NYU Neuroscience Doctoral Education

At NYU, neuroscience graduate education provides integrated training that encompasses molecular, cellular, developmental, systems, cognitive, behavioral, and computational approaches to address the most important questions in the field. Doctoral training in neuroscience at NYU builds on the diversity and strength of research throughout many interrelated departments and multiple campuses, especially among those within the Center for Neural Science, the Neuroscience Institute, and NYU Shanghai.

Students receive a comprehensive, interdisciplinary neuroscience education, and they have the opportunity to sample different research experiences before they commit to a topic area and laboratory. Training strongly emphasizes research at the highest level and faculty are dedicated to mentoring and career development throughout graduate school. Students also benefit directly from an interactive, collegial community and become active participants in shaping the rich, intellectual environment that complements their formal training.

This brochure will introduce you to NYU’s wide array of cutting-edge neuroscience research, our faculty and graduate students, and their most recent and exciting discoveries.
Key Components and Timeline of Study

Year

1
- 2-3 Lab Rotations
- Core Neuroscience Courses
- Track-Specialized Courses

2
- Select Thesis Advisor & Committee
- “First Year” Talk
- Thesis Research
- Qualifying Exams

3
- Advanced Elective Courses
- Thesis Research continues
- Annual Committee Meeting

4
- “Third Year” Talk
- Thesis Research continues
- Annual Committee Meeting

5
- Dissertation & Oral Defense
- PhD in Neuroscience

DC 12/14/2020
Researchers at NYU use cutting edge techniques, including two-photon microscopy, in vivo labeling of individual molecules and neurons, and RNA sequencing analysis, to investigate the electrical, biochemical, and genetic properties that underlie the function of the healthy and diseased brain at the cellular and molecular levels.

Akt inhibition blocks myelin formation in vitro without affecting Krox20 levels (Salzer lab)

Faculty

Cristina Alberini  Wen-Biao Gan  Niels Ringstad  
Chiye Aoki  Jorge Ghiso  James Salzer  
Justin Blau  Stephen Ginsberg  Dan Sanes  
Richard Bonneau  Eric Klann  Neville Sanjana  
Steven Burden  Joseph LeDoux  Helen Scharfman  
Thomas Carew  Efrat Levy  Einar Sigurdsson  
Kenneth Carr  Shane Liddelow  Nicholas Stavropoulos  
Adam Carter  Dayu Lin  Greg Suh  
Aravinda Chakravarti  Arjun Masurkar  Daniel Tranchina  
Moses Chao  Paul Mathews  Dirk Trauner  
Mitchell Chesler  Ralph Nixon  Nicolas Tritsch  
Jeremy Dasen  Simon Peron  Richard Tsien  
Claude Desplan  Dimitris Placantonakis  Jing Wang  
Andre Fenton  Margaret Rice  Thomas Wisniewski
Cell and Molecular Biology of Neurons and Glia

Two-photon image of somatostatin interneuron during whole-cell recording (Carter lab)

Motor axon projections in control (top) and PbzMND (bottom) mice (Dasen lab)

Select Recent Publications


Physiology of Cells and Synapses

Behavior arises as a result of cellular and synaptic activity. NYU neuroscientists are at the forefront of this research aiming to elucidate the underlying neural circuitry, using a wide array of technologies.

PV and SOM interneurons in the infralimbic PFC. (A) Labeling of PV interneurons in the PFC of a PV-Cre mouse. (B) Similar to (A) for SOM interneurons in the PFC of a SOM-Cre mouse. (C) Two-photon images of PV and SOM interneurons. (D) Response to 200 pA and -50 pA current injections (Carter lab)

Faculty

Chiye Aoki  Robert Froemke  Niels Ringstad
Jayeeta Basu  Wen-Biao Gan  John Rinzel
Steven Burden  Eric Lang  Bernardo Rudy
Gyorgy Buzsaki  Shane Liddelow  Dan Sanes
Thomas Carew  Michael Long  James Salzer
Adam Carter  Katherine Nagel  Helen Scharfman
Moses Chao  Simon Peron  David Schoppik
Mitchell Chesler  Alex Reyes  Shy Shoham
Dmitri Chklovskii  Margaret Rice  Nicolas Tritsch
Christine Constantinople  Dmitry Rinberg  Richard Tsien
Physiology of Cells and Synapses

Digital reconstruction of an in vivo recorded and labeled L5/6 fanning-out Martinotti interneuron. Histogram shows average axonal length color coded by layer of reconstructed cells (Rudy lab)

Select Recent Publications


Sensation, Perception, and Movement

Neuroscientists across NYU are working to understand the processes of sensing, interpreting, and acting on stimuli in the environment. Using cutting-edge techniques and novel tools, our scientists ask how we decode odors, learn to balance, perceive texture and faces, and learn vocalizations.

Faculty

Dora Angelaki  
Jayeeta Basu  
Gyorgy Buzsaki  
Thomas Carew  
Marisa Carrasco  
F. Xavier Castellanos  
Christine Constantinople  
Jeremy Dasen  
Claude Desplan  
Zoe (Xiaowei) Dong  
Jon Freeman  
Robert Froemke  
Esther Gardner  
Davi Geiger  
Marc Gershow  
Michael Hawken  
Biyu He  
David Heeger  
Roozbeh Kiani  
Lynne Kiorpes  
Michael Landy  
Li Li  
Michael Long  
Wei Ji Ma  
Larry Maloney  
Arjun Masurkar  
Anthony Movshon  
Katherine Nagel  
Denis Pelli  
Simon Peron  
Bijan Pesaran  
David Poeppel  
Alex Reyes  
Margaret Rice  
Dmitry Rinberg  
Bernardo Rudy  
Dan Sanes  
David Schoppik  
David Schneider  
Robert Shapley  
Shy Shoham  
Eero Simoncelli  
Greg Suh  
Regina Sullivan  
Xing Tian  
Daniel Tranchina  
Jing Wang  
Donald Wilson  
Jonathan Winawer  
Yongdi Zhou

Neurons that project to the spinal cord, color-coded by depth (Schoppik lab)
Sensation, Perception, and Movement

Visualizations of neural population responses in V1 and V2 to visual texture stimuli (Movshon and Simoncelli labs).

Select Recent Publications


Executive Function and Cognition

The brain gives rise to our thoughts, decisions, and sense of self. At levels of analysis ranging from molecules to humans, researchers at NYU reveal the neural substrates that underlie higher order mental processes such as consciousness, judgement and decision making, attention, working memory, inhibitory control, and cognitive flexibility.

Using tDCS to create a computational model of the neural underpinnings of conscious movement intention (He lab)

Faculty

Cristina Alberini  Jeffrey Erlich  Li Li
Dora Angelaki  Andre Fenton  Sukbin Lim
Jayeeta Basu  Jon Freeman  Larry Maloney
Gyorgy Buzsaki  Paul Glimcher  Denis Pelli
Xinying Cai  Todd Gureckis  Bijan Pesaran
Marisa Carrasco  Catherine Hartley  David Poeppel
F. Xavier Castellanos  Biyu He  David Schneider
Christine Constantinople  Wei Ji Ma  Xing Tian
Clayton Curtis  Roozbeh Kiani  Xiao-Jing Wang
Zoe (Xiaowei) Dong  Michael Landy  Jonathan Winawer
Decreased grey matter volume (GMV) in the right posterior parietal cortex (rPPC) is associated with increased age and decreased risk tolerance (top). When controlling for age, only decreased GMV in the rPPC modulates risk preference (bottom; Glimcher lab).

Select Recent Publications


Glimcher lab (2018). The computational form of craving is a selective multiplication of economic value. PNAS.

Learning, Memory, and Development

Neuroplasticity can account for much of learning, memory and development. Neuroscientists at NYU are studying how we learn and remember information over time using a myriad of approaches, including electrophysiology, imaging, and genetic sequencing and manipulations.

Intracellular recording from serotonergic (5HT) neurons that respond to sensitizing stimuli that induce memory formation (Carew lab)

Faculty

Karen Adolph  Zoe (Xiaowei) Dong  Arjun Masurkar  
Cristina Alberini  Jeffrey Erlich  Anthony Movshon  
Dora Angelaki  Andre Fenton  Dan Sanes  
Chiye Aoki  Robert Froemke  Cristina Savin  
Jayeeta Basu  Catherine Hartley  David Schoppik  
Gyorgy Buzsaki  Wen-Biao Gan  Greg Suh  
Thomas Carew  Paul Glimcher  Regina Sullivan  
Kenneth Carr  Todd Gureckis  Wendy Suzuki  
Adam Carter  Lynne Kiorpes  Xing Tian  
F. Xavier Castellanos  Eric Klann  Richard Tsien  
Moses Chao  Joseph LeDoux  Xiao-Jing Wang  
Clayton Curtis  Sukbin Lim  Donald Wilson  
Jeremy Dasen  Michael Long  Jonathan Winawer  
Claude Desplan  Wei Ji Ma  Yongdi Zhou

DC 12/14/2020
Learning, Memory, and Development

Depth profile of theta-nested gamma oscillations (Buzsaki lab)

Select Recent Publications


Emotions are complex physiological and psychological states that drive many of our actions and behaviors. Researchers at NYU investigate how emotions arise and impact behavior using many different approaches, including genetic engineering, tracing, and functional magnetic resonance imaging techniques.

fMRI BOLD responses during late Avoidance/Extinction (Hartley lab).

Faculty

Cristina Alberini
David Amodio
Chiye Aoki
Jayeeta Basu
Justin Blau
Gyorgy Buzsaki
Kenneth Carr
Marisa Carrasco
Adam Carter
F. Xavier Castellanos
Zoe (Xiaowei) Dong

Jeffrey Erlich
Andre Fenton
Jon Freeman
Robert Froemke
Wen-Biao Gan
Paul Glimcher
Catherine Hartley
Biyu He
Eric Klann
Joseph LeDoux
Dayu Lin

Katherine Nagel
Margaret Rice
Helen Scharfman
Nicholas Stavropoulos
Greg Suh
Regina Sullivan
Wendy Suzuki
Nicolas Tritsch
Jing Wang
Donald Wilson
**Emotions and Behavioral States**

Esr1+ neurons in the VMHvl region of the hypothalamus are preferentially activated during (A) fighting and (B) mating in female mice. (Lin lab).

**Select Recent Publications**


Disorders

In addition to normal behavior, it is important to understand disorders of the nervous systems, such as neurodegenerative and neurodevelopmental disorders. Researchers at NYU are investigating these questions at various systems levels and with different models.

Spine density is decreased in select regions of the dendritic tree in Lrp4 mutant mice, a model of neuromuscular disorders (Burden lab)

Faculty

<table>
<thead>
<tr>
<th>Chiye Aoki</th>
<th>David Heeger</th>
<th>James Salzer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steven Burden</td>
<td>Lynne Kiorpes</td>
<td>Neville Sanjana</td>
</tr>
<tr>
<td>Gyorgy Buzsaki</td>
<td>Eric Klann</td>
<td>Helen Scharfman</td>
</tr>
<tr>
<td>Kenneth Carr</td>
<td>Joseph LeDoux</td>
<td>Einar Sigurdsson</td>
</tr>
<tr>
<td>F. Xavier Castellanos</td>
<td>Efrat Levy</td>
<td>Nicholas Stavropoulos</td>
</tr>
<tr>
<td>Moses Chao</td>
<td>Li Li</td>
<td>Regina Sullivan</td>
</tr>
<tr>
<td>Aravinda Chakravarti</td>
<td>Shane Liddelow</td>
<td>Dirk Trauner</td>
</tr>
<tr>
<td>Andre Fenton</td>
<td>Arjun Masurkar</td>
<td>Nicolas Tritsch</td>
</tr>
<tr>
<td>Wen-Biao Gan</td>
<td>Paul Mathews</td>
<td>Richard Tsien</td>
</tr>
<tr>
<td>Jorge Ghiso</td>
<td>Ralph Nixon</td>
<td>Daniel Turnbull</td>
</tr>
<tr>
<td>Stephen Ginsberg</td>
<td>Dimitris Placantonakis</td>
<td>Jing Wang</td>
</tr>
<tr>
<td>Paul Glimcher</td>
<td>Margaret Rice</td>
<td>Donald Wilson</td>
</tr>
<tr>
<td>Donald Goff</td>
<td>Niels Ringstad</td>
<td>Thomas Wisniewski</td>
</tr>
</tbody>
</table>
Disorders

Phosphorylated ribosomal S6 protein (red) in the hippocampus of fragile X syndrome model mice (Klann lab)

Select Recent Publications


Ringstad lab (2018). Antagonistic regulation of trafficking to Caenorhabditis elegans sensory cilia by a retinal degeneration 3 homolog and retromer. PNAS.
Computational modeling can help us to understand and make predictions about molecules, cells, circuits, systems, cognition, and behavior. Often working in parallel with experimentalists, computational neuroscientists continually refine their models and make testable predictions about how the brain works.

Biologically plausible network for blind source separation (Chklovskii lab)

Faculty

Dora Angelaki
Richard Bonneau
Gyorgy Buzsaki
Dmitri Chklovskii
Christine Constantinople
Andre Fenton
Davi Geiger
Paul Glimcher
Todd Gureckis
Biyu He

David Heeger
Yann LeCun
Sukbin Lim
Michael Long
Wei Ji Ma
Anthony Movshon
Katherine Nagel
Bijan Pesaran
Charles Peskin
Alex Reyes

Dmitry Rinberg
John Rinzel
Cristina Savin
David Schoppik
Robert Shapley
Michael Shelley
Eero Simoncelli
Daniel Tranchina
Xiao-Jing Wang
Lai-Sang Young
Computation

Distinguishing four theoretical model network mechanisms for population coding and dynamics. A) Example activity for one neural unit. (B) Correlation of population state (sensory is orange, memory purple) over time. (C) Delay-activity state-specific trajectories (Wang lab)

Select Recent publications


The NYU Neuroscience Community

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

Weekly **Joint Neuroscience Colloquia** are a fundamental component of the community, featuring esteemed neuroscientists from around the world. Students have the opportunity to informally meet with invited speakers.

The **Swartz Seminar Series** promotes the theoretical neuroscience community at NYU by inviting distinguished computational and theoretical neuroscientists to speak about their research.

**Annual Neuroscience Retreats** bring together faculty and students for a multi-day scientific meeting focused on fostering new collaborations and showcasing the cutting edge work of the neuroscience community.

Other events like **Weekly Group Meeting and Fellows’ Seminars** highlight our students’ research in progress, giving them an opportunity to present their research and receive valuable input.

In the **Growing up in Science** series faculty members share their stories about becoming and being scientists to foster an open dialogue about the often unspoken human factors in academia.
The NYU Neuroscience Community

**NOGN: The Neuroscience Outreach Group at NYU** brings the brain to the city by visiting classrooms, hosting public events, and partnering with local educational and cultural institutions.

**NeuWrite** integrates the Scientific and Science Communication communities through events, talks, and a monthly workshop in order to create excellent and compelling science journalism and art.

The **NYU Biotech Association** hosts events that focus on applications of biomedical science in industry, business, law, and translational research.

The **NYU STEP** program is an NIH-funded series that helps graduate student and postdoc trainees identify career goals and provides resources needed to pursue them.

**ScAAN: Scientist Action and Advocacy Network** is a NYU-based group of scientists that partners with organizations that are creating positive social change.
A Selection of Current NYU Neuroscience Students

**Rachel Kim** (BA, Barnard College) is a 2nd year student in the Liddelow lab studying molecular mechanisms of A2 reactive astrocyte induction and function.

**Nikhil Parthasarathy** (BS/MS, Stanford University) is a 2nd year student in the Simoncelli lab using computation and theory to build better models of mid-level visual processing.

**Billy Broderick** (BA, Oberlin College) is a 3rd year student in the Winawer and Simoncelli labs using fMRI and computation to study low-level vision in the human brain.

**Margot Elmaleh** (BS, Brown University) is a 3rd year graduate student in the Long Lab investigating song production circuitry during sleep.

**Janelle Miranda-Fajardo** (BS, UPR - Rio Piedras) is a 4th year student in the Alberini Lab investigating the mechanisms of memory formation during early development.

**Andrew Matheson** (BSc, McGill University) is a 4th year student in the Nagel Lab and is investigating the neural circuits underlying olfactory navigation in Drosophila.

**Daniel Levenstein** (MS, Cornell University) is a 5th year student in the Buszaki and Rinzel Labs creating dynamical models of how neural activity is coordinated during sleep.

**Katie Eyring** (BA, Wellesley College) is a 5th year graduate student working in the Tsien Lab on the mechanisms and functions of short-term plasticity.
NYU Neuroscience Students By the Numbers

2018 Incoming Class

61% female

22% international

Graduate Student Publications

1.4 first author papers

3.0 publications

12% students who publish rotation work

Alumni Placement

- Science
- Medicine
- Other
- Academia

Training Program Stats

116 training faculty

121 students

38 current students with fellowships

5.5 years to degree

DC 12/14/2020
A Selection of NYU Neuroscience Alumni

**Emre Aksay**, PhD ’01, is an Associate Professor at Weill Cornell, and he investigates the molecular, cellular, and circuit mechanisms of temporal integration in neurons.

**Nicole Rust**, PhD ’04, is an Associate Professor at the University of Pennsylvania studying how the brain stores visual memories and recognizes objects.

**Jonathan Pillow**, PhD ’05, is an Associate Professor in Psychology and the Princeton Neuroscience Institute at Princeton University. His research focuses on neural coding and statistical analysis methods for large neural datasets.

**Alexander Jaworski**, PhD ’06, is an Assistant Professor at Brown University studying how the complex wiring pattern of the brain is established during embryonic development.

**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.

**Bianca Jones Marlin**, PhD ’14, is a postdoctoral fellow with Richard Axel at Columbia University, where she investigates the role of cognitive flexibility in innate behaviors.

**Thu Huynh**, PhD ’15 is a postdoctoral fellow with Conor Liston at Weill Cornell Medicine investigating prefrontal microcircuit mechanisms underlying extinction memory formation using novel methods of calcium imaging.

**Georg Kosche**, PhD’16, is a postdoctoral fellow with Botand Roska at the Friedrich Miescher Institute investigating the structure and function of neural circuits.
A Selection of NYU Neuroscience Alumni
NYU and Living in NYC

Neuroscience faculty can be found in more than a dozen academic departments at NYU. Labs are located on both the NYU Grossman School of Medicine campus and the Washington Square campus (see the map below) as well as at the nearby Nathan S. Kline Institute for Psychiatric Research. Free shuttles provide easy access to both campuses and other areas of the city. NYC public transportation is also very convenient, and Citibikes are easy to find on both 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.
Students receive full support throughout their tenure in graduate school so that they can devote themselves full time to their studies. Support comes from the University, a number of training grants, as well as research grants. The program also trains students in the art of grant writing, and many successfully secure fellowships from the NIH, NSF, and other sources.

To assist students, NYU provides housing benefits that offset the cost of living in New York City. Neuroscience students have access to subsidized apartments, either through the School of Medicine’s Housing Services or through the MacCracken program.
Apply to NYU Neuroscience

Applications for the Doctoral Program in Neural Science (based in the Graduate School of Arts and Sciences Center for Neural Science, and NYU Shanghai’s Institute of Brain and Cognitive Science) and Graduate Program in Neuroscience & Physiology (based in the School of Medicine’s Vilcek Institute) are jointly reviewed by a single admissions committee. To learn more about NYU Neuroscience and to access our application, visit us online.

To apply, visit neuroscience.nyu.edu.

The application deadline for Fall 2021 is December 1, 2021.

Contact Us

Graduate Program Directors
Niels Ringstad
niels.ringstad@nyulangone.org

Michael Hawken
michael.hawken@nyu.edu

Academic Administrators
Heather McKellar
heather.mckellar@nyulangone.org

Jess Holman
jess.holman@nyu.edu