

# NEUROBIOLOGY

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Courses given in Neurobiology have the subject code NBIO. For a complete list of subject codes, see Appendix B.

## GRADUATE PROGRAM

Graduate students in the Department of Neurobiology obtain the Ph.D. degree through the interdepartmental Neurosciences Ph.D. program. Accepted students receive funding for tuition and a living stipend. Applicants should familiarize themselves with the research interests of the faculty and, if possible, indicate their preference on the application form which is submitted directly to the Neurosciences Program.

Medical students also are encouraged to enroll in the Ph.D. program. The requirements of the Ph.D. program are fitted to the interests and time schedules of the student. Postdoctoral training is available to graduates holding Ph.D. or M.D. degrees, and further information is obtained directly from the faculty member concerned.

Research interests of the department include: mechanisms of visual transduction and information transmission in vertebrate retina; structure, function, and development of auditory and visual systems; integrative mechanisms and regeneration in the central and peripheral nervous system; mechanisms of ion channel function; and neuronal growth and differentiation.

## COURSES

Course and lab instruction in the Department of Neurobiology conforms to the "Policy on the Use of Vertebrate Animals in Teaching Activities," the text of which is available at <http://www.stanford.edu/dept/DoR/rph/8-2.html>.

The department offers a one quarter course (Neurobiology 200) on the structure and function of the nervous system, which is open to medical and graduate students and advanced undergraduates. Advanced courses are open to students who have completed the basic course.

**NBIO 199. Directed Reading (Undergraduate)**—Prerequisite: consent of instructor.

*1-18 units, Aut, Win, Spr, Sum (Barres, Clandinin, Knudsen, McMahan, Moore, Newsome, Raymond, Shooter, Stryer)*

**NBIO 200. The Nervous System**—Introduction to the structure and function of the nervous system, including neuroanatomy, neurophysiology, and systems neurobiology. Topics include the properties of neurons and the mechanisms and organization underlying higher functions. Framework for general work in neurology, neuropathology, clinical medicine, and for more advanced work in neurobiology. Lecture and lab components must be taken together.

*7-9 units, Win (Barres, Knudsen, Newsome, Raymond, Stryer, Clandinin)*

**NBIO 204. Computational Neuroimaging**—(Same as PSYCH 204A.) Advanced seminar. For students working with functional magnetic resonance imaging (fMRI). Review of current understanding of the physiological basis of the signal measured using fMRI. Possibilities for experiment design and interpretation of the signal with respect to other physiological and behavioral measurements. Emphasis is on experimental design, software tools, and pulse sequences for fMRI experiments.

*1-3 units (Wandell, Grill-Spector) alternate years, given 2004-05*

**NBIO 216. Genetic Analysis of Behavior**—Advanced seminar. Findings and implications of behavioral genetics as applied to invertebrate and vertebrate model systems. Topics include biological clocks, and

sensation and central pattern generators. Relevant genetic techniques and historical perspective. Student presentation.

*4 units, Aut (Clandinin, Goodman) alternate years, not given 2004-05*

**NBIO 218. Neural Basis of Behavior**—Advanced seminar. The principles of information processing in the vertebrate central nervous system, and the relationship of functional properties of neural systems with perception and behavior. Emphasis is on the visual and auditory systems. Original papers, directed discussions, and student presentations. Prerequisite: 200 or consent of instructor.

*4 units (Knudsen, Raymond) alternate years, given 2004-05*

**NBIO 220. Central Mechanisms in Visual Perception**—Contemporary visual neuroscience, emphasizing the neural mechanisms underlying primate vision and visually guided behavior. Seven foundational topics in visual neuroscience; current papers concerning each topic. Student presentations. Computer-based demonstration exercises.

*2-4 units, Spr (Newsome) alternate years, not given 2004-05*

**NBIO 221. Frontiers in Translational Medicine**—Pathways for combining science and medicine during graduate and postdoctoral training and in one's career. Practical aspects of translational medicine. Guest lecturers include physician-scientists who have advanced the frontiers of translational medicine. Speakers last year included Rob Malenka, Judy Swain, Bob Fisher, Jeff Bird, Ching Wang, Lubert Stryer, Jamie Topper, Ben Barres, and Gary Steinberg.

*1 unit, Spr (Barres)*

**NBIO 240. High Level Vision**—(Enroll in PSYCH 250.)

*1-3 units (Grill-Spector) not given 2003-04*

**NBIO 254. Molecular and Cellular Neurobiology**—(Same as BIOSCI 154/254.) For advanced undergraduates and graduate students. Focus is on cellular and molecular mechanisms in the organization and functions of the nervous system. Topics: cell biology of the neuron, wiring of the neuronal network, synapse structure and synaptic transmission, signal transduction in the nervous system, molecular basis of behavior including learning and memory, molecular pathogenesis of neurological diseases. Prerequisite for undergraduates: Biological Sciences core or equivalent, plus at least one of BIOSCI 118, 128, 129, or 153, or consent of the instructors.

*4 units (Luo, Stryer) not given 2003-04*

**NBIO 299. Directed Reading**—Prerequisite: consent of instructor.

*1-18 units, Aut, Win, Spr, Sum (Barres, Clandinin, Knudsen, McMahan, Moore, Newsome, Raymond, Shooter, Stryer)*

**NBIO 300. Professional Development and Integrity in Neuroscience**—Required of Neurosciences Ph.D. students every quarter. Develops professional skills in critical assessment and oral presentation of findings from current neuroscience literature in the visual presentation of quantitative data and writing research grants. The role of animals in lab research, fraud in science, the responsibility of authors and reviewers, science in a multicultural environment, and the relationship between student and mentor. Student and faculty presentations and discussions.

*1-2 units, Aut, Win, Spr (Raymond)*

**NBIO 399. Individual Research**—Prerequisite: consent of instructor.

*1-18 units, Aut, Win, Spr, Sum (Barres, Clandinin, Knudsen, McMahan, Moore, Newsome, Raymond, Shooter, Stryer)*

**NBIO 450. Introduction to Biotechnology**—(Enroll in CHEMENG 450, BIOC 450.)

*3 units, Spr (Kao)*

**NBIO 459. Frontiers in Interdisciplinary Biosciences**—(Crosslisted in multiple departments in the schools of Humanities and Sciences, Engineering, and Medicine. Students should enroll through their affiliated department; otherwise enroll in CHEMENG 459.) See CHEMENG 459 or [http://biox.stanford.edu/chemeng\\_index.html](http://biox.stanford.edu/chemeng_index.html) for description.

*1 unit, Aut, Win, Spr (Robertson)*