

# Neuroscience

## Chair

- Daniel T. Tranel (Neurology/Psychological and Brain Sciences)

**Graduate degree:** Ph.D. in neuroscience

**Faculty:** <https://neuroscience.grad.uiowa.edu/faculty/directory>

**Website:** <https://neuroscience.grad.uiowa.edu>

The Neuroscience Program provides an interdisciplinary and interdepartmental approach to graduate education and research training in the structure, function, and development of the nervous system and its role in cognition and behavior. Students obtain training at all levels of the nervous system, from cellular/molecular to the behavioral/cognitive.

## Programs

### Graduate Program of Study

#### Major

- Doctor of Philosophy in Neuroscience

## Facilities

Training is conducted primarily in the laboratories and teaching facilities of the Carver College of Medicine graduate Departments of Anatomy and Cell Biology, Biochemistry, Internal Medicine, Molecular Physiology and Biophysics, Neurology, Pharmacology, and Psychiatry; and the College of Liberal Arts and Sciences Departments of Biology, Communication Sciences and Disorders, Health and Human Physiology, and Psychological and Brain Sciences. Students use faculty laboratories and central research facilities for ultrastructural analysis; histochemistry and immunocytochemistry; electrophysiology; fluorescence-activated cell sorting; cellular and subcellular biochemistry; cell, tissue, and organ culture; operant and classical conditioning; molecular biology; behavioral genetics; neural substrates of complex behavior; brain-behavior relationships in humans; neuropsychology; and functional neuroimaging (PET, fMRI).

## Courses

### Neuroscience Courses

#### **NSCI:4353 Neurophysiology: Cells and Systems 3-4 s.h.**

Physiological properties of nerve cells, nervous systems; axonal conduction, synaptic transmission, sensory transduction, integrative processes, higher functions. Prerequisites: (BIOL:2753 or BIOL:3253) and (MATH:1460 or MATH:1380 or MATH:1550 or MATH:1850) and ((PHYS:1511 and PHYS:1512) or (PHYS:1611 and PHYS:1612)). Same as BIOL:4353.

#### **NSCI:4753 Developmental Neurobiology 3 s.h.**

Neural induction and nervous system patterning; neurogenesis, axon and dendrite outgrowth and targeting; synapse formation, specificity, refinement; mechanisms of neuronal cell death; myelination; neural stem cells; introduction to cellular, molecular, and genetic techniques in studies of neural development. Prerequisites: BIOL:2753 with a minimum grade of C- or BIOL:3253 with a minimum grade of C-. Corequisites: BIOL:3253, if not taken as a prerequisite. Same as BIOL:4753, MPB:4753.

#### **NSCI:5161 Undergraduate Research in Neuroscience arr.**

Experimental research under faculty supervision.

#### **NSCI:5210 Fundamentals of Behavioral Neuroscience 3-4 s.h.**

Concepts, methods, and findings in behavioral and cognitive neurosciences; emphasis on principles of neuroscience, sensation, motivation, emotion. Same as PSY:5210.

#### **NSCI:5212 Foundations in Behavioral and Cognitive Neuroscience 4 s.h.**

Concepts, methods, and findings in behavioral and cognitive neurosciences. Prerequisites: BIOL:3253 or PSY:5210 or NSCI:5210. Same as PSY:5212.

#### **NSCI:5365 Seminar: Neuropsychology and Neuroscience arr.**

Clinical neuropsychology and cognitive neuroscience: cutting-edge research from scientific journals, case presentations in clinical neuropsychology, and current research. Same as NEUR:5365, PSY:5365.

#### **NSCI:5653 Fundamental Neurobiology 4 s.h.**

Neurobiology from molecular/cellular to systems levels, including cell biology of neuron; membrane electrophysiology, synaptic transmission and plasticity, functional neuroanatomy, sensory systems from periphery to CNS, peripheral and central motor systems, autonomic systems emotion, memory, sleep, language, attention and cognition, development of nervous system; discussion of classic and recent journal articles. Same as BIOL:5653, PSY:5203.

#### **NSCI:5753 Developmental Neuroscience 1 s.h.**

Neural induction and nervous system patterning; neurogenesis, axon, and dendrite outgrowth and targeting; synapse formation, specificity, refinement; mechanisms of neuronal cell death; myelination; neural stem cells; introduction to cellular, molecular, and genetic techniques in studies of neural development. Prerequisites: BIOL:5653. Same as BIOL:5753.

#### **NSCI:6209 Steroid Receptor Signaling 1 s.h.**

Structure-function relationship and genomic and nongenomic actions of the steroid hormone receptor family; basis for actions of novel new ligands on these receptors. Offered spring semesters. Same as MPB:6209, PCOL:6209.

#### **NSCI:6240 Topics in Cognitive Neuroscience 1-3 s.h.**

Key topics in the neural basis of human cognition; research literature. Recommendations: graduate courses in basic neuroscience and cognitive psychology. Same as NEUR:6240.

#### **NSCI:6250 Functional Magnetic Resonance Imaging 2-3 s.h.**

Basic physics principles of functional magnetic resonance imaging and approaches to data acquisition, including BOLD imaging, arterial spin labeling, and magnetic source imaging; data analysis strategies; paradigm design and development.

#### **NSCI:6265 Neuroscience Seminar 0-1 s.h.**

Research presentations. Offered fall and spring semesters. Same as ACB:6265, BIOL:6265, MPB:6265, PSY:6265.

**NSCI:7235 Neurobiology of Disease** **3 s.h.**

Broad, thematic understanding of disease mechanisms in neurobiological disorders.

**NSCI:7301 Directed Study in Neuroscience** **arr.**

**NSCI:7305 Neuroscience Research** **arr.**

Requirements: neuroscience graduate standing.