The University of Texas Graduate School of Biomedical Sciences (GSBS) at Houston is a joint venture of UTHouston and The University of Texas MD Anderson Cancer Center (MDA) offers Ph.D. and M.S. degrees in Neuroscience. The Graduate Program in Neuroscience was started in 1978. Its purpose is to provide high quality training opportunities in a variety of scientific disciplines associated with understanding the function and diseases of the nervous system. Areas of research concentration within the Program include cellular, molecular, systems, computational, and visual neuroscience. There are approximately 50 GSBS faculty members and 35 graduate students representing sixteen departments of UTHouston and MD Anderson currently in The Neuroscience Graduate Program.

All Neuroscience Program Ph.D. students receive full financial support throughout their training, which includes tuition, fees and stipend. Annual competitive awards are also available for outstanding research projects and posters, and to support student travel to scientific meetings. For more information please visit neurograd.org.

**Program Overview**

*Image below:* Immunofluorescence labeling of neurons derived from H1 human embryonic stem cells (hESCs). Beta-tubulin (Tuj1 red) labels both immature and mature neurons. Nuclei (blue) are stained by DAPI. J. Wu

**Program Activities**

- Student organized journal club. Students present a paper of their choice followed by a discussion. At the end of each year, two students are awarded prizes for their presentation skills.

- Neurobiology Seminar Series features invited speakers from around the country. Students have the opportunity to eat lunch with the speakers.

- Teaching assistant opportunities are offered throughout the year for students who would like to learn how to teach and get hands-on experience teaching.

- Each month a lab in the Program presents their data as part of the Lab Update Series. Because our Program has so many labs spread all around the Medical Center this allows labs to update each other on their current activities.

- Retreats are held annually. Alumni speakers, student talks, and a student poster session take place in a relaxed atmosphere.

- Outreach volunteer opportunities are offered throughout the year through the GSBS as well as other programs like the Neuroscience Research Center.

- Annual program picnic/socials are events in which faculty and students have the opportunity to socialize.

- Annual research poster sessions are held multiple times each year. Students have the chance to win cash prizes along with travel awards.

*Images left to right:* Artistically rendered fly adult brain K. Venkatachalam
Peripheral sensory neurons in larvae (multidendritic neurons) K. Venkatachalam
Program Tracks

Because the field of neuroscience is so large, we have separated our Program into four tracks to better reflect the breadth of the field and the different training required to prepare students for different aspects of neuroscience research, as well as the strength of faculty in The Neuroscience Program.

Cellular & Molecular Neuroscience Track
The goal of the Cellular and Molecular Neuroscience track is to train students on approaches to understanding neuronal function by integrating biochemical, physiological, cellular, and molecular biological approaches. Areas of focus include: synapse formation and plasticity, protein trafficking, signal transduction, neuropsychiatric and neurodegenerative disorders, and neuronal development/injury.

Cognitive & Systems Neuroscience Track
The goal of the Cognitive and Systems Neuroscience track is to train students to bridge the diverse range of approaches and techniques required to investigate the brain mechanisms for complex behavioral phenomena such as learning, memory, attention, language, cognition, emotion, sensation perception, and movement.

Theoretical & Computational Neuroscience Track
The goal of the Theoretical and Computational Neuroscience track is focused on the broad range of computational and analytical skills essential to understand the organization and function of complex neural systems.

Visual Neuroscience Track
The goal of the Visual Neuroscience track is to provide an interdisciplinary training environment in vision research. Areas of focus include molecular, developmental, cellular and structural biology, plasticity, circadian biology, experimental pathology, electrophysiology, imaging, and computational modeling.

Doctoral Program Requirements

Students must complete the following requirements to obtain the Degree of Doctor of Philosophy with a specialization in Neuroscience:

Research Rotations: First-year students obtain hands-on research experience by participating in Research Tutorial Rotations in three different laboratories.

Coursework: All students in the Neuroscience Program are required to take four Program Core Courses and complete three research rotations. Also required are Scientific Writing, Ethical Dimensions of Biomedical Science, Neuroanatomy, and advanced courses the topics of which depend on the program track pursued. Core Courses must be taken for credit and a grade of “B” or better must be obtained.

Advancement to Candidacy Exam: The Advancement to Candidacy Exam is taken by the end of the student’s second year.

Defense of Dissertation: The Defense of Dissertation consists of two parts. A public presentation of the dissertation work, followed by public discussion and an oral defense, in a closed session, with the student’s advisory committee.

Coursework

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<th>First Year</th>
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<td>• Foundations of Biomedical Research</td>
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<td>• Ethical Dimensions of Biomedical Science</td>
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<td>• Systems Neuroscience</td>
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<td>• Cognitive Neuroscience</td>
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<td>• Scientific Writing</td>
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<th>Summer</th>
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<td>• Statistics (online)</td>
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Advanced coursework will vary depending on your Program Track and recommendation of your advisory committee.
Jaroslaw Aronowski, Ph.D. Neurology
Neuropharmacology and laboratory models of ischemic stroke and intracerebral hemorrhage

Andrew Bean, Ph.D. Neurobiology & Anatomy • Molecular Mechanisms of Endocytosis

Michael Beauchamp, Ph.D. Neurobiology & Anatomy • Human Brain Mechanisms for Multisensory Integration and Perception

Raymond Cho, M.D., M.Sc. Psychiatry & Behavioral Sciences • Cognitive control, brain oscillations, neuromodulation, EEG/MEG, MRI, computational modeling, neurostimulation (tDCS, tACS, TMS), schizophrenia, bipolar disorder
Nicholas Justice, Ph.D. Institute of Molecular Medicine • Mechanisms of CRF system perturbation in Alzheimer’s Disease

Michael Beierlein, Ph.D. Neurobiology & Anatomy • Synaptic and Local Circuit Dynamics in the Thalamocortical System

John Byrne, Ph.D. Neurobiology & Anatomy • Neural and Molecular Bases of Learning and Memory

Nachum Dafny, Ph.D. Neurobiology & Anatomy • Mechanisms of Pain, Pain Suppression, Stress and Drugs of Abuse

Robert Danzer, Ph.D. Symptom Biology (MDACC) • Behavioral and psychopathological consequences of the effects of cancer therapy on the brain

Pramod Dash, Ph.D. Neurobiology & Anatomy • Mechanisms of Memory Formation and Memory Dysfunction

Patrick Dougherty, Ph.D. Anesthesiology & Pain Management (MDACC) • Neurobiology, neurophysiology and neuropharmacology of the spinal dorsal horn

Valentin Dragoi, Ph.D. Neurobiology & Anatomy • Cortical Mechanisms of Visual Behavior

Daniel Felleman, Ph.D. Neurobiology & Anatomy • Organization, Function, and Plasticity of Primate Cerebral Cortex

Myriam Fornage, Ph.D. Research Center for Human Genetics • Genetic basis of cardiovascular disease

Michael Galko, Ph.D. Biochemistry & Molecular Biology (MDACC) • Drosophila genetics; molecular genetics of tissue repair; cell migration, signaling and signal transduction; pain sensitization

Nicholas Justice, Ph.D. Institute of Molecular Medicine • Mechanisms of CRF system perturbation in Alzheimer’s Disease

Vasanthi Jayaraman, Ph.D. Biochemistry & Molecular Biology • Regulation of the structure of membrane proteins

Scott Lane, Ph.D. Psychiatry & Behavioral Sciences • Substance Use Disorders, Antisocial Personality Disorder

Vidya Gopalakrishnan, Ph.D. Pediatrics (MDACC) • Therapeutic targets for medulloblastoma

Raymond Grill, Ph.D. Integrative Biology & Pharmacology • Spinal Cord Injury: Acute and Chronic Inflammation

Howard Gutstein, Ph.D. Anesthesiology & Pain Medicine/Genetics (MDACC) • Translational studies of pain and analgesia

Ruth Heidelberger, M.D., Ph.D. Neurobiology & Anatomy • Mechanisms of Neurotransmitter Release

Roger Janz, Ph.D. Neurobiology & Anatomy • Synaptic Vesicle Proteins as Regulators of Neurotransmitter Release

Annemieke Kavelaars, Ph.D. Symptom Research CAO (MDACC) • Pathophysiology of cancer therapy-induced physiological/behavioral toxicity

Faculty Research Interest

Images left to right: 1st image: Channelrhodopsin-expressing cholinergic axons from the basal forebrain labeled by GFP (green) target the thalamic reticular nucleus (TRN, labeled red) but not the ventral posteromedial nucleus of the thalamus (VB). M. Beierlein. 2nd image: Illustration from: Protein Trafficking in Neurons, ed. A.J. Bean, London, UK: Elsevier Academic Press. 2006. 3rd image: S. Massey and S. Mills Journal of Comparative Neurology Image to left: Marine mollusc Aplysia, a useful model system for analyzing the neural and molecular mechanisms of memory. J.H. Byrne
Yin Liu, Ph.D. Neurobiology & Anatomy • Computational Biology and BioInformatics

David Marshak, Ph.D. Neurobiology & Anatomy • Structure and Function of Primate Retinal Neurons

Stephen Massey, Ph.D. Ophthalmology & Visual Science • Neuronal circuitry of the retina

Stephen Mills, Ph.D. Ophthalmology & Visual Science • Retinal circuit physiology and function

Ines Moreno-Gonzalez, Ph.D. Neurology • Analysis of risk factors of Alzheimer's disease, including smoking, consumption of meat, and comorbidity (type 2 diabetes, amyotrophic lateral sclerosis, traumatic brain injury, and stroke)

Shin Nagayama, Ph.D., Neurobiology & Anatomy • Neuronal and network dynamics in the olfactory system

Ponnada Narayana, Ph.D. Diagnostic & Interventional Imaging • Development and application of advanced magnetic resonance imaging (MRI) techniques

John O’Brien, Ph.D. Ophthalmology & Visual Science • Molecular mechanisms that control network adaptation in the retina

Christophe Ribelayga, Ph.D. Ophthalmology & Visual Science • Retinal image processing and light/dark adaptation

Sean Savitz, M.D. Neurology • Developing novel therapies for ischemic stroke

Agnes Schonbrunn, Ph.D. Integrative Biology & Pharmacology • Somatostatin receptor signaling and regulation

Anne Sereno, Ph.D. Neurobiology & Anatomy • Higher Cognitive Functions of Attention, Short-Term Memory, and Eye Movement programming

Harel Shouval, Ph.D. Neurobiology & Anatomy • Theoretical/computational approaches to understanding synaptic plasticity and its role in learning, memory and development

Laura Smith Callahan, Ph.D. Neurosurgery & Center for Stem Cell and Regenerative Medicine • Developing tissue engineering approaches toward clinical treatments for spinal cord injury, traumatic brain injury and cartilage defects

Jair Soares, M.D. Psychiatry & Behavioral Sciences • Clinical research in the field of mood disorders

Eric Swindell, Ph.D. Pediatrics • Development of the vertebrate forebrain and eye

Qingchun Tong, Ph.D. Center for Obesity and Diabetes • Neurocircuitry in the brain controls feeding, energy expenditure and glucose homeostasis

Andrey S. Tsvetkov, Ph.D., Neurobiology and Anatomy • Molecular Mechanisms of Neuronal Autophagy

Kartik Venkatachalam, Ph.D. Integrative Biology & Pharmacology • Signal Transduction in the Nervous System

Edgar Walters, Ph.D. Integrative Biology & Pharmacology • Nociceptor memory and chronic pain

M. Neal Waxham, Ph.D. Neurobiology & Anatomy • Molecules Responsible For the Formulation and Storage of Memories

Jack Waymire, Ph.D. Neurobiology & Anatomy • Plasticity of Neurotransmitter Biosynthesis

Anthony Wright, Ph.D. Neurobiology & Anatomy • Learning and Cognition

Jiakian Wu, Ph.D. Neurosurgery • Gene transcription and regulatory mechanisms governing neural differentiation

Ying Xia, M.D., Ph.D. Neurosurgery • Hypoxic dysfunction in cortical neurons

Jiusheng Yan, Ph.D. Anesthesiology and Perioperative Medicine (MDACC) • Structure, function and regulation of mammalian ion channels

Sheng Zhang, Ph.D. Institute of Molecular Medicine/ Lab Research • Mechanisms underlying neuronal degenerative disorders

Image below: Localization of SAP102 and Syntaxin 3B (Syn3B) in the outer plexiform layer (OPL). A single B-type horizontal cell (HC) was dye injected with Neurobiotin (red). A horizontal section showing SAP102 immunoreactivity (blue) was localized to tips of B-type HCs. Syn3B-positive (green) photoreceptor terminals exist in precise register with SAP102 immureactive B-type HC processes. A. Vila and C. M. Whitaker

MD/Ph.D. Students Affiliated with the Neuroscience Program

1. Students are required to form an Advisory Committee and meet every six months.
2. Some Core Courses may be required if advised by your committee.
3. The candidacy exam must be completed by the end of the second year of graduate study. Students are required to take Ethics and two follow up on-line modules prior to petitioning for the candidacy exam.
About the Graduate School

The University of Texas Graduate School of Biomedical Sciences at Houston (GSBS) is a unique partnership between the University of Texas MD Anderson Cancer Center and UTHealth, institutions that are leading the fight against cancer and other major diseases that impact human health and quality of life. Graduate studies under a GSBS faculty mentor will provide students with training in the most significant areas of the biomedical sciences, including research to improve understanding of disease mechanisms at molecular, genetic, cellular and systems levels, and approaches to develop novel targeted therapies for human disease. GSBS is located in the Texas Medical Center, one of the world's largest biomedical education and research facilities. Many of our research programs are ranked in the top quarter in their discipline by the National Research Council.

gsbs.uth.edu

Images top to bottom: Neuroscience Research Center Annual Poster Session
Neuroscience Graduate Program Retreat Poster Completion
Brain Night for Children at the Health Museum
Neuroscience Graduate Program Retreat
About UT Houston

As a comprehensive health science university, the mission of The University of Texas Health Science Center at Houston is to educate health science professionals, discover and translate advances in the biomedical and social sciences, and model the best practices in clinical care and public health.

We pursue this mission in order to advance the quality of human life by enhancing the diagnosis, treatment, and prevention of disease and injury, as well as promoting individual health and community well-being.

uthouston.edu

About MD Anderson

The University of Texas MD Anderson Cancer Center is recognized internationally as a worldwide leader in cancer research, treatment, prevention and education, and offers outstanding opportunities for students beginning their careers in the biomedical sciences.

mdanderson.org

How to Apply

Students interested in the Neuroscience Program must first apply and be admitted by the GSBS. Unlike other graduate schools, students apply to the GSBS not individual departments or programs. Students affiliate with programs at end of the first year and after completing three 10 week research tutorial rotations in laboratories.

Visit https://gsbs.uth.edu/future-students/admissions/ for more information on admission to the GSBS.

City of Houston

Houston, the fourth largest city in the nation, is located on a coastal plain fifty miles from the Gulf of Mexico with a southern climate. Houston is a modern dynamic city, rich in cultural diversity that reflects its multiethnic mix.

Houston has emerged as a cultural center for the Southwest. It is home to the Houston Ballet Company, the Houston Symphony, the Houston Grand Opera and the Alley Theater. The Museum of Fine Arts, the Contemporary Arts Museum and the Houston Museum of Natural Science all offer outstanding exhibitions. Numerous smaller museums and art galleries can be found in the Museum District, one mile north of the Texas Medical Center.

Sports enthusiasts can take advantage of professional sports action year round. Houston is home to four professional sports teams, NFL Texans (football), MLS Dynamo (soccer), NBA Rockets (basketball), MLB Astros (baseball). In addition, Houston's close proximity to the Gulf of Mexico, Galveston Bay (fifty miles) and local lakes provides access to a full range of water sports activities.

Among the major metropolitan areas of the country, Houston has one of the lowest costs of living. In addition, the diversity and breadth of the city's economy provides a wide array of job opportunities for spouses and family members. Low housing costs and friendly people combine to make this a desirable city in which to relocate.
Contact Information

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Neuroscience Graduate Program

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