BEHAVIORAL NEUROSCIENCE

Faculty: Gerecke, Director; Bardi.

Behavioral Neuroscience is an interdisciplinary course of study within the broader framework of neuroscience that explores the impact of behavior and environment on the brain's functions. In the Randolph-Macon behavioral neuroscience laboratory, students explore the impact of parenting, enriched environments, chronic stress, exercise and social interactions on behavioral and neural responses.

The behavioral neuroscience major exposes students to the fundamental elements of the discipline, bolstered by opportunities to conduct relevant original research and complete internships in professional settings. In multiple courses, students learn the fundamental properties of the nervous system and relate those properties to behavior and mental processes. Due to its interdisciplinary nature, students will take relevant courses in several disciplines including the departments of psychology, biology, and chemistry.

Generally, the mission of the behavioral neuroscience major is to provide Randolph-Macon students with an opportunity to gain sufficient expertise/mastery to become critical thinkers in the discipline. Students gain mastery in behavioral neuroscience (e.g., competence in critical thinking, science methodology, and communication skills) by conducting original research projects (and writing formal papers and presenting the information) as they progress through the Randolph-Macon behavioral neuroscience curriculum.

- Behavioral Neuroscience Major (https://catalog.rmc.edu/programs/behavioral-neuroscience/behavioral-neuroscience-major/)
- Behavioral Neuroscience Minor (https://catalog.rmc.edu/programs/behavioral-neuroscience/behavioral-neuroscience-minor/)

NSCI 120 - This Emotional Life (3 Hours)
An introduction to contemporary neuroscience research on emotional regulation. This course is designed to provide students with scientific evidence describing how we can improve our social relationships, learn to cope with problems like stress and anxiety, and become more positive and resilient individuals. Topics include the building blocks and features of emotions, emotional regulation and motivation, and the biochemistry of "unthinkable" behavior. Students will also be introduced to research methods in neuroscience and review opportunities available in the behavioral neuroscience major.

NSCI 124 - Mind and Health (3 Hours)
The immune system and the nervous system interact and cooperate. They have very different means to acquire memory and they affect one another to drive perfectly normal behaviors and many abnormal ones. This course will introduce the biology of the immune system and the organization of the nervous system with a consistent eye on how the two affect behavioral strategies and how they change in response to behavioral outcome. We will place a particular emphasis on the experimental data that give us a modern view of neuroimmunology and its role in human behavior.
Cross-list: PSYC 124

NSCI 200 - Discovering Behavioral Neuroscience (3 Hours)
An introduction to contemporary research on the relationship between brain and behavior. This course is designed to provide prospective majors or minors with appropriate preparation for further study in the field of behavioral neuroscience. Topics include learning and memory, cognitive processes, neuroplasticity, emotional regulation and motivation, and the biochemistry of brain reward circuits. Students will also be introduced to research methods in neuroscience and gain hands-on experience designing and conducting a small laboratory project.

NSCI 320 - Behavioral Neuroscience (3 Hours)
A course designed to promote understanding of the neurobiological foundations of behavior. The biological components of certain aspects of behavior (e.g., sensation, perception, motivation, learning, emotion, consciousness, disorders of mood, and activity) will be discussed. Lectures and demonstrations will help students understand the methods and theories that behavioral neuroscientists employ in their efforts to integrate biological and psychological aspects of behavior.
Prerequisite(s): PSYC 200 and PSYC 201 (Research Methods)

Cross-list: PSYC 320

NSCI 323 - Hormones and Behavior (3 Hours)
This course will examine some of the most notable and well-studied relationships among hormonal messengers, brain activity, and behavioral outcome, such as the stress-response, hormones and cognition, biological rhythms, and hormonal influences on reproductive behavior. The emphasis will be on discussion of how behavioral outcome is connected to physiological functioning, and vice versa, how behavioral / environmental characteristics can affect our physiology. Supplemental texts, videos, writing exercises, and in-class demonstrations will be used to augment lectures and discussions in the classroom.
Prerequisite(s): PSYC 200 and PSYC 201

Cross-list: PSYC 323

NSCI 330 - Behavioral Neuroscience Techniques (3 Hours)
This course will introduce students to various methodological strategies and laboratory techniques in the field of behavioral neuroscience. These techniques will represent relevant behavioral, cellular/physiological, neuroanatomical, and neuroendocrine approaches to understand the associations between neurobiological factors and behavioral outcomes. Following an overview of historical and contemporary aspects of each methodological approach/technique, students will obtain hands-on experience with each approach. Consulting primary sources in the behavioral neuroscience literature, students will demonstrate competence in writing and evaluating specific methodological approaches in the context of relevant research questions and topics.
Prerequisite(s): PSYC 320 or NSCI 320

NSCI 331 - Behavioral and Statistical Modeling (3 Hours)
This course is a comprehensive study of the acquisition and analysis of complex datasets in behavioral neuroscience. It is designed to provide students with a detailed description of how to collect and organize behavioral data, perform data mining, and reduce behavioral complexity to reveal the hidden structure of the interaction between behavior and neurobiological activity. Researchers now realize that trying to grasp the inner component of complexity in neuroscience represents the next frontier in the study of how our brain works. As a consequence, in the past decades the use of multivariate statistics has become increasingly important in neuroscience. This class will help students to navigate the rapidly evolving field of advanced behavioral analysis, focusing on aspects of primary importance for a neuroscientist, such as the integration between neuroendocrine activity and behavioral modifications.
Prerequisite(s): PSYC 201

NSCI 455 - Internship in Behavioral Neuroscience (Unpaid) (3 Hours)
Open to qualified students, this course provides practical experience outside of the classroom in behavioral neuroscience or a related field. Students complete a minimum of 130 hours in a setting consistent with the student's goals, preparation, and interests. Students complete a daily reflective journal and a rigorous reaction paper integrating their behavioral neuroscience coursework with their knowledge in the workplace. Open to juniors and seniors with a minimum GPA of 2.25. Application and permission of the instructor is required. See Internship Program. A special fee ($200) is charged for this course.
Prerequisite(s): six hours of upper level NSCI courses or permission of the instructor

Curriculum: EL

NSCI 457 - Internship in Behavioral Neuroscience (Paid) (3 Hours)
With prior approval, students may earn Experiential Cross Area Requirement (CAR) credit and transcript notation for one credit hour for a paid internship. To qualify for experiential credit a student must have completed 48 semester hours of work prior to the beginning of the internship and be in good academic standing (not on academic probation) at the time of application and at the start of the internship. Registration and application procedures are similar to those for academic internship courses. Satisfactory completion of a paid internship requires a minimum of 130 hours (160 recommended) working at the host site, a reflective daily journal, a final written report, and a satisfactory evaluation from the site supervisor. A special fee ($400) is charged for this course.
Curriculum: EL

NSCI 460 - Senior Seminar Capstone (3 Hours)
The main objective of this course is to further critical thinking through the exploration and discussion of primary research literature in behavioral neuroscience, and to provide an opportunity to improve oral and written communication. The fundamental principle of this course is to give students the tools that they will need for the next phase of their careers. Students will become well versed in primary literature, and use empirical data to defend a thesis. In addition, this class is meant to be eclectic, drawing from many areas of research within behavioral neuroscience. This course will also address how the biology of the brain may give rise to complex aspects of human nature.
Prerequisite(s): NSCI 330, senior status and one additional 300-level course on the major

Curriculum: CS

NSCI 491 - Senior Independent Study (3 Hours)
An independent student under the guidance of a member of the department. At least a 3.25 cumulative quality point ration and approval by the curriculum committee are required.
Prerequisite(s): NSCI 330, NSCI 331, and senior status

Curriculum: CS

NSCI 496 - Senior Project (3 Hours)
Senior majors may with departmental approval undertake a substantial research project in some area of behavioral neuroscience. Student earns a total of six hours for the full senior project experience (496, 497, and 498).
Prerequisite(s): NSCI 330, 331, and senior status

Curriculum: CS

NSCI 497 - Senior Project (3 Hours)
Senior majors may with departmental approval undertake a substantial research project in some area of behavioral neuroscience. Student earns a total of six hours for the full senior project experience (496, 497, and 498).
Prerequisite(s): NSCI 330, 331, and senior status

Curriculum: CS

NSCI 498 - Senior Project (3 Hours)
Senior majors may with departmental approval undertake a substantial research project in some area of behavioral neuroscience. Student earns a total of six hours for the full senior project experience (496, 497, and 498).
Prerequisite(s): NSCI 330, 331, and senior status

Curriculum: CS