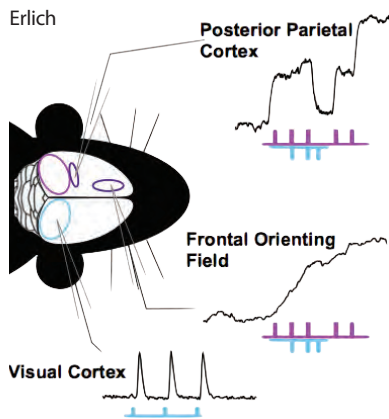# Doctoral Program in Neural Science
Shanghai Track

Gan

L   R

Tian

Erlich

Posterior Parietal
Cortex

Frontal Orienting
Field

Visual Cortex

Fishell

NYU Neuroscience Doctoral Education

At NYU, neuroscience graduate education provides integrated training that encompasses molecular, developmental, cellular, systems, cognitive, behavioral, and computational approaches to address the most important questions in the field. Our doctoral training program in neural science builds on the diversity and strength of research across many interrelated departments and multiple campuses, especially among the Center for Neural Science, the NYU Neuroscience Institute, and the Institute of Brain and Cognitive Science in Shanghai.

This brochure will introduce you to the Shanghai track of the NYU Doctoral Program in Neural Science, including the cutting-edge neuroscience research conducted by our faculty and their most recent discoveries in the field. The Shanghai track is a specialized track combining the long-standing strength of NYU's neural science program based in New York with the unique environment for research and training in the newly established NYU-ECNU Institute of Brain and Cognitive Science at NYU Shanghai. Students who participate in the track will benefit from NYU's global vision of transformative teaching and innovative research. Interested students should apply to the NYU Doctoral Program in Neural Science and select Shanghai on their application.

Klann/Carter
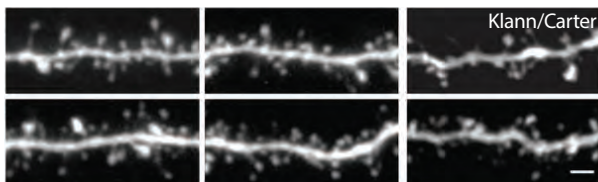
NYU Neuroscience - Core Graduate Components

Research Training

We strongly emphasize research at the highest level throughout graduate school, and students on the Shanghai track participate in research from the very beginning of graduate training, working in both Shanghai and New York. At the outset of training, students will spend two consecutive summers rotating with faculty in Shanghai and the intervening academic year rotating with a lab in New York. By the beginning of the second year, students typically select a lab and primary advisor in Shanghai for their thesis work as well as a co-mentor in New York. Students continue to have opportunities to work and collaborate with colleagues in New York throughout their training.
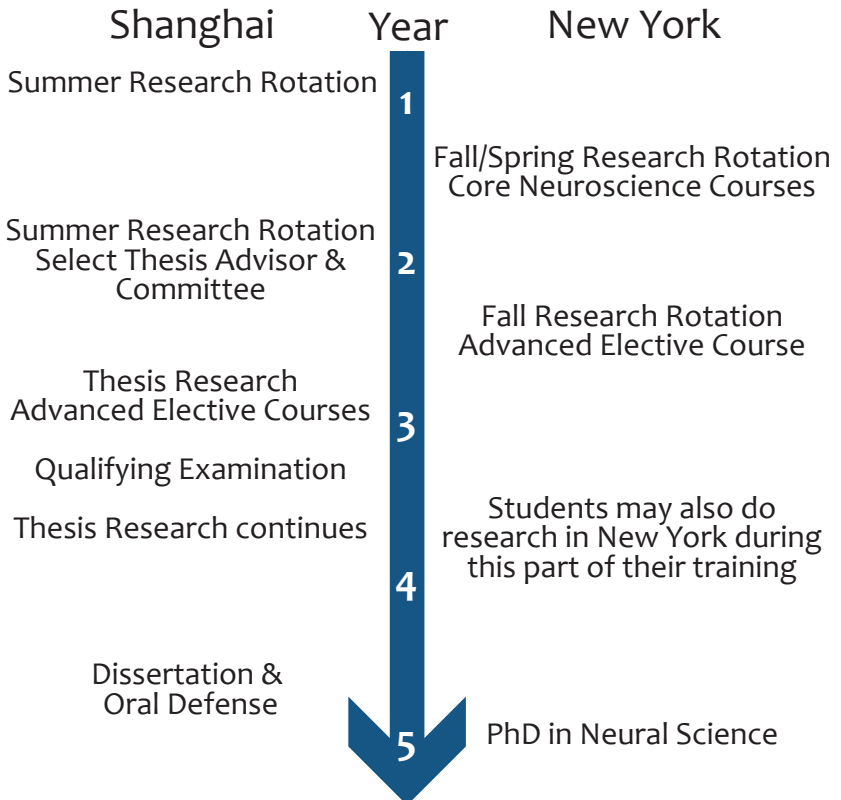
Coursework

A core curriculum in neuroscience, taken during the academic year spent in New York, gives students a broad and in depth understanding of the nervous sytem, from molecules to systems. The three core courses - Cellular Neuroscience, Neuroanatomy, and Sensory and Motor Systems - include lectures, student-led discussions, and hands-on components. In addition, all students take a course in biostatistics as well as advanced electives. Students also benefit directly from the interactive, collegial communities in both New York and Shanghai and become active participants in shaping the rich, intellectual environment - including seminars, retreats, and colloquia - that complements formal training.

Mentoring and Milestones

Students are advised by the graduate program director and additional faculty advisors in the first year of the program. Once a primary research mentor in Shanghai and co-mentor in New York are selected, they advise students together with a thesis committee. In the third year, students write and defend a qualifying exam (thesis proposal). The dissertation defense typically occurs in the fifth year in front of the thesis committee and additional faculty, including an outside expert.

Key Components and Timeline of Study

Shanghai	Year	New York
Summer Research Rotation	**1**	
		Fall/Spring Research Rotation Core Neuroscience Courses
Summer Research Rotation Select Thesis Advisor & Committee	**2**	
		Fall Research Rotation Advanced Elective Course
Thesis Research Advanced Elective Courses	**3**	
Qualifying Examination		
Thesis Research continues		Students may also do research in New York during this part of their training
	4	
Dissertation & Oral Defense	**5**	PhD in Neural Science

Students in the Shanghai track of the Doctoral Program in Neural Science will spend one and a half years at NYU in New York for course work and laboratory rotations, before joining a laboratory in Shanghai for thesis research. They will maintain a close tie with New York, and they will receive an NYU PhD, typically within 6 years.

NYU Shanghai Core Faculty

Xiao-Jing Wang
Professor

Dynamical Behavior of Neural Circuits

Wang is an expert on the neurobiology of executive and cognitive functions. His group has pioneered neural circuit models of the prefrontal cortex, often called the "CEO of the brain." From cellular mechanisms to large-scale brain circuit models, Wang is well-known for his work on memory, decision-making, communication, and other cognitively-controlled, flexible behaviors.

Before joining NYU in 2012, Wang was Professor of Neurobiology, Physics, Applied Mathematics, and Psychology at Yale University and Director of the Swartz Center for Theoretical Neuroscience.

Xinying Cai
Assistant Professor

Valuation, Rewards, and Decision Making

Cai's research focuses on elucidating the neural underpinnings of economic decision-making. He has studied the encoding of economic value in various brain areas, most recently focusing on how abstract choice outcome is transformed into a suitable action plan.

Cai holds a PhD in Bioengineering from Arizona State University and was a postdoctoral fellow at Yale University and Washington University in St Louis.

NYU Shanghai Core Faculty

Jeffrey Erlich
Assistant Professor

Competition, Stress, and Attention on Decision Making

Erlich's research interests include the neural mechanisms of decision-making, attention and emotion. His lab investigates how coherent behaviors and decisions emerge from chaotic neural activity that is driven by a combination of internal dynamics and external sensory input.

Erlich received his PhD from NYU's Center for Neural Science in 2006 and completed his postdoctoral training at Princeton University.

Xing Tian
Assistant Professor

The Relationship between Action and Perception

Using electrophysiological (MEG/EEG), neuroimaging (fMRI) techniques, and behavioral, computational approaches, Tian investigates motor-sensory interactions, mental imagery, and speech and language.

Tian has a PhD from the University of Maryland and, prior to joining NYU Shanghai, he was a postdoctoral fellow in the Department of Psychology at NYU.

Recent Publications from NYU Shanghai Faculty

Ardid S, **Wang X-J** (2013) A Tweaking Principle for Executive Control: Neuronal Circuit Mechanism for Rule-Based Task Switching and Conflict Resolution. *Journal of Neuroscience*.

Bernacchia A, **Wang X-J** (2013) Decorrelation by Recurrent Inhibition in Heterogeneous Neural Circuits. *Neural Computation*.

Cai X, Padoa-Schioppa C (2012) Neuronal encoding of subjective value in dorsal and ventral anterior cingulate cortex. *Journal of Neuroscience*.

Cai X, Padoa-Schioppa C (2014) Contributions of orbitofrontal and lateral prefrontal cortices to economic choice and the good-to-action transformation. *Neuron*.

Chaudhuri R, Bernacchia A, **Wang X-J** (2014) A diversity of localized timescales in network activity. *eLife*.

Erlich JC, Bush DE, LeDoux, JE (2012) The role of the lateral amygdala in the retrieval and maintenance of fear-memories formed by repeated probabilistic reinforcement. *Frontiers in Behavioral Neuroscience*.

Erlich JC, Bialek M, Brody CD (2011) A cortical substrate for memory-guided orienting in the rat. *Neuron*.

Tian X, Poeppel D (2014) Dynamics of Self-monitoring and Error Detection in Speech Production: Evidence from Mental Imagery and MEG. *Journal of Cognitive Neuroscience*.

Tian X, Poeppel D (2012) Mental imagery of speech: linking motor and perceptual systems through internal simulation and estimation. *Frontiers in Human Neuroscience*.

Tian

Alberini

Movshon

Erlich
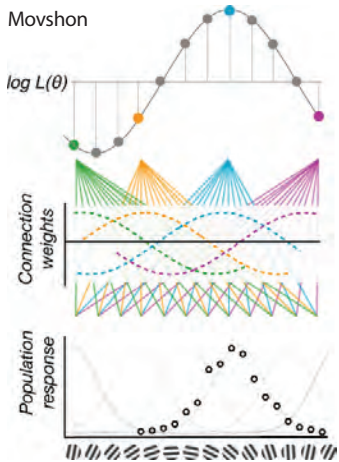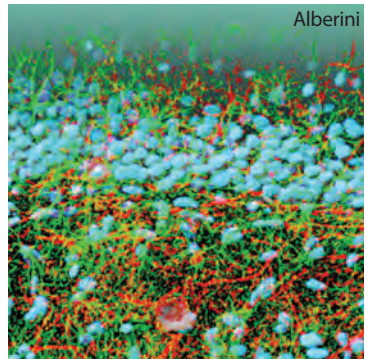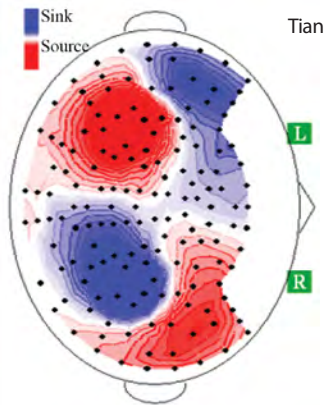
Other NYU Neuroscience Faculty

Cristina Alberini	Molecular mechanisms of long-term memory
Chiye Aoki	Neuronal plasticity in neocortex
Jayeeta Basu	Circuits mechanisms underlying learning
Steven Burden	Neuromuscular synapse formation
Gyorgy Buzsaki*	Rhythms in neural networks
Thomas Carew*	Architecture of memory formation
Kenneth Carr	Neurobiology of feeding & drug addiction
Adam Carter	Prefrontal cortex neurons & circuits
F. Xavier Castellanos	Attention-Deficit Hyperactivity Disorder
Moses Chao	Neurotrophin receptor signaling
Mitchell Chesler	Regulation of pH in the nervous system
Jeremy Dasen	Genetics of neural circuit formation & function
Nathaniel Daw	Decision making & neuromodulation
Andre Fenton	Memory, from molecules to computation
Gord Fishell	Genetic origin of interneuron diversity
Robert Froemke	Synaptic & cortical plasticity
Wen-Biao Gan*	Imaging *in vivo* synaptic dynamics
Esther Gardner	Somatosensory & motor integration
Stephen Ginsberg	Mechanisms of neuronal degeneration
Paul Glimcher*	Interdisciplinary study of decision making
Donald Goff	Biological mechanisms of schizophrenia
Michael Halassa	Regulation of information processing
Michael Hawken	Neuronal mechanisms of visual perception
David Heeger	Computational neuroimaging

Other NYU Neuroscience Faculty

Roozbeh Kiani	Perceptual & mnemonic decision making
Lynne Kiorpes	Development of visual function
Eric Klann	Molecular basis of cognition & brain disorders
Eric Lang	Neuronal basis of motor control
Joseph LeDoux*	Memory & emotion
Efrat Levy	Neurodegenerative disease
Dayu Lin	Neural circuits for social behaviors
Rodolfo Llinas	Intrinsic properties of neurons
Michael Long	Complex, learned motor behaviors
Wei Ji Ma	Behavioral & neural mechanisms of perception
Paul Mathews	Neuronal vulnerability in Alzheimer's disease
David McLaughlin	Visual neural science
Anthony Movshon*	Vision & visual development
Katherine Nagel	Biophysics of sensory processing
Ralph Nixon	Cellular basis of neurodegenerative diseases
Bijan Pesaran*	Neuronal dynamics and decision making
Dimitris Placantonakis	Neurogenesis & gliomagenesis
Alex Reyes	Functional interactions in neural networks
Margaret Rice	Neurophysiology of dopaminergic neurons
Dmitry Rinberg	Olfactory information processing
Niels Ringstad	Signalling pathways that modulate behavior
John Rinzel*	Biophysical & theoretical neural computations
Bernardo Rudy	Molecular regulation of neuronal excitability
James Salzer	Myelinating axons and demyelination

Other NYU Neuroscience Faculty

Dan Sanes	Development & plasticity of audition
Helen Scharfman	Neuronal excitability and plasticity
David Schoppik	Principles of neural circuit function
Malcolm Semple	Neurobiology of hearing
Robert Shapley	Visual physiology & perception
Einar Sigurdsson	Age-related degenerative diseases
Eero Simoncelli	Computational vision
Nicholas Stavropoulos	Genetics & molecular mechanisms of sleep
Greg Suh	Neural circuits of innate behaviors
Regina Sullivan	Neurobiology of infant attachment
Wendy Suzuki*	Memory, learning & cognition
Richard Tsien*	Activity driven signaling to the nucleus
Donald Wilson	Neurobiology of memory & perception
Thomas Wisniewski	Pathogenesis of Alzheimer's disease
Edward Ziff	Synaptic trafficking & neurological disease

* denotes Collaborating Faculty in the NYU-ECNU Institute of Brain and Cognitive Science at NYU Shanghai
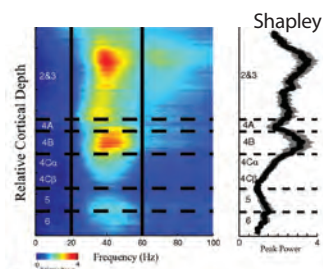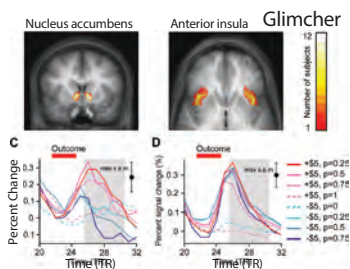
Recent Publications from Other NYU Faculty

Chen DY, Bambah-Mukku D, Pollonini G, **Alberini CM** (2012) Glucocorticoid receptors recruit the CaMKIIα-BDNF-CREB pathways to mediate memory consolidation. *Nature Neuroscience*.

Stark E, Roux L, Eichler R, Senzai Y, Royer S, **Buzsáki G** (2014) Pyramidal cell-interneuron interactions underlie hippocampal ripple oscillations. *Neuron*.

MacAskill AF, Cassel JM, **Carter AG** (2014) Cocaine exposure reorganizes cell type- and input-specific connectivity in the nucleus accumbens. *Nature Neuroscience*.

Jung H, Mazzoni EO, Soshnikova N, Hanley O, Venkatesh B, Duboule D, **Dasen JS** (2014) Evolving Hox activity profiles govern diversity in locomotor systems. *Developmental Cell*.

Otto AR, Raio C, Chiang A, **Phelps EA, Daw ND** (2013) Working-memory capacity protects model-based learning from stress. *PNAS*.

Lee H, Dvorak D, Kao HY, Duffy ÁM, Scharfman HE, **Fenton AA** (2012) Early cognitive experience prevents adult deficits in a neurodevelopmental schizophrenia model. *Neuron*.

Au E, Ahmed T, Karayannis T, Biswas S, Gan L, **Fishell G** (2013) A modular gain-of-function approach to generate cortical interneuron subtypes from ES cells. *Neuron*.

Louie K, Khaw MW, **Glimcher PW** (2013) Normalization is a general neural mechanism for context-dependent decision making. *PNAS*.

Yang G, Lai CS, Cichon J, Ma L, Li W, **Gan WB** (2014) Sleep promotes branch-specific formation of dendritic spines after learning. *Science.*

Recent Publications from Other NYU Faculty

Sears RM, Fink AE, Wigestrand MB, Farb CR, de Lecea L, **Ledoux JE** (2013) Orexin/hypocretin system modulates amygdala-dependent threat learning through the locus coeruleus. *PNAS*.

Freeman J, Ziemba CM, **Heeger DJ, Simoncelli EP, Movshon JA** (2013) A functional and perceptual signature of the second visual area in primates. *Nature Neuroscience*.

Cogan GB, Thesen T, Carlson C, Doyle W, Devinsky O, **Pesaran B** (2014) Sensory–motor transformations for speech occur bilaterally. *Nature*.

Smear M, Resulaj A, Zhang J, Bozza T, **Rinberg D** (2013) Multiple perceptible signals from a single olfactory glomerulus. *Nature Neuroscience*.

Karayannis T, Au E, et al. (2014) Cntnap4 differentially contributes to GABAergic and dopaminergic synaptic transmission. *Nature*.

Zhang Y, Bekku Y, Dzhashiashvili Y, Armenti S, Meng X, Sasaki Y, Milbrandt J, **Salzer JL** (2012) Assembly and maintenance of nodes of Ranvier rely on distinct sources of proteins and targeting mechanisms. *Neuron*.

Goris RL, **Movshon JA, Simoncelli EP** (2014) Partitioning neuronal variability. *Nature Neuroscience*.

Dus M, Ai M, **Suh GS** (2013) Taste-independent nutrient selection is mediated by a brain-specific Na+solute co-transporter in *Drosophila*. *Nature Neuroscience*.

Owen SF, Tuncdemir SN, Bader PL, Tirko NN, **Fishell G, Tsien RW** (2013) Oxytocin enhances hippocampal spike transmission by modulating fast-spiking interneurons. *Nature*.

A Selection of Current NYU Neuroscience Students

Mel Khaw (BA, University of Arizona), a 3rd year student in the Glimcher Lab, is interested in how preferences emerge from neural activity and modeling decision making.

Abba Leffler (BS, Princeton University) is a 4th year student with the Bonneau and Rudy labs developing computational tools to design drugs that target specific ion channels.

Andra Mihali (BA, Columbia University), a 3rd year student in the Ma Lab, studies the role of microsaccades in visual short term memory.

Caitlin Mullins (BA, Columbia University) is a 3rd year student with the Tsien Lab, and she is interested in how neuromodulators regulate synapses, circuits, and behavior.

Katherine Peng (BA, Johns Hopkins), a 4th year student with the Mathews and Levy labs, examines the role of endosomal and exosomal pathology in Alzheimer's disease.

Ryan Shewcraft (BA, Brown University) is a 4th year student with the Pesaran Lab, and he is applying optogenetics to probe neocortical circuit dynamics in primates.

Christopher Wilson (BA, Claremont McKenna College) is a 3rd year student in the Rinberg Lab searchinf for the neural code that underlies concentration invariance in olfaction.

Corey Ziemba (BA, UC Davis) is a 5th year student with the Simoncelli and Movshon labs and aims to link visual perception of textures to cortical physiology.

A Selection of NYU Neuroscience Alumni

Kevin LaBar, PhD '96, is a Professor at Duke University. His lab examines how emotions modify cognition in healthy adults and in psychiatric patients.

Emre Aksay, PhD '01, is an Assistant Professor at Weill Cornell Medical College, and he investigates the molecular, cellular, and circuit mechanisms of temporal integration in neurons.

Nicole Rust, PhD '04, is an Assistant Professor at the University of Pennsylvnia studying how the brain stores visual memories and recognizes objects.

Wei Lu, PhD '06, is an Investigator at the National Institutes of Health (NINDS), where his group focuses on unraveling the molecular mechanisms of synaptic plasticity.

Mehrdad Jazayeri, PhD '07, is an Assistant Professor at MIT. He is interested in the neural bases of complex behaviors such as flexible timing and sensorimotor integration.

Edward Zagha, PhD '08, is a postdoctoral fellow with David McCormick at Yale University and studies sensory processing between cortical brain regions.

Jennifer Choi, PhD '10, is a postdoctoral fellow with Ted Abel at the University of Pennsylvania, studying the impact of sleep on learning, memory, and regulation of protein translation.

Anne Takesian, PhD '10, is a postdoctoral fellow in Takao Hensch's lab at Harvard University and is focused on experience-dependent plasticity during critical periods.

The NYU Neuroscience Community

The NYU Neuroscience community comes together for weekly seminars and a wealth of additional scientific events that encourage interdisciplinary and cross-campus interactions to ensure a stimulating intellectual environment for graduate training.

Joint Neuroscience Colloquia are a fundamental component of the neuroscience community at NYU, featuring esteemed neuroscientists from around the world. Students and postdocs have the opportunity to meet with invited speakers informally to discuss their research.

Annual Neuroscience Retreats are held in a picturesque, upstate New York resort and bring together faculty and students for a 3-day scientific meeting focused on fostering new collaborations.

Numerous additional events - **Weekly Group Meeting, Fellows' Seminars, Uptown/Downtown**, etc. - highlight our graduate students' research in progress, giving them an opportunity to develop presentation skills as well as receive valuable input from their colleagues.

NYU and New York City

While in New York, students have the opportunity to work with neuroscience faculty from more than a dozen academic departments from the NYU Washington Square and School of Medicine campuses. Labs working in all areas of neuroscience are well-equipped with state-of-the-art research facilities that support basic, translational, and clinical neuroscience.

NYU provides housing benefits to assist doctoral students while they reside in New York City. The school also provides free shuttles to each campus and other areas of the city, and the city's public transportation is also very convenient, with extensive subways, buses, and a new bike sharing system.

New York City is a thriving, lively backdrop for our doctoral students, who benefit from its diversity of cultures, cuisines, art, and entertainment.

NYU Shanghai

NYU Shanghai, part of New York University's Global Network University, is the first Sino-US higher education joint venture. The NYU-ECNU Institute of Brain and Cognitive Science at NYU Shanghai seeks to advance our understanding of brain function with the primary goal of understanding the neural circuits in the brain that generate higher cognition and flexible behavior and how their impairments are associated with brain diseases.

The Institute leverages our existing significant strength of neuroscience research in systems and cognitive neuroscience, using a range of tools including the development of transgenic primates, molecular and physiological studies of neural circuits, experimental analysis of behavior, microcircuit and large-scale neural circuit modeling, and human brain imaging. The Institute will have more than twenty, collaborating research groups and bring together faculty from New York, Shanghai, and the world.

Contact Us

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To apply to the Doctoral Program in Neural Science Shanghai track, visit:
http://neuroscience.nyu.edu/graduate-programs

To learn more about the NYU-ECNU Institute of Brain and Cognitive Science at NYU Shanghai, please visit:
https://shanghai.nyu.edu/research/brain