The Michigan State University Neuroscience Ph.D. Program offers world-class research and unparalleled education paired with outstanding mentors and a highly collaborative environment. The program provides a wide range of research opportunities for our students that covers molecules to man.

In the Neuroscience Program at MSU, graduate students work closely with researchers with a variety of interests and skills. Faculty are able to teach the latest research techniques and help students refine their research ideas. They also help students enhance communication skills, improving the ability to explain research findings to others. Students first present at Program events, surrounded by their mentors and colleagues, but soon many students find they are ready to present on an international stage at annual conferences. Students will learn the importance of testing their ideas widely and the rewards that come with having ideas accepted by other scientists.

Numerous opportunities exist for students in the MSU Neuroscience Program. Prominent neuroscientists from around the country visit frequently as part of the Neuroscience Program weekly seminar series, and students are able to meet with them and discuss current research findings and ideas. The Neuroscience Program and MSU Graduate School also provide frequent events to help with professional development. Additionally, the Neuroscience Program students and faculty take great pride in their outreach efforts, and volunteers are always needed to bring neuroscience to the public.

Thank you for taking time to find out more about the MSU Neuroscience Program.
Spartans work every day to advance the common good in uncommon ways. We teach. We explore and we discover. We collaborate and lead. We innovate, inspire, and empower. We achieve our potential and create circumstances that help our students and others achieve theirs.

We’re good at it, and we’ve been at it for more than 150 years.

The nation’s pioneer land-grant university, MSU began as a bold experiment that democratized higher education and helped bring science and innovation into everyday life. The revolutionary concept became a model for the nation.

Today, MSU is one of the top research universities in the world—on one of the biggest, greenest campuses in the nation. We’re a diverse community of dedicated students and scholars, athletes and artists, scientists and leaders.

Working side by side on campus and in communities around the world, we’re helping ensure safe food and water supplies, developing lifesaving vaccines, improving math and science education for students nationwide, and advancing alternative energy technologies.

MSU also is home to top-ranked graduate programs and world-leading research centers that attract an international community of scientists and graduate students.

MSU’s East Lansing campus—one of the largest in the United States—is home to a vibrant and diverse community of undergraduate and graduate students, as well as renowned scholars and scientists from around the globe. It’s a hub for international programs, centers, and events and worldwide partnerships.

Through programs that are not only interdisciplinary but intercontinental, MSU students and scholars, scientists, and leaders are at work.

Together, we’re building on our legacy of empowerment and making the world a better, safer, more hopeful place.
SPARTANS,
PREPARE FOR GLORY!

HOW TO APPLY
Application deadline: December 5 of each year. Admission is normally made only for fall semester.

For consideration, submit the following materials:
- The MSU Application for Graduate Study
- The application fee of $50
- A personal statement
- Transcripts
- Official copy of GRE scores
- Three letters of recommendation
- Attend the Neuroscience Program Interview Weekend
- Official copy of TOEFL scores - International applicants only

More information can be found on our website.

HOW TO PREPARE
To improve your chances of getting accepted:
- Do well in undergraduate courses
- Form close relationships with individuals who are in a position to write recommendation letters
- Do well on the GRE
- Get laboratory research experience

To improve your success after admission:
- Determine your interests. You will be investing a lot of time on this degree and it should be in an area of neuroscience that you are really excited about.
- Talk with experienced graduate students. Their experience and mistakes can help guide you.
- Work hard during your laboratory rotations. Faculty want to know that you like working in the lab and are able to think through problems and provide solutions.
LIFE AS A GRADUATE STUDENT

FIRST YEAR
- Semester-long rotations in labs you are interested in for your thesis work
- Completion of three core classes: Physiology and Pharmacology of Excitable Cells, Systems Neuroscience, and Methods in Neuroscience Laboratory

SECOND YEAR
- Decide where you will do your thesis work
- Completion of core classes: Advanced Behavioral Neuroscience, Molecular & Developmental Neurobiology, and Statistics for the Biological Sciences
- Teaching experience
- Form dissertation guidance committee
- Completion of the comprehensive exam

THIRD YEAR
- Thesis proposal
- Thesis work

FOURTH AND FIFTH YEARS
- Continue thesis work
- Thesis defense

FINANCIAL SUPPORT
All students in good standing are supported throughout their plan of study. Students are supported during the first year by the Neuroscience Program and during subsequent years by research grants, teaching assistantships, or individual fellowships. The stipend for students that entered in 2012 was approximately $22,000. In addition to the stipend, assistantships and fellowships include a full tuition credit waiver and health care benefits.

WHAT TO EXPECT
What can I do with a degree in Neuroscience?

The Neuroscience Program at Michigan State University recognizes that this question is often on the minds of our applicants. Neuroscientists can and have put their research and problem-solving skills to work in a number of industries. A degree in neuroscience can open up a number of career paths.

- Graduate school
- Medical school
- Vet school
- Dental school
- Pharmaceutical industry
- Laboratory technician / administrator

- K-12 education
- Science journalism
- Grants administration
- Consulting
- Law
- Public policy

Research Interests include:
- Autonomic nervous system function
- Neural development and plasticity
- Neural imaging
- Neural mechanisms of behavior
- Neurodegenerative disease
- Neuroendocrinology
- Sensory and motor systems
- Synaptic transmission
- Signal transduction
- Intracellular metabolism
- Evolution

Current Approaches Include:
- Cre-Lox animal models
- Electrophysiology
- Functional magnetic resonance imaging
- Gene therapy
- Computational modeling
- Animal behavior
- Neuroimaging
- Optogenetics
- Live confocal imaging
**FROM THE FIRST COURSE TO THE DISSERTATION DEFENSE**

**Curriculum**

**Required core courses**
- Physiology and Pharmacology of Excitable Cells (NEU 827)
- Systems Neuroscience (NEU 839)
- Advanced Behavioral Neuroscience (NEU 811)
- Molecular and Developmental Neurobiology (NEU 804)
- Statistics for the Biological Sciences (PHM 830 or PSY 815)
- Methods in Neuroscience Laboratory (NEU 806)
- Research Forum (NEU 800)

**Electives**
- Vertebrate Neural Systems (ANT 885)
- Synaptic Transmission (PHM 810)
- Developmental Psychobiology (PSY 809)
- Neuropsychology (PSY 851)
- Principles of Drug-Tissue Interaction (PHM 819)
- Confocal Microscopy (NSC 837)
- Writing and Manuscript Preparation in the Neural and Behavioral Sciences (PSY 992)

**Lab Rotations:** First year students participate in two laboratory rotations, each one semester in duration. Students normally choose a Ph.D. mentor after the 2nd rotation.

**Neuroscience Program Responsible Conduct of Research Series:** NSP students are required to attend 7 workshops offered by the Graduate School.

**Neuroscience Program Retreat:** Each year, the Neuroscience Program holds a retreat for all faculty, students and postdocs to welcome incoming students and to share data and ideas generated over the course of the summer.

**Teaching:** All students in the Program are expected to work as a teaching assistant for one semester during their second year of study.

**Comprehensive Exams, Thesis Defense, and Dissertation**
WORKSHOPS AND SEMINARS
AND OUTREACH, OH MY!

Seminar Series: Meet visiting prominent neuroscientists from around the country

Career Development:
- NSP Research Forum: Learn skills such as grant writing, teaching, and scientific ethics
- PREP workshops (Graduate School): Designed to help you plan for a successful doctoral experience and a smooth transition into your future role in academia, government, industry, corporations, or agencies
- Certification in college teaching (Graduate School): Helps graduate students organize, develop, and document their teaching experiences.

Women in Science Seminar

Travel: Present at regional, national, and international scientific meetings

Social Events: Neuroscience retreat, and other social and networking events

OUTREACH
The NSP faculty and graduate students take great pride in their outreach efforts.

Brain Bee at MSU: The Brain Bee at MSU is an exciting, live Q&A competition that challenges high school students on their knowledge of neuroscience facts. Topics covered include: intelligence, memory, emotions, sensations, movement, stress, aging, sleep, addiction, Alzheimer’s, and stroke.

Neuroscience Fair: Teachers, students, and parents are able to experience neuroscience first hand and hear from local celebrities in neuroscience. Experience cool neuroscience activities including hearing and seeing real neurons fire, learning how our senses can be tricked, and even touching a real human brain!

Brain Awareness Week: Brain Awareness Week occurs in March, and Neuroscience Program volunteers visit local elementary, middle, and high schools to promote neuroscience education to young students. Activities range from presentations to mini-experiments to seeing (and touching) real animal and human brains.

neuroscience.msu.edu
## FACULTY AND THEIR RESEARCH INTERESTS

<table>
<thead>
<tr>
<th>Faculty Name</th>
<th>Title and Affiliations</th>
<th>Research Interests</th>
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<tbody>
<tr>
<td>William D. Atchison, Ph.D.</td>
<td>Professor of Pharmacology &amp; Toxicology. Neuroneurotransmitter release and synaptic transmission; models of human neuromuscular disorders of peripheral and central neurotransmission, chemical neurotoxicity, ion channel pharmacology.</td>
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<tr>
<td>Andrea Bozoki, M.D.</td>
<td>Assistant Professor of Neurology &amp; Ophthalmology and Radiology. Effects of aging and dementia on the memory networks of the brain, using functional magnetic resonance imaging (fMRI) and diffusion tensor imaging (DTI).</td>
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<tr>
<td>S. Marc Breedlove, Ph.D.</td>
<td>Barnett Rosenberg Professor of Neuroscience, Professor of Psychology and Zoology. Effects of steroids on the organization and activation of plasticity in the nervous system.</td>
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<tr>
<td>Soo-Eun Chang, Ph.D.</td>
<td>Assistant Professor of Communicative Sciences &amp; Disorders. Neural bases of speech perception and production, sexual dimorphism of brain development underlying chronic developmental stuttering, functional and structural neuroimaging.</td>
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<tr>
<td>Timothy J. Collier, Ph.D.</td>
<td>Professor of Translational Science &amp; Molecular Medicine. Models of Parkinson’s disease to study mechanisms of degeneration and therapeutics; neurobiology of aging. (Grand Rapids)</td>
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<tr>
<td>Ke Dong, Ph.D.</td>
<td>Professor of Entomology. Insect voltage-gated ion channels, interaction between ion channels and insecticides and other neurotoxins, and molecular mechanisms of insecticide resistance.</td>
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<tr>
<td>Anne McLaren Dorrance, Ph.D.</td>
<td>Associate Professor of Pharmacology &amp; Toxicology. Cerebral ischemia and cerebral vessel structure and function.</td>
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<tr>
<td>Heather L. Eisthen, Ph.D.</td>
<td>Associate Professor of Zoology. Neuroethology, comparative and developmental vertebrate neurobiology.</td>
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<tr>
<td>Kimberly Fenn, Ph.D.</td>
<td>Assistant Professor of Psychology. Acquisition and consolidation of complex skills and episodic memory.</td>
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<tr>
<td>Gregory D. Fink, Ph.D.</td>
<td>Professor of Pharmacology &amp; Toxicology. Neural control of blood pressure and body fluid homeostasis, autonomic nervous system; neuropeptides.</td>
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<tr>
<td>James J. Galligan, Ph.D.</td>
<td>Director Neuroscience Program, Professor of Pharmacology &amp; Toxicology. Neurophysiology and pharmacology of autonomic nerves.</td>
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<tr>
<td>Kathleen Gallo, Ph.D.</td>
<td>Professor of Physiology and Biochemistry &amp; Molecular Biology. Protein kinase signaling in neurodegenerative diseases.</td>
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<tr>
<td>John L. Goudreau, Ph.D., D.O.</td>
<td>Associate Professor of Pharmacology &amp; Toxicology, Neurology &amp; Ophthalmology. Genetic and Environmental Factors in the Pathogenesis of Parkinson’s Disease.</td>
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<tr>
<td>Jeremy Gray, Ph.D.</td>
<td>Associate Professor of Psychology. Individual differences in self-regulation, including creativity, intelligence, and mindfulness meditation</td>
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</tr>
<tr>
<td>Brain Gulbransen, Ph.D.</td>
<td>Assistant Professor of Physiology. Interactions between neurons and glia in the enteric nervous system.</td>
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</tbody>
</table>
Colleen C. Hegg, Ph.D., Assistant Professor of Pharmacology & Toxicology. Elucidating the mechanisms of neuroregeneration.

Jie Huang, Ph.D., Associate Professor of Radiology. Neural imaging of language processing, hyperneuronal activity in Migraine and its prevention with precision spectral filters and white matter fiber-tracking.

Alex Johnson, Ph.D., Assistant Professor of Psychology. Neuronal mechanisms of learning and motivation.

Cynthia L. Jordan, Ph.D., Professor of Psychology. Steroid regulation of cellular development; Cellular and molecular mechanisms of steroid action on behavior; Neuronal plasticity and development.

Florian A. Kagerer, Ph.D., Assistant Professor of Kinesiology. Sensorimotor integration, adaptive motor control, motor development, brain-behavior relationship.

Nicholas M. Kanaan, Ph.D., Assistant Professor of the Division of Translational Science & Molecular Medicine. Aging and neurodegenerative diseases (e.g., Alzheimer’s and Parkinson’s disease) and animal models of disease. (Grand Rapids)

Weiming Li, Ph.D., Professor of Fisheries & Wildlife and Physiology. Pheromone regulation of behavior and neuroendocrine olfaction, functional genomics.

Jack W. Lipton, Ph.D., Professor of Neurology & Ophthalmology. Developmental exposure to drugs of abuse, development of the dopamine system, etiology and experimental therapeutics of Parkinson’s disease. (Grand Rapids)

Taosheng Liu, Ph.D., Assistant Professor of Psychology. Visual perception and attention, attentional control, object recognition, neural mechanisms of perception and cognition.

Joseph S. Lonstein, Ph.D., Associate Professor of Psychology. Neural, sensory, and hormonal control of parental and emotional behaviors during lactation.

Keith J. Lookingland, Ph.D., Associate Professor of Pharmacology & Toxicology. Development of neuroprotective pharmacological agents and strategies for the treatment of dopamine neurodegenerative disorders including Parkinson’s Disease and Restless Legs Syndrome (RLS).

Fredric P. Manfredsson, Ph.D., Assistant Professor of Translational Science & Molecular Medicine. Development of virally-mediated CNS gene-therapy in the study, and treatment, of neurodegenerative disease.

Michelle Mazei-Robison, Ph.D., Assistant Professor of Physiology. Drug- and stress-induced changes in behavior, neuronal signaling, and neuronal morphology.

J. Devin McAuley, Ph.D., Associate Professor of Psychology. Auditory perception, attention, and cognition, timing and rhythm, relationship between music and language processing, computational modeling, and neuroimaging.

Kyle Miller, Ph.D., Assistant Professor of Zoology. Axonal elongation and organelle transport in neurons.

Puliyur MohanKumar, Ph.D., Associate Professor of Pathobiology & Diagnostic Investigation. Age-related changes in the activity of brain monoamines in hormone regulating nuclei of the hypothalamus.

András M. Komáromy, Ph.D., Associate Professor, Small Animal Clinical Sciences/Veterinary Medicine. Molecular and cellular mechanisms of inherited retinal and optic nerve diseases; gene therapy.

David L. Kreulen, Ph.D., Professor of Physiology and Neurology & Ophthalmology. Regulation of the sympathetic nervous system; relationships between sympathetic neuron properties and the regulation of blood vessels; interactions between sympathetic and sensory neurons.

Gina Leinninger, Ph.D., Assistant Professor of Physiology. Central regulation of feeding and other motivated behaviors.
Sheba MohanKumar, Ph.D., Assistant Professor of Pharmacology & Toxicology. Neuroimmune-endocrine interactions.

Antonio A. Nuñez, Ph.D., Professor of Psychology. Associate Dean of the Graduate School. Circadian and seasonal rhythms, neuroendocrinology.

Karim G. Oweiss, Ph.D., Associate Professor of Electrical & Computer Engineering. Neural integration and coordination in sensorimotor systems, Brain Machine Interfaces, multiscale signal processing in the nervous system.

David J. Rademacher, Ph.D., Assistant Professor, Translational Science & Molecular Medicine. Experience-dependent structural plastic changes in brain networks. (Grand Rapids)

Susan M. Ravizza, Ph.D., Assistant Professor of Psychology. Cognitive processes necessary to achieve goals in a constantly changing environment.

A.J. Robison, Ph.D., Assistant Professor of Physiology. The role of gene transcription in hippocampus: cell signaling, synaptic physiology and morphology, and mouse models of drug addiction

Sharleen T. Sakai, Ph.D., Professor of Psychology. Anatomical substrates of the motor control systems.

Stephen P. Schneider, Ph.D., Associate Professor of Physiology. Mechanisms of sensory processing in spinal cord.

Erik Shapiro, Ph.D., Research Director of Radiology. Molecular and cellular MRI, particularly in the use of MRI to track specific cell populations.

Cheryl L. Sisk, Ph.D., Professor of Psychology. Neuroendocrinology, neural development during puberty, steroid hormone regulation of neural development and behavior.

Laura Smale, Ph.D., Professor of Psychology & Zoology. Neural mechanisms controlling circadian rhythms in nocturnal and diurnal animals.

Caryl E. Sortwell, Ph.D., Professor of Neurology. Primary neuronal cultures, ex vivo and in vivo gene therapy, stereotaxic surgery, immunohistochemistry, neuro substructure microdissections, behavioral evaluations of motor performance, microscopy, long term deep brain stimulation platform. (Grand Rapids)

Kathy Steece-Collier, Ph.D., Professor of Translational Science & Molecular Medicine. Brain plasticity in neurodegenerative disease models. (Grand Rapids)

Kenneth Strauss, Ph.D., Associate Professor of translational Science & Molecular Medicine. Regulation of arachidonic acid metabolism in the brain modulates inflammation and recovery after brain injuries. (Grand Rapids)

Greg Swain, Ph.D., Professor of Chemistry. Neural control mechanisms of arteries and veins in hypertension, and maturation of the enteric nervous system and its regulatory function in the gastrointestinal tract.

Juli S. Wade, Ph.D., Professor of Psychology & Zoology. Neuroendocrine regulation of sex differences in brain and behavior.

Donna H. Wang, M.D., Professor of Medicine and Pharmacology & Toxicology. Cellular and molecular mechanisms underlying salt sensitive hypertension.

Hongbing Wang, Ph.D., Assistant Professor of Physiology & Neuroscience. Cyclic AMP signaling and neuroplasticity.

Arthur J. Weber, Ph.D., Professor of Physiology. Structurefunction relation of retinal ganglion cells undergoing glaucomarelated degeneration in the primate eye. Development of treatment strategies aimed at mitigating or preventing glaucomatos retinal ganglion cell degeneration.

Juyang (John) Weng, Ph.D., Professor of Computer Science and Engineering. Computational modeling of nervous systems, mental architectures, neural networks, development, and learning.

Lily Yan, M.D., Ph.D., Assistant Professor of Psychology. Molecular, cellular and neural mechanisms underlying circadian rhythm regulation
MSU Neuroscience Program became a Ph.D.-granting program.

Number of attendees at the 2013 Neuroscience Fair outreach event.

Half of MSU's NIH training grants are directed by NSP faculty.

MSU Neuroscience Program conducts research in both East Lansing and Grand Rapids.

Faculty span 17 departments, 5 colleges, and 3 medical schools.

An undergraduate degree program in Neuroscience was implemented.

1998

1,100

50%

2

17/5/3

2012

FACTS