Neuroscience is one of the newest and most exciting areas of study in the sciences. It integrates aspects of biology, psychology, and other sciences in an examination of the brain and behavior. The Neuroscience Program at Bowdoin College is an interdisciplinary program that provides students with a wealth of opportunities to explore the brains and nervous systems of species ranging from invertebrates to humans. With four full-time faculty members in neuroscience, Bowdoin has one of the largest programs in the country at a small liberal arts college.

The research and activity in Bowdoin’s neuroscience laboratories are both diverse and complementary. Though the faculty have their own areas of specialization, they work collaboratively with students, colleagues, and scholars throughout the world. The program includes many of the courses taught in both biology and psychology at Bowdoin. Introductory courses in both departments provide a solid grounding in the principles and concepts that form the core of knowledge upon which the field of neuroscience has developed, as well as in the nature of experimentation in these fields.

Neuroscience is an exciting major for students intending to continue in research in neuroscience or in related areas of biology or psychology, for students interested in pursuing careers in medicine, and for those who simply find the subject interesting and wish to pursue it as part of a liberal arts education.

The Curriculum
Students wishing to major in neuroscience take one of two introductory-level neuroscience courses to provide an introduction to the field. A series of mid-level laboratory courses, including Neurophysiology, Molecular Neurobiology, Cognitive, and a course on social behavior, provides students with more in-depth experience and laboratory work in areas of neuroscience ranging from molecular to cognitive. More specialized courses, including upper-level seminars, allow students to pursue areas of interest to them. These courses cover such diverse topics as neurobiology, developmental neuroscience, hormones and behavior, and the neuroscience of memory.

The Major Program
The major in neuroscience consists of twelve courses, including an introductory course in neuroscience (either Neurobiology or Physiological Psychology), as well as an introduction to psychology, either Scientific Reasoning in Biology or Biological Principles II, Organic Chemistry I, and a course on data analysis or biostatistics. Students then take three of a group of four mid-level laboratory courses in neuroscience designed to give them exposure to many aspects of the field: Molecular Neurobiology, Neurophysiology, Laboratory in Behavioral Neuroscience: Social Behavior, and Cognitive Neuroscience.

The major culminates in an upper-level seminar in neuroscience; the specific topics for these may vary from year to year, but in recent years they have included Hormones and Behavior, Comparative Neuroanatomy, Memory and Brain, Topics in Neuroscience, and Neuronal Regeneration.

The remaining three elective courses are taken from a specific group of psychology, biology, physics, mathematics, and computer science courses.

Facilities and Resources
Bowdoin has excellent facilities for both teaching and research in neuroscience. Kanbar Hall houses state-of-the-art research and teaching facilities for the Neuroscience Program. These are equipped for electrophysiological recordings in humans, as well as experiments involving hormonal manipulations and behavior in lower vertebrates.

The laboratories in Stanley F. Druckenmiller Hall, Bowdoin’s 106,000-square-foot interdisciplinary science facility, are well equipped for cellular and molecular-level neuroscience. Students conducting independent research, as well as students in courses, routinely record the activity of nerves using a variety of extracellular amplifiers, and they record intracellularly from individual neurons using microelectrodes. An impressive array of up-to-date neurophysiological equipment is available in the research labs. Students also stain for specific neuronal molecules, including transmitters and growth factors, which they can then visualize using fluorescence microscopes, all of research quality. Extensive facilities for computerized data acquisition and analysis are used in all the neuroscience laboratories.

The Hatch Science Library, connected to the second floor of the Druckenmiller science building, houses science-related materials such as books, periodicals, maps, and electronic resources.
Neuroscience

Honors Projects

Recent honors projects completed by majors in the program have included:

- Activation of Vasotocin-related Neuronal Circuitry by Androstenedione in Male Goldfish, Carassius auratus
- Truncated Vasotocin Receptor Expression in Carassius auratus
- Localization of Human CLDH and its Effects on the Cardiac Central Pattern Generator in Homarus americanus
- Localizing the Estrogen Receptor that Mediates the Rapid Testosterone and Estradiol Influence on Visually Guided Sexual Behavior and Sperm Release in Male Goldfish
- The Rapid Effects of Water-soluble β-estradiol on Retinal Responses to Light Stimuli in Male Carassius auratus
- Characterization of the Effects of Pyrokinin Peptides on the Cardiac Ganglion of Homarus americanus
- Modeling of Excitatory Chemical Synapses in Rhythmic Neuronal Networks: A Computational Model Inspired by the Crustacean Cardiac Ganglion
- The Neuromodulatory Effects of SGRNPRLFamide on the Cardiac Ganglion of the Homarus americanus
- Regulation of a Truncated Goldfish Vasotocin Receptor after Exposure to Pre-ovulatory Females
- The Identification of the Pyrokinin-family Neuropeptides in Homarus americanus: An Immunohistochemically Guided Approach
- Understanding the Dynamics of a Network Composed of Intrinsically Different Cells: A Computational Approach
- Characterization of Semaphoring in the Central Nervous System of Adult Crickets following Deafferentation
- Investigating the Causative Role of Semaphoring:2a in Compensatory Growth in the Cricket Gyllus bimaculatus

Faculty

Richmond R. Thompson, professor of psychology and neuroscience, B.S. (Furman), Ph.D. (Cornell), teaches courses in neuroendocrinology. His research focuses on the neurochemistry of social behavior in species ranging from lower vertebrates to humans.

Patsy S. Dickinson, Josiah Little Professor of Natural Sciences, A.B. (Pomona), M.S., Ph.D. (Washington), teaches comparative physiology and neurobiology. Her research focuses on the control of behavior by neural networks in simple model systems such as those found in crustaceans.

Hadley Wilson Horsch, associate professor of biology and neuroscience, B.A. (Swarthmore), Ph.D. (Duke), teaches introductory neuroscience courses as well as upper-level courses in molecular-level neuroscience. Her research focuses on mechanisms of neuronal regeneration in simple model systems such as the cricket.

Erika M. Nyhus, assistant professor of psychology and neuroscience, B.A. (California-Berkeley), M.A., Ph.D. (Colorado-Boulder), specializes in cognitive neuroscience of memory. Her research interests are in the neural processes involved in higher-level cognition, including executive functioning and episodic memory.

After Bowdoin

The majority of neuroscience majors go on to either graduate or medical school. In addition, a number of majors have gone on to careers in the allied health professions, including veterinary medicine, public health, and nursing. Some recent choices of graduate and medical schools include Harvard, Yale, Brandeis, Johns Hopkins, Stanford, University of Pennsylvania, and University of Calgary. Many majors spend one to three years after graduation conducting research at institutions such as the National Institutes of Health or a variety of major universities and medical institutions before going on to graduate or professional school.

For more information, go to: bowdoin.edu/neuroscience/

Revised September 2014