

BEHAVIORAL NEUROSCIENCE

Program Overview

The Behavioral Neuroscience major educates the next generation of scientists with a foundation in biological sciences and behavioral neuroscience. Students in the behavioral neuroscience major are prepared to join the workforce or attend professional or graduate school. Rider achieves this through small class and laboratory sizes allowing direct, hands-on instruction, and faculty accessibility. Students also have opportunities to do research with faculty via work study or independent study. Each student is assigned a faculty advisor who provides academic advice and career guidance tailored to the student's needs. Areas of professional and graduate study include medical, dental, and veterinary school; allied health programs in optometry, podiatry, physical therapy, occupational therapy, nursing; as well as programs leading to M.S. or Ph.D. degrees in the life sciences; and programs in science education.

Many graduates of the Behavioral Neuroscience program have pursued graduate studies at prestigious institutions including Johns Hopkins University, University of Pennsylvania, Dartmouth College and Cornell University. Others have entered medical school, or have gone on to become educators, surgical assistants, marine biologists, mental health technicians, nurses, behavioral therapists, occupational therapists or physical therapists.

Curriculum Overview

The curriculum for majors has been shaped to prepare students for a life of learning in the sciences. Students are expected to gain knowledge, and develop technical and analytical skills and competency in writing and speaking. Classes include coursework focused on the principles of evolution and diversity, neuroscience, and psychology, among other courses. Rider's faculty are research-oriented, and encourage students to take advantage of the opportunity to engage in internships and research by doing work study, an independent research project and/or a senior thesis. Students also have the opportunity to take part in a three-week internship course through the Capital Health System Hospitals, summer research and other off-campus internships.

Student Learning Outcomes

Graduates of the Behavioral Neuroscience major will be able to:

1. Explain foundational concepts in biological sciences.
2. Apply scientific methods of inquiry through testing of newly formed hypotheses with observation and experimentation.
3. Apply concepts from other disciplines in the analysis and interpretation of biological information.
4. Demonstrate the ability to locate, critically analyze, and communicate relevant scientific information.
5. Explain the ethical practice of scientific research and its societal applications.

Honors Programs

Honors in Behavioral Neuroscience

The objective of the honors program in Behavioral Neuroscience is to introduce talented undergraduate majors to the methods of basic research in behavioral neuroscience. Qualified biology or behavioral neuroscience majors may participate in the Departmental Honors program. For consideration, a student must have at least a 3.25 overall

grade point average at the end of their junior year. In the senior year, a student seeking Honors must write and orally defend a written honors thesis based upon their independent research. A candidate who has a 3.25 cumulative average, a 3.5 average in their science courses, and who has completed an acceptable Honors Thesis, will be awarded Honors in Behavioral Neuroscience upon graduation.

Pre-medical, Pre-Dental, Pre-Veterinary and Pre-allied Health Advising Programs

In addition to their academic advisor, students pursuing medical, dental or veterinary school or pre-allied health programs upon graduation from Rider are encouraged to also consult with the department's pre-medical studies advisor. The pre-medical studies advisor is a faculty member who assists pre-medical, pre-dental, pre-veterinary students and pre-allied health students with academic and extra-curricular planning required to become competitive applicants for programs in the health professions.

Rider and Thomas Jefferson University have a long-standing articulation agreement for students who wish to pursue training in the allied health professions. This agreement does not guarantee admission of Rider students into Jefferson's programs; it does mean that Rider faculty members are familiar with Jefferson's academic requirements and that Rider's courses are eligible for transfer to Jefferson.

Rider University offers students with baccalaureate degrees the opportunity to take the undergraduate science course prerequisites for medical, dental, veterinary or graduate school. For more information, visit the Premedical Studies (<https://www.rider.edu/academics/colleges-schools/college-liberal-arts-sciences/programs-opportunities/pre-med/>) page.

Degrees Offered

- B.S. in Behavioral Neuroscience

Contact

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Program Website: Behavioral Neuroscience (<https://www.rider.edu/academics/colleges-schools/college-arts-sciences/science-technology-math/undergraduate/behavioral-neuroscience/>)

Associated Department: Department of Biology and Behavioral Neuroscience (<https://www.rider.edu/academics/colleges-schools/college-arts-sciences/science-technology-math/faculty-departments/biology-behavioral-neuroscience-health/>)

Related Programs

- Biology (<http://catalog.rider.edu/undergraduate/colleges-schools/arts-sciences/majors-minors-certificates/biology/>)

- Biochemistry (<http://catalog.rider.edu/undergraduate/colleges-schools/arts-sciences/majors-minors-certificates/biochemistry/>)
- Chemistry (<http://catalog.rider.edu/undergraduate/colleges-schools/arts-sciences/majors-minors-certificates/chemistry/>)
- Environmental Sciences (<http://catalog.rider.edu/undergraduate/colleges-schools/arts-sciences/majors-minors-certificates/environmental-sciences/>)
- Health Sciences (<http://catalog.rider.edu/undergraduate/colleges-schools/arts-sciences/majors-minors-certificates/healthsciencesbs/>)
- Mathematics (<http://catalog.rider.edu/undergraduate/colleges-schools/arts-sciences/majors-minors-certificates/mathematics/>)
- Physics (<http://catalog.rider.edu/undergraduate/colleges-schools/arts-sciences/majors-minors-certificates/physics/>)
- Psychology (<http://catalog.rider.edu/undergraduate/colleges-schools/arts-sciences/majors-minors-certificates/psychology/>)
- M.A. in Applied Psychology (<http://catalog.rider.edu/graduate/colleges-schools/arts-sciences/programs-certificates/ma-applied-psychology-applied-behavior-analysis/>)

Major Requirements

(51-54 credits)

Departmental Course Repeat Policy (p. 3)

Code	Title	Credits
Required Courses:		
Biology		
BIO 115 & 115L	Principles of Biology I and Principles of Biology I Lab ¹	4
BIO 116 & 116L	Principles of Biology II and Principles of Biology II Lab ¹	4
Behavioral Neuroscience		
BNS 275 & 275L	Behavioral Neuroscience and Behavioral Neuroscience Lab ¹	4
Select two of the following:		8
BNS 310 & 310L	Neurobiology and Neurobiology Lab	
BNS 360 & 360L	Neurochemistry and Neurochemistry Lab	
BNS 375 & 375L	Neuroethology: Circuits of Behavior and Neuroethology Lab	
Select one of the following		
PSY 100 or BNS 107	Introduction to Psychology or Life Science: Brain and Behavior	3
Mathematics		
MTH 105 or MTH 106	Algebra and Trigonometry ² or Precalculus	4
Select one of the following:		3-4
BNS 250 & 250L	Biostatistics and Biostatistics Lab ²	
ENV 200 & 200L	Statistical and Computer Applications in the Natural Sciences and Statistical and Computer Applications in the Natural Sciences Lab ²	
PSY 201	Statistics and Research Design (requires PSY 105 prerequisite) ²	

Chemistry

CHE 120	Principles of Chemistry	3
CHE 121	Principles of Chemistry Lab	1
CHE 122	Intro to Chemical Systems	3
CHE 123	Quantitative Methods Lab	1

Biology/Psychology Electives

Select two of the following: 6-8

Upper-level Biology Course		
BIO 215 & 215L	Medical Microbiology and Microbiology Lab	
BIO 260 & 260L	Principles of Biology: Evolution, Diversity, and Biology of Cells and Principle of Biology: Cells Lab	
BIO 265 & 265L	Genetics and Genetics Lab	
BIO 272 & 272L	Intro to Marine Biology and Marine Biology Laboratory	
BIO 300 & 300L	Developmental Biology and Developmental Biology Lab	
BIO 305 & 305L	Animal Physiology and Animal Physiology Lab	
BIO 335 & 335L	Plant Biology and Modern Plant Biology Lab	
BIO 340 & 340L	Evolutionary Biology and Evolutionary Biology Lab	
BIO 350 & 350L	General Ecology and General Ecology Lab	
BIO 370 & 370L	Immunology and Immunology Lab	
BIO 372 & 372L	Behavior of Marine Organisms: Evolutionary Approach and Behavior of Marine Organisms: Evolutionary Approach Lab	

Any PSY 200-level or higher course

Additional Electives

Select one of the following:		4
Any additional BNS 300-level course with a lab		
Any PSY 300-level course with a lab		
Any BCH 200 or higher course with a lab		

Senior Capstone Seminar 3

Complete one of the following:

BNS 415	Seminar in Behavioral Neuroscience	
BIO 400	Seminar in Cellular and Molecular Biology	
BIO 420	Seminar in Organismal Biology	
BIO 450	Seminar in Ecology & Evolution	
BNS 490	Independent Study: Research and Creative Expression ³	

Total Credits 51-54

¹ Students must earn a grade of "C" or better in this course to meet the major requirements and before enrolling in upper-level courses for which these courses are prerequisites.

² Students must place into MTH 105 Algebra & Trigonometry or higher level mathematics in order to register for BIO 115, BIO 116 and BNS 275.

³ It is the student's responsibility to arrange an independent study with a faculty member in the Department. To be registered for a BNS

490, the student must complete an independent study form (<https://www.rider.edu/academics/academic-support/registrar/forms/>) and proposal with the faculty member.

Department of Biology and Behavioral Neuroscience Course Repeat Policy

The following guidelines apply to courses offered by the Department of Biology and Behavioral Neuroscience. Students may repeat any biology (BIO) or behavioral neuroscience (BNS) course once without special permission *unless* they received an unsatisfactory grade (C-, D, F). With an unsatisfactory grade, students need permission from the department chair to repeat a class. They can not register on their own on MyRider. Students with an unsatisfactory grade should email the department chair to request permission to repeat a course. A course will be considered repeated if the student has previously earned a letter grade in the course, or if the student has previously withdrawn from the course after the Friday of the seventh week of classes (previously Withdrawal II or Withdrawal III).

Academic Plan of Study

The following educational plan is provided as a sample only. Rider students who do not declare a major during their freshman year; who are in a Continuing Education Program; who change their major; or who transfer to Rider may follow a different plan to ensure a timely graduation. Each student, with guidance from their academic advisor, will develop a personalized educational plan.

Course	Title	Credits
Year 1		
Fall Semester		
BIO 115 & 115L	Principles of Biology I and Principles of Biology I Lab	4
CHE 120	Principles of Chemistry	3
CHE 121	Principles of Chemistry Lab	1
MTH 105	Algebra and Trigonometry ¹	4
CMP 120	Seminar in Writing and Rhetoric	3
Semester Credit Hours		15

Spring Semester

BIO 116 & 116L	Principles of Biology II and Principles of Biology II Lab	4
CHE 122	Intro to Chemical Systems	3
CHE 123	Quantitative Methods Lab	1
CMP 125	Seminar in Writing and Research	3
Social Perspectives		3
Semester Credit Hours		14

Year 2

Fall Semester

BNS 275 & 275L	Behavioral Neuroscience and Behavioral Neuroscience Lab	4
BNS 250 & 250L	Biostatistics and Biostatistics Lab	4
PSY 100	Introduction to Psychology	3
HIS 150	Pre-Modern World: Evolution to Revolution	3
Semester Credit Hours		14

Spring Semester

BNS 310 & 310L	Neurobiology and Neurobiology Lab	4
BCH 225 & 225L	Introduction to Organic and Biochemistry and Introduction to Organic & Biochemistry Lab ³	4
HIS 151 or HIS 152 or HIS 153	World in the Modern Era: Exploration to Globalization or Contemporary World: Historical Perspectives or Cold War: A Global History	3
Foreign Language		3
Elective course ²		3
Semester Credit Hours		17

Year 3

Fall Semester

Upper-level Neuroscience (select one)		4
BNS 360 & 360L	Neurochemistry and Neurochemistry Lab	
BNS 375 & 375L	Neuroethology: Circuits of Behavior and Neuroethology Lab	
Social Perspectives		3
Foreign Language		3
Philosophical Perspective		3
Aesthetic Perspectives: Fine Arts		3
Semester Credit Hours		16

Spring Semester

Biology/Psychology Elective (select one)		3-4
BIO 215 & 215L	Medical Microbiology and Microbiology Lab	
BIO 260 & 260L	Principles of Biology: Evolution, Diversity, and Biology of Cells and Principle of Biology: Cells Lab	
BIO 265 & 265L	Genetics and Genetics Lab	
BIO 272 & 272L	Intro to Marine Biology and Marine Biology Laboratory	

BIO 300 & 300L	Developmental Biology and Developmental Biology Lab	
BIO 305 & 305L	Animal Physiology and Animal Physiology Lab	
BIO 335 & 335L	Plant Biology and Modern Plant Biology Lab	
BIO 340 & 340L	Evolutionary Biology and Evolutionary Biology Lab	
BIO 350 & 350L	General Ecology and General Ecology Lab	
BIO 370 & 370L	Immunology and Immunology Lab	
BIO 372 & 372L	Behavior of Marine Organisms: Evolutionary Approach and Behavior of Marine Organisms: Evolutionary Approach Lab	
Any 200-level PSY course		
Aesthetic Perspectives: Literature		3
Three Elective Courses ²		9
Semester Credit Hours		15-16
Year 4		
Fall Semester		
Upper-level Neuroscience		4
BNS 360 Neurochemistry or BNS 375 Neuroethology		
Four Elective Courses ²		12
Semester Credit Hours		16
Spring Semester		
Biology/Psychology Elective		3-4
BNS 415	Seminar in Behavioral Neuroscience	3
Three Elective Courses ²		9
Semester Credit Hours		15-16
Total Credit Hours for Graduation		122-124

¹ For course placement information see <https://www.rider.edu/student-life/first-year-experience/orientation/placement-testing> (<https://www.rider.edu/student-life/first-year-experience/orientation/placement-testing/>)

² Elective credits may be used to complete requirements in a second major or minor.

³ Natural and Physical Sciences and Mathematics core requirements are included in the major.

Courses and Descriptions

BNS 107 Life Science: Brain and Behavior 3 Credits

An introduction to the biology of the human brain and the rest of the human nervous system. Topics in neuroscience are covered in molecular, cellular, and systematic terms. Additional material is presented on the origins and effects of neurological and psychiatric diseases. This course counts towards the fulfillment of the Disciplinary Perspectives element of the CLAS general education curriculum.

BNS 250 Biostatistics 4 Credits

This course will assist students with acquiring the skills necessary to design, conduct, and interpret research studies. Emphasis will be on learning how to develop experimental designs to translate theoretical concepts into testable hypotheses. Experiments conducted during laboratory sessions will use laboratory mice and will use equipment for measuring animal behavior. Students will gain experience collecting, analyzing, writing and orally presenting their research results. Three hours of lecture and one three-hour lab per week. Prerequisite(s): MTH 105 or higher or placement into MTH 210, grade of "C" or better in one lab science course.

Corequisite(s): BNS 250L.

BNS 250L Biostatistics Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course.

Prerequisite(s): MTH 105 or higher or placement into MTH 210, grade of "C" or better in one lab science course.

BNS 275 Behavioral Neuroscience 4 Credits

An introductory behavioral neuroscience course including basic neuroanatomy and neurophysiology of movement, ingestive, reproductive, emotional, and learning behaviors. Emphasis is on the structure/function relationships that allow animals to make appropriate physiological and behavioral responses to the environment. Three hours of lecture and one three-hour lab per week.

Prerequisite(s): BIO 115 with a minimum grade of C and BIO 116 with a minimum grade of C.

BNS 275L Behavioral Neuroscience Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course.

Prerequisite(s): BIO 115 and BIO 116.

BNS 310 Neurobiology 4 Credits

A lecture-laboratory course investigating the structure and function of the nervous system. Lecture topics include organization of the nervous system, neuroanatomy, neurophysiology, neurochemistry, physiology of sensory systems, biological aspects of nervous system diseases, and behavior. Laboratory exercises include study of anatomy of the nervous system, nerve cell recording, modern neuroanatomical techniques, and the neural basis of animal behavior. Three hours of lecture and one three-hour lab per week.

Prerequisite(s): BIO 115 with a minimum grade of C and BIO 116 with a minimum grade of C.

BNS 310L Neurobiology Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course.

Prerequisite(s): BIO 115 and BIO 116.

BNS 360 Neurochemistry 4 Credits

Examines the fundamentals of neurochemistry, including the neuroanatomical distribution, pharmacology, and functions of neurotransmitters; signal transduction pathways; behavioral and physiological effects of chemicals either used therapeutically to treat biopsychological disorders or that may be abused for their psychotropic effects; and mechanisms and models for the study of drug action. Three hours of lecture and one three-hour lab per week. Prerequisite(s): BIO 115, BIO 116, CHE 122, CHE 123 with a grade of C or better in each course.

Corequisite(s): BNS 360L.

BNS 360L Neurochemistry Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course. Corequisite(s): BNS 360.

BNS 375 Neuroethology: Circuits of Behavior 4 Credits

Neuroethology is the study of the neural and physiological basis of animal behavior. This course focuses on the specific behavioral problems faced by animals in their natural habitats, and the ways in which their nervous systems solve these problems. The mechanisms that underlie complex behaviors such as spatial orientation and navigation, escape mechanisms, and animal communication will be examined, as well as the extraordinary sensory adaptation of organisms to their environments (e.g., echolocation, electroreception, and magnetic reception). The neural control of motor programs and temporally-patterned behaviors will be studied in simpler neuronal systems. Finally, recent cellular and molecular approaches to the study of behavior will be addressed. Three hours of lecture and one three-hour lab per week. Prerequisite(s): BIO 115, BIO 116 with a grade of C or better in each course.

Corequisite(s): BNS 375L.

BNS 375L Neuroethology Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course.

Corequisite(s): BNS 375.

BNS 415 Seminar in Behavioral Neuroscience 3 Credits

Critical analysis of the scientific literature pertaining to current topics in behavioral neuroscience. Topics include mechanisms through which the brain influences physiology and behavior and the integration of nervous and endocrine systems. Three hours of lecture per week.

Prerequisite(s): BIO 115 and BIO 116, junior standing and permission of instructor.

BNS 490 Independent Study: Research and Creative Expression 1-4 Credits

Immerses the student in laboratory research. The student learns to organize material, use the literature, make precise measurements, and obtain reproducible data. If possible, the student will publish the results or present them at a scientific meeting.

BNS 491 Internship in Behavioral Neuroscience 1-4 Credits

A supervised work experience in an approved organization where qualified students gain real-world knowledge and utilize their academic training in a professional environment. Placement may be in private, public, non-profit, or governmental organizations. These can include educational or research institutions. The method of evaluation will be formalized prior to the approval of the internship by the sponsoring faculty and should include keeping a journal of activities, a term paper or project report and a poster presentation.

Prerequisite(s): 2.5 GPA and permission of the instructor.