Program in Neuroscience at Williams College

Neuroscience is a rapidly growing interdisciplinary field concerned with understanding the relationship between brain, mind, and behavior. The faculty and students in the Neuroscience Program at Williams College forge research and teaching collaborations that are a model for undergraduate liberal arts colleges. Our students and faculty work closely together on projects that integrate the work of biologists, chemists, psychologists, and computer scientists in an attempt to understand the workings of the brain. Most upper level courses are small and have associated laboratories; other upper level courses such as seminars and tutorials are even smaller and emphasize close reading of the scientific literature. There are also opportunities to attend talks by invited speakers – and perhaps meet these prominent neuroscientists over dinner to discuss their work. Many students also attend national scientific meetings and may even present their own research. This combination of challenging classroom instruction, individual research opportunities, and exposure to the wider world of neuroscience prepares you for further education and careers in neuroscience and allied fields.

Concentration Requirements

Students interested in neuroscience may choose to pursue a concentration in the field. The program requirements are a total of seven courses including five courses specific to Neuroscience – an introductory course, 3 electives, and a senior seminar – plus two prerequisites, Biology 101 and Psychology 101. Introduction to Neuroscience (NSCI 201) is the foundation course and provides the background for other neuroscience courses as well as an overview of current topics such as the possible relationship between mirror neurons and consciousness and the basis of neurological conditions such as Alzheimer's disease and autism. The laboratory component exposes students to a number of different methodologies, including micro and macro anatomy, electrophysiology, and behavior.

Geshri Gunasakera '06 conducting a behavioral experiment for a course project.

Electives are upper-level courses designed to provide a more detailed treatment, including laboratory experience, of specific topics and areas of neuroscience. Many electives offer students the opportunity to conduct empirical projects. Students must take at least one elective from each major discipline (see box).

The senior course, Topics in Neuroscience (NSCI 401), is a seminar that provides an integrative culminating experience.

Courses

I. Required Prerequisites

BIOL101: The Cell
PSYC 101: Introductory Psychology

II. Required Core Courses

NSCI 201: Introduction to Neuroscience
NSCI 401: Topics in Neuroscience

III. Electives

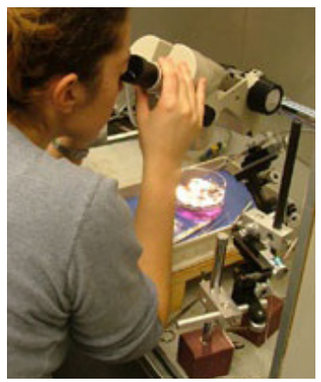
Group A

BIOL 204 Animal Behavior
BIOL 303 Sensory Biology
BIOL 304 Neurobiology
BIOL 209T Animal Communication
BIOL 310 Neural Development
BIOL 410 Cell Dynamics in Living Systems

Group B

PSYC 312 Drugs and Behavior
PSYC 315 Hormones and Behavior
PSYC 316 Clinical Neuroscience
PSYC 317T Nature vs. Nurture: Explorations in Developmental Psychobiology
INTR 223 Image, Imaging and Imagining: The Brain and Visual Arts

The electives offered will change as the field of Neuroscience evolves and progresses.



A student in Introductory Neuroscience sets up an electrophysiological experiment.

Faculty

The faculty in the Program in Neuroscience are drawn from the Psychology and Biology Departments, and have research interests ranging from neuroethology, molecular neurobiology and electrophysiology to developmental psychobiology and clinical neuroscience. All faculty members hold or have held grants from the National Institutes of Health or the National Science Foundation.

Lara Hutson works with small Heat shock Proteins (sHSPs). Her laboratory studies how sHSPs regulate neural development in the zebrafish. Her work uses confocal microscopy to examine the growth of fluorescently-labeled axons in embryos engineered to express abnormal sHSPs.

Noah Sandstrom investigates the relationship between sex hormones and cognitive processes, including the protective effects of estrogens against brain injuries. His work also examines how behavior after such injuries relates to cell death.

Paul Solomon conducts clinical research on the diagnosis and treatment of Alzheimer's disease. He serves as the Clinical Director of the Memory Clinic at Southwestern Vermont Medical Center.

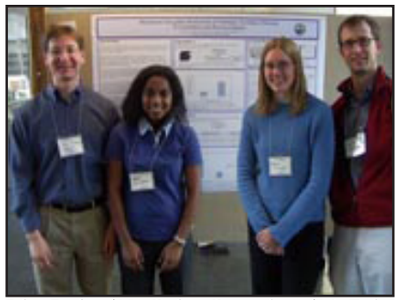
Heather Williams studies bird song as an animal model for human speech. Her lab's projects include studies of the relationship between brain and song plasticity, brain correlates of song syntax, and field investigations of vocal learning.

Betty Zimmerberg researches the effects of early maternal and social deprivation on the development of coping behavior and the neuronal mechanisms underlying behavioral responses to fearful situations.

Steven Zottoli studies the neuronal basis of the ability of non-mammalian vertebrates to recover after spinal cord injury. His work also includes investigations of how well the recovery from injury functions when an organism must evade predators.

Martha Marvin investigates how small Heat Shock Proteins (sHSPs) are involved in the early patterning of the vertebrate nervous system.

Research



John Rudoy '05, Geshri Gunasakera '06, Erika Williams '08, and Professor Noah Sandstrom presenting their research at a conference.

While the Neuroscience Program does not include a research requirement, students who have worked in laboratories find the experience to be invaluable. Students may conduct research as an independent study during the regular semester, Winter Study, or as as an Research Fellow on campus during the beautiful Berkshire summer. Professors in the department are enthusiastic about including student researchers in their work, and opportunities are always available for those who are interested. Students in these settings are considered junior colleagues and their research efforts often lead to coauthorship of published research papers in various scientific journals, and many students also present their work at national scientific meetings.

"My project was a wonderful chance to take part in a unique research opportunity. I learned a great deal about the process." *- Amy Russell '08*

"Doing research in neuroscience at Williams as a research assistant and thesis student has been so rewarding. You have the support to help you pursue and achieve anything!." *- Erika Williams '08*

"My campus job as a research assistant gave me the opportunity to present my own research at the national meeting of the Society for Neuroscience. It was such a great experience!" *- Ashley Rae Martinez '09*

Senior Thesis

Sarah Chuzi '07 and Magali Rowan '07 creating sections on the cryostat for their respective theses.

The degree with honors in neuroscience allows students to undertake an original research project under the supervision of one or more of the neuroscience faculty. In addition to completing the requirements for the Concentration in Neuroscience, candidates for an honors degree must spend a full academic year, including a Winter Study, working on their projects and writing an original thesis.

Facilities

Because of the commitment of Williams College to neuroscience and the success of the neuroscience faculty and college faculty in general in obtaining federal and private research support, Williams enjoys state-of-the-art facilities for neuroscience research. These include teaching and research laboratories equipped to perform electrophysiological recordings, anatomical studies at both the light and electron microscopic levels, behavioral testing in a variety of species (including telemetric monitoring of behavioral and physiological states, self-administration of addictive substances, and classical and operant conditioning) neuropsychological evaluations in humans, EEG recordings, and a wide variety of molecular techniques including quantitative PCR and automated DNA sequencing. Collaborative relationships with area hospitals allow students wishing to conduct more clinically-oriented research to work with human patients.

Modern instruments are available for both transmission and scanning electron microscopy. Facilities are available for neuromorphometry, computer assisted 3-D reconstructions, and standard histology and immunocytochemistry. The college also maintains animal surgeries for a variety of species, animal care facilities, fully-equipped and staffed machine, electronic, and wood shops, and an electron microscopy facility.

After Williams...

If you've already started to think beyond Williams, you will find that Neuroscience alumni are working in a variety of fields and professions. Many of our graduates are attending MD, PhD and MD/PhD programs at universities such as Stanford, Georgetown, Duke, and Harvard. Some graduates take research positions or work for biotech companies investigating conditions such as autism, Alzheimer's, stroke, and drug addiction; often these positions lead on to graduate or medical school.

Other alumni have chosen graduate programs in unrelated fields such as linguistics, law, MBA, and environmental studies. Still others have chosen careers ranging from investment banking and consulting to architecture and theater direction and public and private school teaching in the United States and abroad.

Additional material and contact information can be found at:
http://www.williams.edu/Neuroscience/

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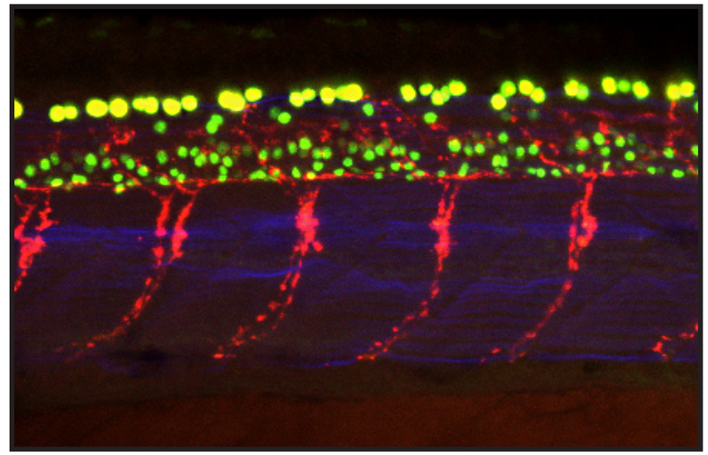

Side view of the trunk of a zebrafish embryo at 30 hours of development, triple labeled for motor neurons (red), spinal cord nuclei (green), and muscle fibers (blue). Motor neuron cell nuclei are labeled both green and red and so appear yellow. Courtesy of Maria Recco, Hutson lab.

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