NEUROSCIENCE AND BEHAVIOR MAJOR

MAJOR DESCRIPTION

The Program in Neuroscience and Behavior (NS&B) opens avenues for students to explore the role of the brain in expressing behavior in animals including humans. Students who major in NS&B learn the details of how the nervous system works and how it functions with other biological and psychological systems. New technologies in contemporary neuroscience have helped to bring about many important discoveries, with more on the horizon. Wesleyan neuroscience students learn in an interdisciplinary environment that includes coursework in biology, psychology, and chemistry. Students often expand their learning to include topics such as statistics, computer programming, design, and philosophy of science. Lab-based methods courses and hands-on research in state-of-the-art laboratories give students a rich educational experience that provides a foundation for various career options that include medicine, basic and applied research in the public or private sector, and scientific writing or reporting.

Students who pursue the NS&B major bring a strong curiosity about the intricate workings of the brain and nervous system. They strive to integrate knowledge and research from relevant areas of science to understand behavior. They develop analytical, detail-oriented problem-solving expertise and they learn how to stay current with the latest advancements in neuroscience.

ADMISSION TO THE MAJOR

One or more of the foundation courses in biology (BIOL181, BIOL182) are prerequisites for the advanced **NS&B** courses offered by the Biology Department. Although not legislated as prerequisites, NS&B213 and **NS&B** laboratory courses provide important conceptual and practical background for independent research in the junior and senior years.

A recommended course sequence for students with a strong background in science would include BIOL181 and BIOL182 (and associated labs) along with introductory chemistry in the first year. Other students may wish to take the Introductory Chemistry Sequence in the first year prior to the Introductory Biology sequence. In the sophomore year, one would take NS&B213. The other required courses and research tutorials would be spread out over the last two years. For information on the pathway through the major, please visit wesleyan.edu/nsb/pathways.html (http://www.wesleyan.edu/nsb/pathways.html) for further information.

To be admitted to the major during March of the sophomore year, a student must have completed, with grades of C- or better, at least two of the full-credit courses listed in foundation and core courses that follow. At least one of these credits must be either NS&B213 or BIOL181.

MAJOR REQUIREMENTS

FOUNDATION COURSES

Code	Title	Hours
BIOL181	Principles of Biology I: Cell Biology and Molecular Basis of Heredity	1
BIOL191	Principles of Biology I--Laboratory	.5
BIOL182	Principles of Biology II	1
BIOL192	Principles of Biology II: Laboratory	0.5
CHEM141 & CHEM142	General Chemistry I and General Chemistry II	2
or CHEM143 & CHEM144	Honors General Chemistry I and Honors General Chemistry II	
CHEM251 & CHEM252	Organic Chemistry I and Organic Chemistry II	2
Two additional courses from the following (beginning with the graduating class of 2016):		
PSYC105	Foundations of Contemporary Psychology	1
PHYS111	Introductory Physics I	1
or PHYS112	Introductory Physics II	
or PHYS113	General Physics I	
MATH117	Introductory Calculus (or higher)	1
COMP112	Introduction to Programming (or higher)	1

Core Course

Code	Title	Hours
NS&B213	Behavioral Neurobiology	1

ADVANCED COURSES

Five advanced courses from the following list are required for students; two must be cross-listed with biology; two cross-listed with psychology; and one, a research tutorial or methodological course. Some courses appear in both Biology and Psychology lists but may be counted only once, in either category.

Cross-listed with Biology

Code	Title	Hours
NS&B224	Hormones, Brain, and Behavior	1
NS&B239	Functional Anatomy of the Human Brain	1
NS&B244	Neuropharmacology	1
NS&B245	Cellular Neurophysiology	1
NS&B252	Cell Biology of the Neuron	1
NS&B254	Comparative Animal Behavior	1
NS&B299	Waves, Brains, and Music	1
NS&B302	Neurobiology of Aging	1
NS&B302Z	Neurobiology of Aging	1
NS&B303	Receptors, Channels, and Pumps: Advanced Topics in Membrane Protein Structure and Function	1
NS&B304	Glia: Not just neuronal glue!	1
NS&B317	Neuroethics	1
NS&B320	Neuroscience of Learning and Memory	1
NS&B323	Biochemistry of Neurodegenerative Disease	1
NS&B325	Stem Cells: Basic Biology to Clinical Application	1
NS&B328	Chemical Senses	1

NS&B343	Muscle and Nerve Development	1
NS&B344	Developmental Biology of the Nervous System	1
NS&B345	Developmental Neurobiology	1
NS&B347	Mammalian Cortical Circuits	1
NS&B351	Neurobiology of Learning and Memory	1
NS&B353	Neurobiology of Neurological Disorders	1
NS&B357	Sex and Gender: From Synapse to Society	1
NS&B356	Neurodevelopmental Disorders	1
NS&B358	Neurobiology of Movement	1
NS&B360	Neuroplasticity and Neurogenesis in Health and Disease: Molecules, Cells, and Circuits	1
NS&B373	Exploring the Brain-Body Interface: The Neuroscience of Basic Survival	1

Cross-listed with Psychology

Code	Title	Hours
NS&B220	Cognitive Psychology	1
NS&B222	Sensation and Perception	1
NS&B225	Cognitive Neuroscience	1
NS&B227	Motivation and Reward	1
NS&B228	Clinical Neuropsychology	1
NS&B238	Psychological Theories of Learning and Motivation	1
NS&B239	Functional Anatomy of the Human Brain	1
NS&B302	Neurobiology of Aging	1
NS&B316	Schizophrenia and Its Treatment: Neuroscientific, Historical, and Phenomenological Perspectives	1
NS&B317	Neuroethics	1
NS&B320	Neuroscience of Learning and Memory	1
PSYC322	Psychology of Decision-Making	1
NS&B329	Neural Costs of War	1
PSYC332	Seminar in Cognitive Neuroscience	1
NS&B335	Behavior Genetics	1
NS&B341	Psychology of Human Memory	1
NS&B348	Topics in Cognitive Development	1
PSYC351	Your Brain on Drugs: The Neuroscience Behind Drugs of Abuse and Addiction	1
NS&B353	Neurobiology of Neurological Disorders	1
NS&B356	Neurodevelopmental Disorders	1
NS&B358	Neurobiology of Movement	1

Research Methods and Practica

Code	Title	Hours
MATH132	Elementary Statistics	1
PSYC200	Statistics: An Activity-Based Approach	1
NS&B210	Research Methods in Cognition	1
NS&B215		1
BIOL242	Quantitative Methods for the Biological and Environmental Sciences	1
NS&B243	Neurohistology	1
BIOL247	Laboratory in Neurophysiology	1
NS&B250	Laboratory in Cellular and Behavioral Neurobiology	1
BIOL251	Laboratory in Basic Practices in Neuroscience	1
NS&B280	Applied Data Analysis	1
PSYC378	Advanced Research in Cognitive Neuroscience	1
PSYC382	Advanced Research in Decision Making	1
NS&B383	Advanced Research in Learning and Memory	1
NS&B390	Experimental Investigations into Reading	1
NS&B392	Behavioral Methods in Affective Neuroscience	1
NS&B399		1.25

The following are taken for two semesters, both in the lab of the same faculty member:

NS&B409 & NS&B410	Senior Thesis Tutorial and Senior Thesis Tutorial (two semesters, both in the lab of the same faculty member)	1
or NS&B423 & NS&B424	Advanced Research Seminar, Undergraduate and Advanced Research Seminar, Undergraduate	

Note: MATH132 can be taken to meet requirements for either the methodological or foundation major requirements, but not both. Methodological courses cannot be credited toward the requirements of advanced courses cross-listed with biology or psychology. *Courses listed in both categories A. or B. can be counted only in A. or B. but not both.

Courses of relevance outside the program. Though not requirements of the major, students should be aware that courses in organic chemistry and molecular biology, as well as courses in non-neuroscience areas of biology and psychology, complement the **NS&B** major and should be considered, in consultation with your advisor, when planning your program of study.

SUBSTITUTING OUTSIDE COURSES FOR CREDIT TO THE MAJOR

Foundation courses: A student who has taken foundation courses outside of Wesleyan may be able to apply them to the major. As a general rule, courses acceptable to the biology, chemistry, and physics departments for university credit are acceptable to the NS&B program for substitution for foundation courses.

Advanced courses: Advanced courses, inside or outside of the University, might be acceptable as substitutes for the advanced courses of the NS&B major. In general, only one such course can be substituted, and approval must be obtained in advance from the program director.

UNDERGRADUATE RESEARCH

NS&B majors are encouraged to become involved in the research of the faculty. Research tutorials and senior thesis tutorials are taken with mode of grading and amount of credit to be arranged with the research supervisor. Research tutorials are numbered NS&B411/NS&B412, NS&B409/NS&B410, and NS&B423/NS&B424. These courses can fulfill the research methods requirement or can receive graduation credit. For the most up-to-date information on NS&B faculty research, please visit our department website (http://www.wesleyan.edu/nsb/).

STUDENT LEARNING GOALS

Our program offers a curriculum that encourages fluency across multiple disciplines in the field of neuroscience and behavior. Immersion in this field

requires thinking across multiple levels of analysis and an appreciation for how complex and broad questions can be made amenable to scientific inquiry. In terms of goals, we have three areas of knowledge that we expect all students to acquire by the time they have completed the NS&B major:

- **Structure:** The parts and how they connect. Structural knowledge includes neural development, neuroanatomy, neurotransmitters, and the cell and molecular biology of the neuron.
- **Function:** How the parts come together to produce systems. Such systems include various sensory, motor, and neuroendocrine systems. Knowledge concerning function is gained by studies of structures and studies of perception, learning and memory, behavior, and cognition.
- **Theory:** Governing principles that can be proposed from all the above. Examples of theories include those that address the relationships between brain and behavior, articulate how brain structure and function changes over time, and explain cognitive and perceptual processes.

In addition, it is our goal that all students can skillfully apply and analyze knowledge gained from their studies. Statistics courses, lab-based methods courses, and/or direct experience in research projects serve this goal.

ADVANCED PLACEMENT

AP credit may be used to place out of any of the foundation courses, subject to the guidelines of the department hosting these courses.

PRIZES

George H. Acheson and Grass Foundation Prize in Neuroscience: Established in 1992 by a gift from the Grass Foundation, this prize is awarded to an outstanding undergraduate in the Neuroscience and Behavior Program who demonstrates excellence in the program and who also shows promise for future contributions in the field of neuroscience.

BA/MA PROGRAM

This program provides an attractive option for science majors to enrich their course and research background. Students are advised to begin research by their junior year if they intend to pursue the BA/MA. Admission is competitive and based on GPA, faculty recommendations, and research experience. For more information, please visit https://catalog.wesleyan.edu/departments/nsb/grad-nsb/ as well as the Graduate Studies page: http://wesleyan.edu/grad/degree-programs/bama.html (http://www.wesleyan.edu/grad/degree-programs/bama.html).

ADDITIONAL INFORMATION

- **Teaching apprenticeships.** Students may be appointed teaching apprentices with the approval of the participating faculty member and the Office of Academic Affairs. The apprenticeship position involves assisting a faculty member in the teaching of a course. Concurrently, the apprentice enrolls in an apprenticeship tutorial (NS&B491/NS&B492) that is usually a one-credit course and operates in either the graded or credit/no credit mode.
- **Petitioning for exemptions.** A student may request a variance from the requirements of the major or for honors by submitting a written petition to the chair of the program. The petition should indicate why the requirement cannot be met and the educational justification for the alternative. The petition will be considered by the NS&B faculty, and the student will receive a statement of the decision by letter.
- **Seminars.** The program periodically invites neuroscientists from outside Wesleyan to come here and describe their research. These seminars frequently complement course material and give students the opportunity to interact with noted researchers. The talks are usually scheduled for noon on Wednesdays. Students are encouraged to attend.

HONORS

To be considered for honors, a student must be an NS&B major and have a B average (grade average 85) in the courses credited to the major. The student must submit a laboratory research thesis that was supervised by a member of the NS&B faculty and be recommended for honors by the NS&B faculty.